THE HEALTH COST OF TOBACCO USE IN UGANDA

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THE HEALTH COST OF TOBACCO USE IN UGANDA

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CTCA
Center For Tobacco Control In Africa

MAKERERE UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH

American Cancer Society®

THE REPUBLIC OF UGANDA
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Foreword

Africa is still at the early stage of the tobacco use epidemic and therefore requires evidence to advocate and drive tobacco control policies. Tobacco use is a major risk factor for non-communicable diseases globally and lack of control of such risk factors of non-communicable diseases will water down efforts made to address the high burden of communicable diseases leading to a double tragedy. Many of the non-communicable diseases for example, heart diseases, cancers, and diabetes are due to preventable risk factors such as tobacco use, physical inactivity, poor diet and harmful use of alcohol. This study provides evidence on the cost of managing tobacco related illnesses incurred by the patient, family and government. The study provides valuable data and evidence-based information, which will be used in Uganda, and across Africa to design, and implement practical measures for tobacco control such as taxation and tax structure reforms.

I acknowledge the tireless efforts of the investigators from the Center for Tobacco Control in Africa (CTCA), Uganda Cancer Institute, American Cancer Society and Ministry of Health Uganda. I extend my gratitude to the study collaborators including; Mulago National Referral Hospital, Uganda Cancer Institute, Uganda Heart Institute, Diabetic Clinic and Chest Clinic in Mulago Complex for participating and providing valuable data for successful implementation of the study. I would also like to extend my appreciation to the patients and their caregivers who spared time to provide information while in and out of hospital.

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Acronyms

ASH	Action on Smoking and Health
CTCA	Centre for Tobacco Control in Africa
CDC	Centers for Diseases Control and Prevention
CTFK	Campaign for Tobacco Free Kids
CVD	Cardiovascular Diseases
COPD	Chronic Obstructive Pulmonary Disease
ETS	Environmental Tobacco Smoke
FCTC	Framework Convention on Tobacco Control
GATS	Global Adult Tobacco Survey
GDP	Gross Domestic Product
GYTS	Global Youth Tobacco Survey
HMIS	Health Management Information System
IARC	International Agency for Research on Cancer
IMF	International Monetary Fund
LMICs	Low and Middle Income Countries
MakSPH	Makerere University School of Public Health
MoH	Ministry of Health
NCDs	Non-Communicable Diseases
PAR	Population Attributable Risk
RR	Relative Risk
SAF	Smoking Attributable Fraction
SHS	Secondhand Smoke
TAE	Total Attributable Expenditure
TB	Tuberculosis
TFI	Tobacco Free Initiative
TI	Tobacco Industry
WHO	World Health Organization

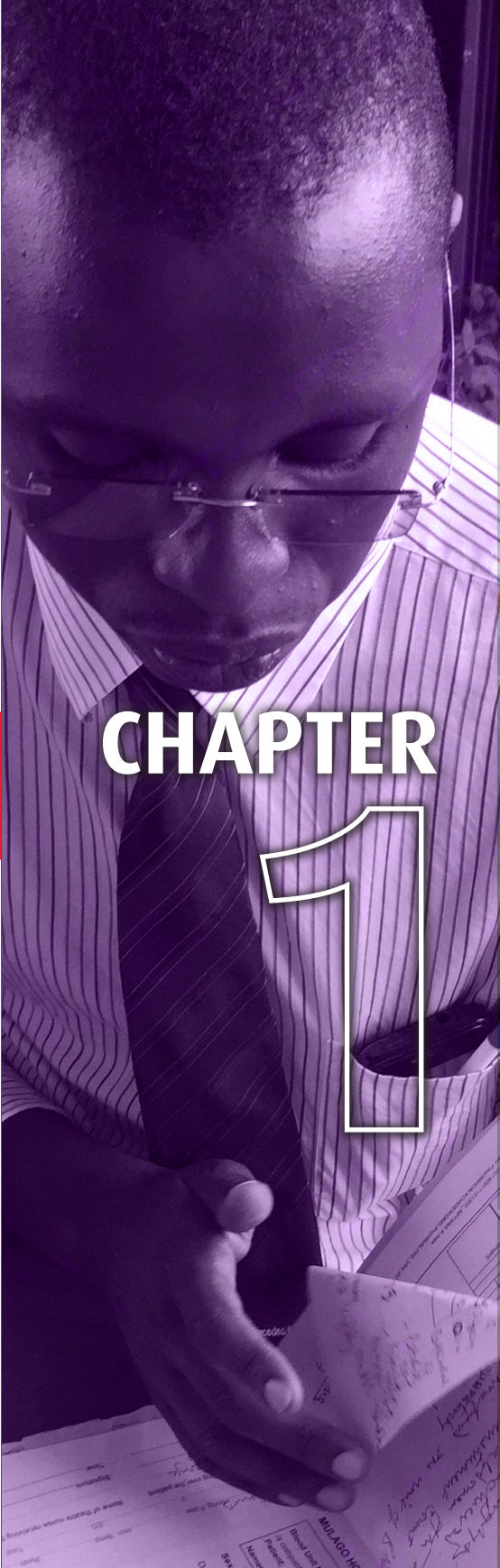
Executive Summary

The economic cost of tobacco use is a well-studied issue in the context of high-income countries. It has been measured in only a handful of low and middle-income countries (LMICs). This is partly because the tobacco epidemic is at an early stage in LMICs. Hence, the adverse health consequences of tobacco use are not felt as hard as is in high-income countries. This study aims at estimating the economic cost of tobacco use in Uganda. As a benchmark, the study will make tobacco control communities, including professionals and policy makers, aware of the current harms caused by tobacco use to the economy. Consequently, this would lead them to take appropriate measures to prevent the epidemic.

The study used data from four units in the National Referral Hospital namely; Uganda Cancer Institute, Heart Institute, Diabetic and Chest clinic. A sample of 353 patients was surveyed. The study used the World Health Organization (WHO) *Economics of Tobacco Toolkit: Assessment of Economic Costs of Smoking,* where the Annual Cost option of the "Cost of Illness Approach" was adopted.

The results revealed that the annual average medical cost of a current or former smoker suffering from a tobacco-attributable disease is UGX 3,697,255 (USD 1,422) which is 2.28 times the annual average medical cost of a never smoker, that is UGX 1,619,309 (USD 622.8). The relative risk (RR) ratio is thus 2.28. With a population level tobacco use prevalence of 11.76percent (Global Adult Survey, 2013) and RR of 2.28, the population attributable risk (PAR) is 0.94 percent. It means that about 1percent of the total cost of tobacco-related illnesses can actually be attributed to tobacco use in Uganda. The direct cost of treating tobacco-attributable illnesses in Uganda is estimated to be UGX 108.05 billion (USD 41.56M).

The total health cost of tobacco use including the direct cost of treatment and the indirect costs of loss of income and productivity from death and disability in Uganda is UGX 328.82 billion, which is equivalent to US$126.48 million. The total health cost outweighs the market value UGX 211.15 billion (USD 81.22M) of tobacco products or the assumed benefits of tobacco use in Uganda. These benefits accrue to the wages and salaries of the farmers and employees employed in the tobacco sector, profit of the tobacco growers and manufacturers, and government revenue generated from tobacco taxes. The fact that, the cost of tobacco use in Uganda exceeds the benefits, justifies government intervention to control and combat tobacco use in the country. The cost of tobacco use constituted 0.5 percent of GDP while the health care expenditure for treating tobacco-induced diseases accounted for 2 percent of the national health expenditure in 2013. These resources could have been diverted to more productive uses benefiting public health as well as the economy.



CHAPTER 1

1.0 Introduction

The World Health Organization (WHO) identifies tobacco as the leading cause of preventable death in the world. If effective measures are not taken urgently, tobacco use will likely kill more than 1 billion people in the 21st century.[1, 2] Many of these deaths occur prematurely, and impact negatively on the socio-economic development of any nation. Tobacco use causes six million death globally per year, while second hand smoke causes 600,000 deaths globally per year.[3] The annual death toll from tobacco use is expected to rise to over 8 million by the year 2030 with more than 80 percent deaths projected to occur in Low and Middle-Income Countries.[4,5]

Estimates that tobacco kills one of every two users and has a mortality rate higher than any other disease globally.[2] Many of these deaths which are largely preventable, by appropriate life measures, occur prematurely and negatively impact on the socio-economic development of any nation.

1.1 Tobacco Use Prevalence and Exposure

The 2013, Global Tobacco Adult Survey (GATS), indicates that 7.9 percent of Ugandans aged 15-49 years use tobacco products. Tobacco usage among men is 11.6 percent and 4.6 percent among women. Overall 5.8 percent of adults (10.3 percent men and 1.8 percent women) use smoked tobacco products while 2.4 percent (1.7 percent men and 3 percent women) use smokeless tobacco products. Cigarette use stood at 5.3 percent for adults (9.6 percent men and 1.4 percent women), while exposure to secondhand smoke at the workplace was 20.4 percent, at home 13.1 percent and 62.3 percent in bars and night clubs.[6]

The Global Youth Tobacco Survey (GYTS) report for Uganda 2011, which studied school-going youths aged 13-15 years, found that 17.3 percent were current users of any form of tobacco; 4.8 percent were currently smoking cigarettes and 15.6 percent were currently using other tobacco products.[7] In addition, the report shows that 38.3 percent of youths in Uganda were exposed to SHS. This demonstrates that tobacco use is a serious problem to Uganda's youthful population and clearly predicts a gloom picture for the future generation.

1.2 Tobacco Related Mortality

The 2010 WHO Global Status Report on Non-Communicable Diseases (NCDs) shows that NCDs are the biggest cause of death worldwide. It reveals that more than 36 million people died from NCDs, mainly cardiovascular diseases (48 percent), cancers (21 percent), chronic respiratory diseases (12 percent) and diabetes (3 percent). Premature deaths from NCDs stood at 22 percent among men and 35 percent among women in low-income countries.[8] In Uganda, NCDs account for 25 percent of all deaths.[8] The estimates indicate that cancers account for 127 deaths per 100,000, chronic respiratory diseases account for 159 deaths per 100,000 while cardiovascular diseases and diabetes account for 562 deaths per 100,000.

Tobacco use and exposure to secondhand smoke is associated with disability and death from non-communicable diseases such as lung cancer, heart disease, stroke and respiratory diseases. Tobacco use is also associated with an increased risk of death from communicable diseases. These may include: respiratory infections and tuberculosis, and increased rates of stillbirth, low birth weight, congenital malformations, death attributed to sudden death syndrome in infancy, disability from respiratory diseases in childhood and adolescence and young adulthood, and increased rates of cardiovascular death in relatively young middle-aged adults.

1.3 The Cost of Tobacco Use

Global evidence suggests that people in lower socio-economic status spend a higher proportion of their income on tobacco products.[9] NCDs killed 1,064,000 people in Uganda and sixty-one percent of these deaths were due to NCDs in persons below the age of 70. It is estimated that for every 100,000 men in Uganda in 2010, 1,094 men died of NCDs, and of these deaths, 12 percent were due to cancer, 15 percent were due to chronic respiratory diseases and 51 percent due to diabetes and heart diseases. On the other hand, in the same year, for every 100,000 women, 685 died of NCDs, and of these deaths, 20 percent were due to cancer, 8 percent were due to chronic respiratory diseases, and 6 percent were due to diabetes and heart disease[10].

Besides ill health, tobacco use and exposure have adverse implications for the health, social and economic status of families, communities and governments. Tobacco use contributes to poverty because expenditure on tobacco consumes a substantial proportion of total household disposable income, displaces other goods and services important for health,[11] and results in debilitating diseases and conditions with high medical costs. This presents a burden to families

and communities who have to care for and cope following the loss of loved ones and valued community members due to tobacco-related diseases.[11] Governments also incur a significant health care cost on the treatment of tobacco related diseases.

According to the Tobacco Atlas, [12] the monetary value of the health damage from a single pack of cigarettes is US$35 to an American smoker. There is also reduced national productivity due to premature death or disability that limits government capital for investment in other public services or infrastructure to serve the public good.[13] The life expectancy of a long-term smoker is about 10 years less than a non-smoker. If one starts tobacco use at a younger age, it is most likely they will smoke for longer and die early from tobacco use-related diseases.[14]

1.4 Rationale

The burden of managing these disease conditions is borne by the individual, household and government however there is scanty or near absence of evidence on the socio-economic cost of the tobacco related disease burden in Uganda. Generally, there is a growing body of evidence showing high rates of tobacco use and related diseases but research to estimate the cost imposed by diseases related to tobacco use in Uganda has not been done. Evidence about what it costs to smoke and to die of the related illnesses, and costs incurred by individuals, families and government to care for the patients, and loss of persons to tobacco use is not well documented in Uganda. Absence of knowledge of the cost negatively affects policy formulation and implementation. Worse still, Uganda's economy is constrained by lack of resources to adequately manage the chronic conditions resulting from tobacco use.

The tobacco industry argues that tobacco contributes significantly to global and local economies, ignoring the enormous resource drain that the use of tobacco products has on society as a whole. Though there is enough global evidence that the burden of disease, disability and deaths caused by the use of tobacco far outweighs any economic benefit from the tobacco industry and consumption of tobacco, such information is lacking in the case of Uganda. The study presents local evidence to support policy development and implementation.

1.5 Objectives of the Study

The general objective of the study was to estimate the health costs attributable to tobacco use in Uganda and support policy development and implementation. The specific objectives were to:

1. Estimate the costs incurred by individuals to purchase tobacco products.
2. Estimate costs of health care to patients suffering from tobacco use related diseases.
3. Estimate the costs incurred by households on health care of a family member suffering from tobacco related diseases.
4. Estimate government expenditure on health care for patients suffering from tobacco use related diseases.

2.0 Literature Review

Tobacco use and exposure have adverse implications on the health, social and economic status of families, communities and governments. Tobacco use does not only cause absenteeism from work, but also early retirement, both of which negatively impact the economy. Tobacco use contributes to family poverty. Expenditure on tobacco consumes a substantial proportion of the total household disposable income. This displaces basics goods and services that are important for health. The diseases that arise from tobacco use present a burden to families and communities who have to care for and cope following the loss of loved ones and valued community members.[15]

Governments also incur a significant health care expenditure on the treatment of tobacco related diseases. In addition, governments suffer from reduced national productivity due to premature death or disability resulting from tobacco related diseases. This limits government capital for investment in other public services or infrastructure to serve the public.[16]

2.1 Tobacco Use and Relationship with Other Diseases

2.1.1 Tobacco use and Tuberculosis (TB)

Studies from around the world indicate that there is a harmful synergistic effect between smoking and TB.[15] Smoking is known to affect T-cell function in the lungs, reduce cytotoxic activity and impair clearance of particles and possibly favor replication of mycobacterium.[15] Another study conducted in Morocco to assess

the impact of smoking on TB treatment adherence indicated that smoking was significantly correlated with treatment failure. [16,17] According to WHO, more than 20 percent of the global TB incidence is attributable to tobacco use, hence making tobacco a major risk factor for TB. It is further estimated that tobacco use increases the risk of acquiring TB by more than two and a half times. [17]

2.1.2 Tobacco use and HIV and AIDS

Among HIV and AIDS patients, smokers lose more life years to tobacco use than to HIV infection. The excess mortality of smokers is tripled and the population-attributable risk of death associated with use is doubled among HIV patients compared to the background population.[14] Tobacco use weakens the immune system and makes it harder for the body to fight HIV related infections. It interferes with processing of medications by the liver, making its functioning weaker. Smokers on HIV medications are likely to experience nausea and vomiting. People with HIV and AIDS that smoke are likely to develop several opportunistic infections such as oral thrush, oral leukoplakia, bacterial pneumonia and pneumocystis pneumonia.[14]

2.1.3 Tobacco use and Reproductive Health

Weisberg observed that, tobacco use reduces a woman's fertility. [18] Female smokers tend to take longer to conceive than non-smokers, and are at a higher risk of not being able to get pregnant at all. Tobacco use during pregnancy increases the risk of spontaneous abortions, premature delivery, stillbirths, infertility, and having children with low birth weight. Tobacco contains nicotine and tar, which substances affect blood vessels supplying the placenta, hence leading to under nutrition of the fetus. Other complications include; neonatal death, and long-term effects on surviving children including long term disabilities such as cerebral palsy, intellectual disability, and learning problems. Women who smoke during pregnancy are more likely to have ectopic pregnancy, vaginal bleeding, placenta abruption, and placenta previa.

2.2 Economic Burden of Cigarette Smoking

Over the years, several studies have been conducted in different countries around the world to estimate the economic burden of tobacco use. The studies reveal that the burden caused by tobacco products outweighs any economic benefit from their manufacture and sale. Studies conducted in the USA and other high -income countries found that annual smoking attributable to health care costs account for 6-15 percent of the national healthcare expenditure.[19, 26] According to the Campaign for Tobacco Free Kids, the total annual public and private health care expenditures caused by smoking in USA is approximately US$170 billion. This figure does not include costs from smokeless or spit tobacco use or pipe/cigar smoking. It also indicates that productivity losses caused by smoking each year in USA account for US$151 billion, while productivity losses from secondhand smoke exposure account for US$5.6 billion.

In a study undertaken to estimate the cost of smoking to the European Union Society, it was found that the public healthcare expenditure on treating smoking attributable diseases suffered by smokers was around €36.6 billion in 2000. Public healthcare expenditure on treating secondhand smoke related illnesses was estimated at around €1.2 billion in 2000, which corresponds to 0.2 percent of the total healthcare spending in the EU. Smoking related productivity losses are reported to have cost the EU economy an estimated €12.4 billion in the year 2000, an equivalent of 0.1 percent of GDP.[20]

Another study undertaken in Vietnam to estimate the direct and indirect costs of active smoking, found that the total economic cost of smoking in 2011 was US$1.173 billion, approximately 0.97 percent of the 2011 gross domestic product. The direct costs of inpatient and outpatient care reached US$470.4 million and US$122 million, respectively. The government's contribution to these costs was US$215.5 million, which was equivalent to 5.76 percent of its 2011 healthcare budget. The indirect costs (productivity loss) due to morbidity and mortality were US$126 million and US$454.6 million, respectively. These indirect costs represent about 49.5 percent of the total costs of smoking. [20]

A comprehensive study on the impact of tobacco- related illnesses in Bangladesh, [22]estimated the total cost of tobacco-related illnesses at US$1.5 billion, on the basis of 25 percent of potential patients being admitted to hospital. The annual cost of tobacco-related illnesses in Bangladesh attributable to tobacco usage was estimated at US$0.68 billion, including US$0.07 billion for secondhand use. The total cost of tobacco use, net of benefits from tax revenue and income generated in the tobacco sector, is reported to amount to US$442 million per year. This is a huge cost to a low-income economy like Bangladesh.

In India, a study based on 2004 data, estimated the tobacco-attributable costs of diseases separately for smoked and smokeless tobacco use.[23] The direct medical costs of treating tobacco related diseases in India amounted to US$907 million for smoked tobacco and US$285 million for smokeless tobacco. The indirect morbidity costs of tobacco use, which included the cost of caregivers and value of work loss due to illness, amounted to US$398 million for smoked tobacco and US$104 million for smokeless tobacco. The total economic cost of tobacco use amounted to US$1.7 billion. Of the total cost of tobacco, 88percent was attributed to men. The total tobacco-attributable direct healthcare expenditures (TAE) of treating tobacco related diseases amounted to US$1192.5 million, including US$188.7 million for male smokeless tobacco users and US$96.6 million female smokeless tobacco users. The TAEs were highest for cardiovascular diseases for males and females regardless of the type of tobacco use. The study found that the cost of tobacco use was many times more than the expenditures on tobacco control by the government of India, and about 16 percent more than the total tax revenue from tobacco. The tobacco-attributable cost of tuberculosis was three times higher than the expenditure on tuberculosis control in India. Tuberculosis accounted for 18 percent of tobacco-related costs (US$311 million).

CHAPTER 3

3.0 Study Methods

3.1 Study Design and Population

The study was cross-sectional, and conducted in Mulago National Referral Hospital. The study subjects were patients diagnosed with cancer (lung, stomach, oral-pharyngeal), chronic obstructive pulmonary disease (COPD), cardiovascular diseases and diabetes, and their caregivers. The study covered patients aged 30 years and above.

3.2 Data Sources

The primary data for the study was collected from four major specialized care centers in Mulago National Referral Hospital namely: Uganda Cancer Institute, Uganda Heart Institute, Chest Clinic and Diabetic Clinic. A statistically representative sample size of the population was obtained using Kish Leslie formula[26]: $n=Z^2P(1-P)/d^2$, where ***n*** is the ideal sample size, ***Z*** is the 95 percent confidence interval, ***d*** is the degree of precision level (5 percent) and ***p*** is prevalence of disease condition. An independent sample size was generated for each of the disease categories based on the WHO estimates of mortality attributable to tobacco use. For each patient selected, one full time caregiver was selected and interviewed.

The following techniques were used to collect the data; document review, survey and key informant interviews. Documents reviewed included: Budgets and expenditure reports, hospital reports, patient records, and health management information system (HMIS). Additional data/information was generated through patient and

caregiver surveys. The survey involved patients suffering from the named tobacco related diseases at the Mulago National Referral Hospital during the period (July 1, 2013-June 30, 2014). Key informant interviews were conducted from selected interviewees in the Ministry of Health and Mulago hospital administration.

3.3 Analytical Approach

The study applied the cost-of-illness approach used by Dorothy Rice and colleagues, [28-32] to estimate the economic cost of tobacco use in Uganda. This approach takes a macroeconomic perspective in assessing the aggregate economic impact of tobacco use on all agents in society. Within this approach, the economic cost of tobacco use is measured in terms of direct and indirect costs. The direct cost includes health care and other expenditures incurred due to tobacco related illnesses while, the indirect cost includes value of lost productivity due to disability and premature deaths caused by tobacco-related illnesses. This approach has been applied in the majority of cost of tobacco use studies reviewed in the literature. The details of the cost of illness approach have been provided in the WHO toolkit on the assessment of the economic costs of smoking.[33]

The direct cost covers two major components in this study:

i. The payments made for health care services (e.g. hospitalization, physician's service, laboratory tests for diagnosis of illness, outpatient services, drugs, nursing care, etc.) received by the patients who suffer from tobacco-attributable diseases. In the present study, the patients surveyed in four disease units were asked about the expenses they incurred both within the health care facility under study and outside the facility. These costs can either be out-of-pocket expenditures or provided by the public health care system.

ii. The non-health care expenses (e.g. transport and communication of the patient and caregiver to and from the health care facility)

Based on the human capital approach, the indirect cost also covers two major components:

i. Morbidity costs- which include the lost income from the loss of working days of the employed patients and their caregivers due to the disability caused by tobacco-induced illnesses.

ii. Mortality costs- which include the lost income from the loss of working days of the patients who died prematurely and who would have been economically active had they survived.

While the direct cost components and the indirect morbidity costs are measured on an annual basis, the mortality costs are assessed as a present value of the loss of income stream over the period of working lifetime that was lost to premature death from tobacco-induced diseases.

The study population in the hospitals included both men and women who were aged 30 years or older and suffered from one of the tobacco-induced (both smoked and smokeless tobacco) diseases prevalent in Uganda. These diseases include; lung cancer, stomach cancer, oral and pharyngeal cancer, diabetes, cardiovascular diseases and chronic obstructive pulmonary disease. The study was limited to only the effect of active tobacco use and did not include the health effects of secondhand smoking. Further still, the study did not compute the household production foregone due to illness or premature death as part of the indirect cost of tobacco use due to lack of data on household production. The indirect cost estimated in this study is thus an underestimate of the true indirect cost of tobacco use.

3.4 Methods of Estimation

3.4.1 Smoking-attributable fraction/population-attributable risk

Since the illnesses specified in the study may have been caused by risk factors other than tobacco use, we needed to attribute the total cost to tobacco use. For this measure, we calculated the Smoking Attributable Fraction (SAF), which is the proportion of health services utilization, healthcare costs, deaths, or other health outcome measures that are attributable to tobacco use. The SAF is also known as the population attributable risk (PAR).

The SAF was calculated using the epidemiological approach for all the tobacco use related diseases of interest. Specifically, the medical cost ratio approach was used to calculate the relative risk. This approach used average annual treatment cost per person stratified by tobacco use. The product of the SAF and the national healthcare cost corresponding to the specified diseases is the smoking-attributable healthcare cost for those diseases. Data needed for SAF calculation include smoking prevalence and relative risk of the predefined diseases using the following epidemiological formula separately:

$$SAF = \frac{P_e \times (RR_e - 1)}{P_e * (RR_e - 1) + 1} \times 100\% \qquad (1)$$

$$SAF = \frac{[P_n + (P_e * RR_e)] - 1}{[P_n + (P_e * RR_e)]} \times 100\% \qquad (2)$$

Where; the subscript:

P_e= percentage of ever smokers (current plus former smokers)

P_n = percentage of never smokers, which equals (1 - P_e)

RR_e= relative risk of developing a particular tobacco-related disease or having an event (such as incurring disability days) for ever smokers compared to never smokers.

In this study, we used the following medical cost ratio approach to estimate RR:

$$RR = \frac{Average\ annual\ treatment\ cost\ for\ ever\ smokers}{Average\ annual\ treatment\ cost\ for\ never\ smokers}$$

Ideally, both the numerator and denominator should be based on per person cost for all people (including healthy and ill persons) rather than just those who have the disease of interest. However, due to lack of data on the medical cost of all people, we used the medical cost per person who had the disease of interest only and hence this ratio may be biased downward and lead to underestimation of the PAR and tobacco-attributable costs.

3.4.2 Total direct costs of tobacco use

Let the average annual health care expenditure per patient in the health care facilities under study be UCOST1 and the average annual health care expenditure per patient outside those facilities be UCOST2. The sum of these two average costs gives the average annual health care expenditure per patient:

UCOSTH = UCOST1 + UCOST2 *(5)*

Let the average annual transport and communication cost per patient be UCOST3 and the average annual transport and communication cost per caregiver for each patient be UCOST4. The sum of these two average costs gives the average annual non-health care expenditure per patient:

UCOSTNH = UCOST3 + UCOST4 *(6)*

The sum of the average costs of health care and non-health care services provides the average direct cost per patient:

UCOST = UCOSTH + UCOSTNH *(7)*

The total direct cost is given by the product of the total number of patients who suffered from the tobacco-attributable diseases and accessed health care services in a given year and the

average direct cost per patient:

TDC = TOTP x UCOST *(8)*

In the absence of any direct information on the number of patients suffering from tobacco-related illnesses and accessing health care facilities, we used findings from two studies on Uganda that estimated the prevalence of self-reported NCDs) at 23 percent.[34] and the percentage with access to health care at 76 percent.[34] The total number of patients with NCDs accessing health care in a given year was estimated by:

TOTP = POP (30+) x 23% x 76% *(9)*

where POP (30+) is the total population who are 30 years or older.
The tobacco-attributable direct cost was estimated by the product of the total direct cost and the population attributable risk:

TATDC = TDC x PAR *(10)*

3.4.3 Indirect morbidity costs of tobacco use

The formula for calculating tobacco-attributable indirect morbidity costs based on the human capital approach is expressed as:

TAIMBC = PAR x TWLDP x DINCP + PAR x TWLDC x DINCC *(11)*

Where; TWLDP = total yearly work–loss days of patients;

TWLDC = total yearly work-loss days of caregivers;

DINCP = daily income per patient;

DINCC = daily income per caregiver.

The daily income was calculated from reported monthly income under the assumption that there are 22 working days in a month. The total yearly work-loss days of patients (caregivers) was calculated by the average monthly work-loss days times 12 multiplied by the total number of patients (caregivers) and the employment rate of patients (or caregivers):

TWLDP = TOTP x EMPLOYP x WLMP x 12 *(12)*

$$TWLDC = TOTC \times EMPLOYC \times WLMC \times 12 \quad (13)$$

Where; TOTP = total number of patients;

TOTC = total number of caregivers (for simplicity, it is assumed that each patient has one caregiver);

EMPLOYP = employment rate of patients;

EMPLOYC = employment rate of caregivers;

WLMP = average monthly work-loss days per patient;

WLMC = average monthly work-loss days per caregiver.

3.4.4 Indirect mortality costs of tobacco use

Based on the human capital approach, the tobacco-attributable indirect mortality cost was estimated according to the formula:

$$TAIMTC = PAR_x \quad \sum_{a=Min\ a}^{Max\ a}\left(TDEATH_{ja} x PVLE_{ja}\right) \quad (14)$$

Where; TAIMTC = tobacco-attributable indirect mortality cost;

$TDEATH_{ja}$ = total number of deaths from tobacco-attributable diseases for population subgroup j (male and female) whose age at death is within the age group "a" (30-44, 45-59, 60-69, 70-79, 80+)

$PVLE_{ja}$ = total discounted present value of lifetime earnings for population subgroup j whose age is within the age group "a"

Min a = minimum age group

Max a = maximum age group

The formula to calculate the PVLE is specified as follows:

$$PVLE_{ja} = \sum_{n=a}^{Max}\left(SURV_{ja}(n)\right) x Y x E_j x \frac{(1+V)^{n-a}}{(1+r)^{n-a}} \quad (15)$$

Where; $SURV_{ja}(n)$ = the probability that a person of age a and gender j will survive to age n;

a = the age of the person at death;

Max = maximum age group (e.g., age 80+);

Y = the mean annual earnings of an employed person;

Ej = the proportion of the population of gender j that are employed in the labor market;

V = the growth rate of labor productivity;

r = the discount rate.

The survival probabilities by age group and gender were obtained from the WHO life table. The future pattern of earnings and labor force participation rates were predicted by assuming that people will be working and productive during their lifetimes in accordance with the current pattern of earnings and work experience for their cohorts. In the absence of gender specific average earning, we assumed the same average earning for men and women, which is UGX 4.56 million per person. This annual income was assumed to grow at an annual average growth rate of 6 percent (based on projections from 2015 to 2020 in IMF World Economic Outlook).[36] The rate of discount was assumed to be 3 percent per annum following Sung et al.[11]

3.4.5 Total health care cost of tobacco use

The total health cost of tobacco use is given by the following sum of the direct and the indirect costs that are attributable to tobacco use:

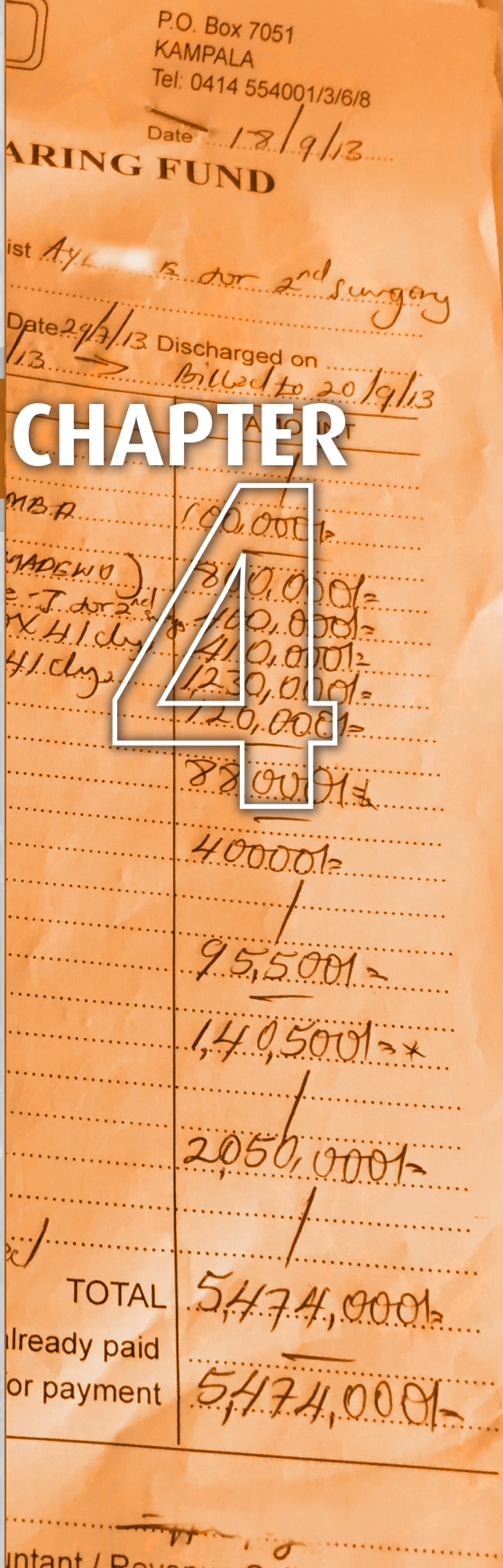
$$THC = TATDC + TAIMBC + TAIMTC \qquad (16)$$

3.5 Study Limitations

1. Missing data in some of the records reviewed
2. The number of patients who died during the study made it difficult to follow up.
3. Recall bias by patients and caregivers was a possibility, given that some clients were reached more than six months after their last hospital visit.
4. The study was not able to get data on health costs of patients managed abroad.
5. Fragmentation of health care resulting into multiple patient records made it difficult to estimate the total cost for patients who had co-morbidities

4.0 Findings

CHAPTER 4



This Chapter presents the findings of the study as follows: description of the characteristics of patients and caregivers; estimates of the direct and indirect health care costs; and estimates of the non-health care costs to patients, their families and government.

4.1 Description of the Patients Characteristics

Data was extracted from the medical records of 353 patients, of which 189 (54 percent) were male and 164 (46 percent) were female. Of the 353 patients, 103 (55 percent males, 45 percent females) were followed-up with a phone interview to obtain information pertaining to their smoking history, and the health care costs on medication. The mean age of the patients was 58 years and there was no significant variation in mean age by gender. In terms of regional distribution, about 63 percent of the study patients were from the Central region. As shown in Table 1, the Western and Eastern regions had 13 percent each, Northern region 6 percent, and 5 percent were from outside Uganda.

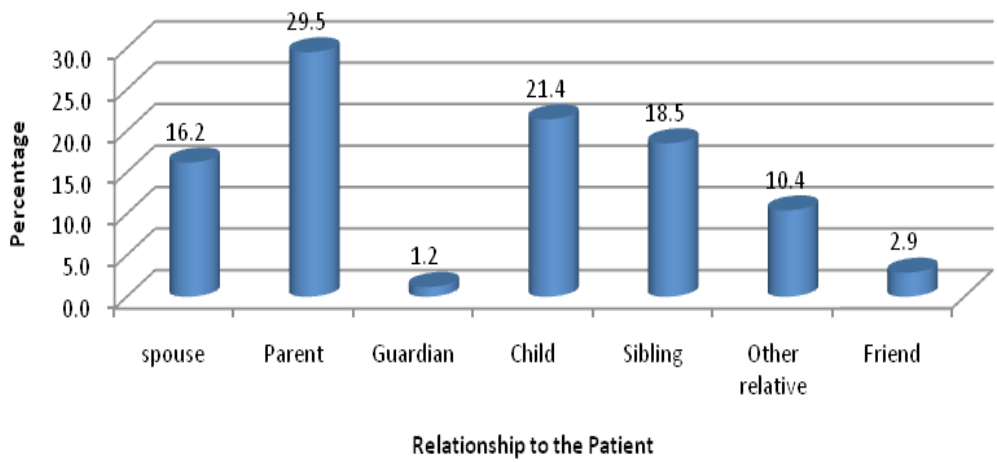
Table 1. Patients' Age Group and Region of Origin by Sex

Region	Male	Female	Total
Outside Uganda	6.0	3.7	4.9
North	7.6	3.1	5.5
East	14.7	11.0	13.0
Central	55.4	73.0	63.7
West	16.3	9.2	13.0
Total	**100**	**100**	**100**
Age groups			
<30-39	10.6	17.7	13.9
<40-49	15.9	13.4	14.7
<50-59	27.5	17.1	22.7
60+	44.4	51.8	47.9
Total	**100**	**100**	**100**

4.2 Description of the Caregivers Characteristics

A total of 173 caregivers were interviewed, majority (61 percent) of whom were females. The mean age of the caregivers was 39 years. In terms of relationship to the patients, the first generational family contributed the largest number of caregivers with parents (30 percent), siblings (19 percent), other relatives (11 percent). The second generational family members were spouse (16 percent) and children (21 percent). Overall about 3 percent of the caregivers were friends to the patients as shown in Figure1.

Figure 1. Relationship of caregiver to the patients



With regard to the marital status of the caregivers, most of them were married (65 percent) while about a quarter (25 percent) had never been married. The separated/divorced and widowed combined constituted only 10 percent. This has implications on the availability of caregivers and productivity loss while caregiving. Forty-four percent and forty-three percent of the caregivers had attained tertiary and secondary education respectively, and 11percent had attained primary education. Anglicans and Catholics each constituted 32 percent, Muslims 19 percent, Pentecostals 14 percent and other religions constituted 4 percent.

4.3 Use of Tobacco Products

Use of Tobacco Products among Patients

The smoking history was captured for 103 patients (57 males and 46 females). Results presented in Table 2 show that 21 percent of the patients had a history of tobacco use (8 percent were currently using tobacco products and 14 percent had ever used tobacco). The proportion of patients who were current users or had ever used tobacco products was 32 percent for men and 9 percent for women.

The common tobacco products used in the last 12 months included; cigarettes (75 percent), "roll your own" (10 percent), pipe (10 percent) and chewable tobacco (5 percent). On average, cigarette users smoked 13 sticks per day.

A pack of cigarettes (20 sticks) cost the users on average UGX 4000 equivalent to (US$ 1.5) with a stick costing UGX 200 (USD 0.08). This implies that patients who were cigarette smokers spent on average UGX 2,600 (USD 1) on purchasing cigarettes on a daily basis. The patients met the costs of the cigarettes. Thirty-eight percent of the patients reported to have a household member who smoked. Annually, the average cost of cigarettes to an individual smoker is UGX 949,000 (USD 365).

Table 2. Smoking History of the Patients

	Currently use tobacco products			Ever used tobacco products			Current plus ever used tobacco products		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Yes	12.3	2.2	7.8	19.3	6.5	13.6	31.6	8.7	21.4
No	87.7	97.8	92.2	68.4	91.3	78.6	68.4	91.3	78.6
Total	100	100	100	100	100	100	100	100	100

Use of tobacco products by Caregivers

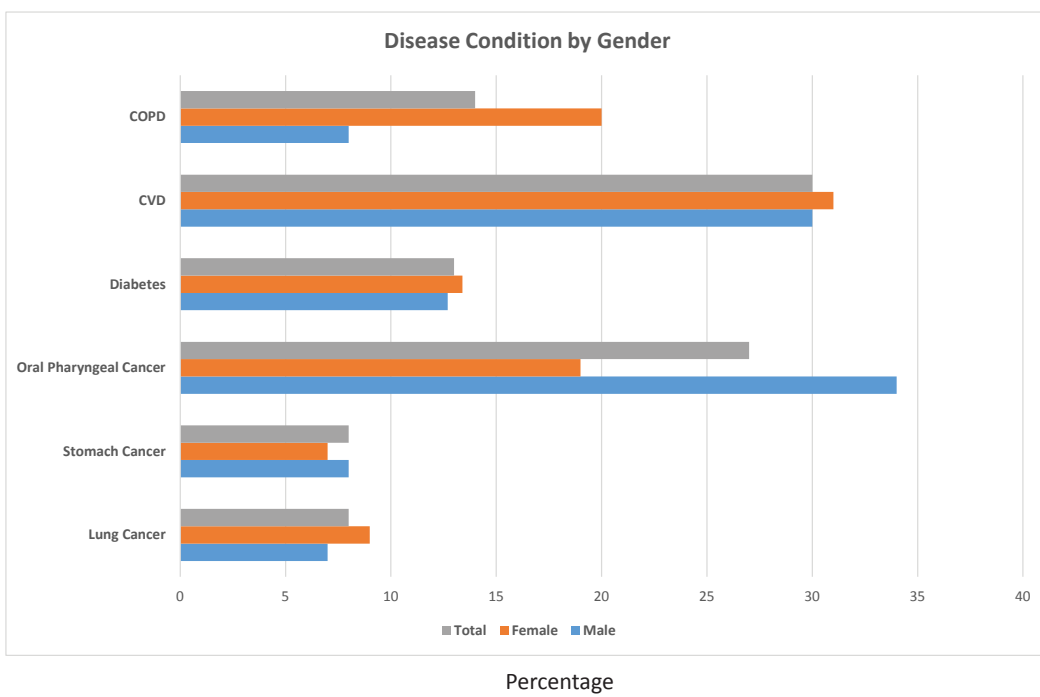
Of the 173 caregivers interviewed, 6 percent had a history of using tobacco products. Of these, 4 percent were current users and 2 percent had ever used tobacco products. All the caregivers who reported using tobacco products were using cigarettes. On average, Caregivers reported to be smoking 3 sticks of cigarette per day. The Caregivers incurred the costs of the cigarettes.

Thirty-seven percent of the Caregivers reported to be living with a family member who was smoking tobacco, which is an indication of second hand smoke exposure.

4.4 Distribution of Patients by Disease Conditions

Out of the 353 patients, 30 percent had cardiovascular disease (CVD), 27 percent had oral pharyngeal Cancer, 14 percent had COPD, and 13 percent had diabetes. Lung and stomach cancers each constituted about 8 percent as illustrated in Figure 2. Furthermore, 67 percent of the patients (235 out of 353) were traced through individual patient interviews or Caregiver. Of these 64 percent were alive and 36 percent had died. Lung, oral pharyngeal and stomach cancers had the highest number of patients who had died, with their proportion constituting over 50 percent.

Figure 2. Disease conditions by gender



4.5 Hospital visits and admission

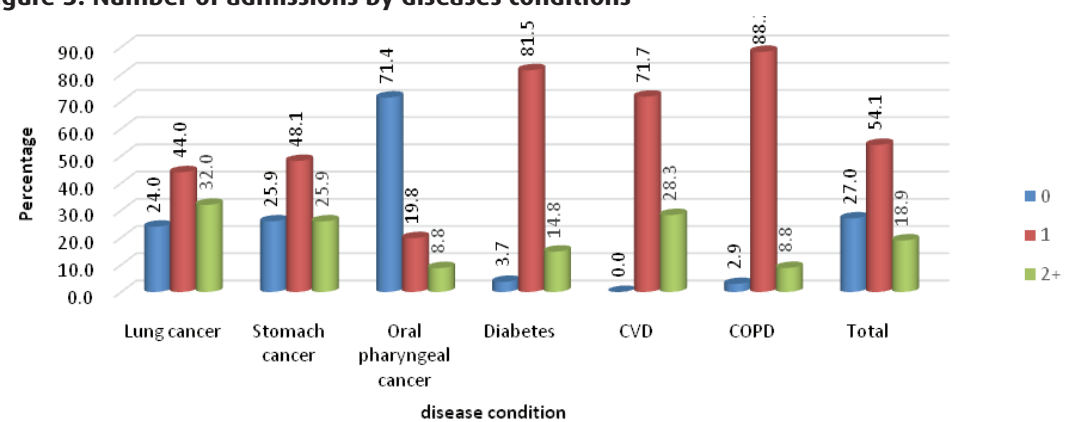
On average, patients made 3 hospital visits in year. CVD, stomach, Oral pharyngeal and lung cancer patients made on average 4 visits in a year. About 36 percent and 14 percent of the oral pharyngeal and lung cancer patients respectively made more than 10 visits in a year.

Table 3. Number of visits by disease condition

Condition	Number of visits						
	1-3	4-6	7-9	10+	Total	Mean	Medium
Lung cancer	50	25	10.7	14.3	100	3.6	2
Stomach cancer	48.1	18.5	22.3	11.1	100	3.8	3
Oral Pharyngeal cancer	36.3	19.8	7.6	36.3	100	3.7	3
Diabetes	69.9	13	12.8	4.3	100	2.9	2
CVD	43	32.7	15.9	8.4	100	4.2	4
COPD	89.8	6.2	2	2	100	1.7	1
Total	51.2	21.2	12.3	15.3	100	3.4	3

Figure 3, shows that majority (73 percent) of the patients across the disease conditions were admitted in the study year. Of these, 54 percent were admitted once a year, majority of whom had COPD (88 percent) and diabetes (82 percent); 19 percent were admitted two or more times a year, majority of whom had lung cancer, CVD and stomach cancer. Most of the oral pharyngeal cancer patients (71 percent) were not admitted.

Figure 3. Number of admissions by diseases conditions



4.5.1 Number of in-patient days

The study assessed the number of days patients were on admission in the year. Table 4 reveals that on average, 35 percent of the patients admitted had 7 or more in-patient days in the study period. Stomach and lung cancer patients (26 percent and 23 percent respectively) had admissions of more than a month (29 plus days) in the study period.

Table 4: Number of In-patient days by disease condition

Number of in-patient days	Lung Cancer	Stomach Cancer	Oral Pharyngeal	Diabetes	CVD	COPD	Total
0	26.9	22.2	81.3	7.4	1.1	0.0	31.0
1-7	15.4	18.5	1.0	51.9	54.8	79.4	33.7
8-14	26.9	18.5	5.2	33.3	30.1	17.6	19.8
15-21	3.8	11.1	3.1	3.7	6.5	0.0	4.6
22-28	3.8	3.7	5.2	0.0	6.5	2.9	4.6
29+	23.1	25.9	4.2	3.7	1.1	0.0	6.3
Total	100	100	100	100	100	100	100
Patient admitted for more than 7 days							
Percentage admitted for more than 7 days	57.7	59.3	17.7	40.7	44.1	20.6	35.3
Average (Days)	9.2	10.6	12.2	6.7	7.3	5.0	7.4
Median (Days)	9	10.5	12	6	6	3.5	6

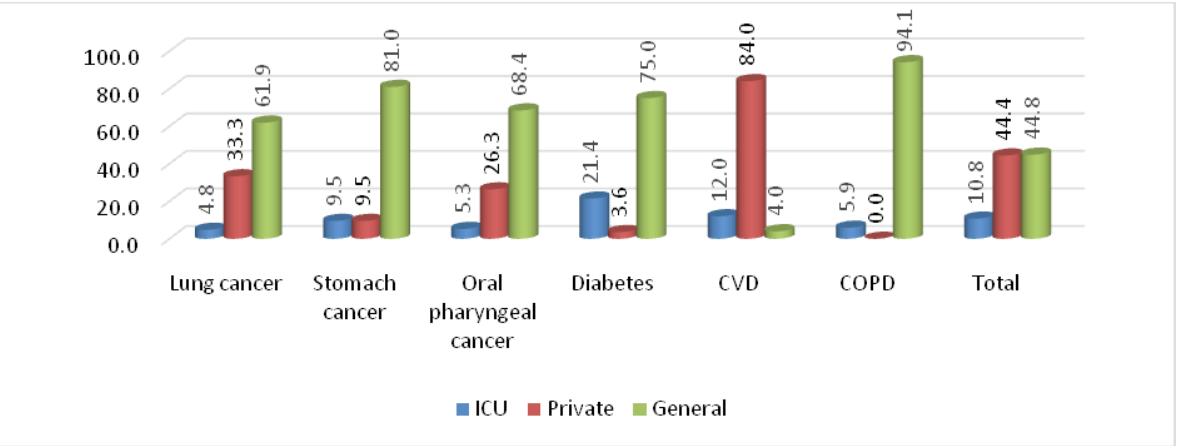
4.5.2 Type of admission

In Uganda, health care services are provided by government, private and private not for profit institutions. Health care services provided by government facilities in Uganda are free though with minimal contributions from patients. Mulago hospital operates both gov't subsidized (with minimal out of pocket contributions from patients) and private services (where patients pay for an improved service). In this regard, there are general wards and private wards.

Figure 4 gives details of the type of admission for the patients. This is important because the costs of care differ by the type of admission. Majority of the patients (62 percent lung cancer, 81 percent stomach cancer, 68 percent oral pharyngeal cancer, 75 percent diabetes and 94 percent COPD) were admitted as general patients; this means the cost of services were met by government with minimal contributions from the patients. However, for CVD majority (84 percent) of patients were admitted as private patients; this means the patients met all the costs of care with very little or no contribution from government. This partly explains why the cost of care for CVD patients is higher compared to other disease conditions.

Overall, forty-five percent of all the admissions were in the general wards which means there was an out-of-pocket contribution by patients, while 44 percent were admitted in the private wards and 11 percent admitted in the Intensive Care Unit (ICU), which costs are met by the patients.

Figure 4: Type of admission



4.6 Direct Health Care Costs

4.6.1 Average direct healthcare cost to patients

This section provides findings on health care costs patients incurred in the four units. The costing areas assessed include; admissions, consultation, medication, investigations (laboratory services and x-rays) nursing care and medical procedures.

Table 5. Direct healthcare costs by disease condition in Uganda Shillings (UGX)

Costing area		Lung cancer	Stomach cancer	Oral pharyngeal	Diabetes	CVD	COPD	Total
Inpatient Admission costs	Mean	738,556	770,000	790,800	278,611	218,155	211,628	347,803
	Median	517,500	585,000	765,000	240,000	147,000	160,000	210,000
Outpatient visits consultation	Mean	185,250	198,889	235,278	100,870	93,633	76,364	144,313
	Median	125,000	165,000	200,000	80,000	75,000	60,000	100,000
Inpatient Consultations costs	Mean	48,125	66,818	63,000	32,500	39,699	27,297	39,503
	Median	40,000	50,000	50,000	30,000	25,000	20,000	25,000
Investigations/ Laboratory costs	Mean	781,409	773,667	402,256	190,089	386,816	162,814	389,319
	Median	847,500	770,000	327,500	133,000	290,000	140,000	260,000
Medication costs	Mean	607,774	902,862	405,954	196,278	359,821	81,885	387,745
	Median	255,150	616,400	182,040	189,444	247250	54315.5	191,808
Nursing care and costs	Mean	800,013	872,753	764,944	409,764	554,693	312,372	592,508
	Median	623,600	660,000	537,500	310,000	400,000	200,000	400,000
Overall	Mean	3,042,864	4,267,067	1,979,504	990,554	3,424,181	722,137	2,683,456
	Median	1,950,700	3,406,300	1,528,000	965,901	1,704,400	562,205	1,410,000

The total average direct healthcare cost to patients during the study period was UGX 2,680,000 (USD 1,030.7), with this average highest among stomach cancer patients, UGX 4,267,067 (USD 1,641.2) and lowest among COPD patients UGX 722,137 (USD 277.7). The average costs incurred in a year for each service type were as follows (Table 5): Details of the costs reveal that:

I. Admission Costs

On average, patients admitted incurred UGX 350,000 (USD 134.6) as the cost of admission during the study year. The cost was highest among the cancer patients, with oral pharyngeal patients incurring the highest cots of UGX 790,000 (USD 303.8). Diabetes, COPD and CVD recorded the lowest costs of admission.

II. Consultation Costs

Patients incurred UGX 140,000 (USD 53.8) as the total cost for out patient consultations on average in a year. The cost was highest among oral pharyngeal

patients and lowest among COPD patients. The average expenditure on inpatient consultations during the study period was about UGX 40,000 (USD 15.4), with the highest among stomach and oral pharyngeal cancer patients at UGX 62,500 (USD 24). In-patient consultations emerge as the least costly among the direct cost components for health care, as the government subsidizes most of these.

III. Investigations Costs

The average cost incurred on investigations by patients was UGX 400,000 (USD153.8). The cost was highest among lung and stomach cancer patients. COPD patients had the lowest average investigation costs recorded at about UGX 160,000 (USD 61.5).

IV. Medications Costs

The average cost on medicines during the study period was about UGX 390,000 (USD 150). Stomach and lung cancer patients recorded the highest costs of UGX 900,000 (USD 346.2) and UGX 607,774 (USD 233.8) respectively. The lowest average cost was recorded among COPD patients at UGX 81,885 (USD 31.5).

V. Nursing and medical procedure Costs

The average cost of nursing care and medical procedures was UGX 593,000 (USD 228.1) with highest cost among stomach cancer patients at UGX 630,000 (USD 242.3) and lowest among COPD patient at UGX 315,000 (USD 121.2).

4.6.2 Total direct healthcare costs to patients

During the study period, the total direct healthcare cost to all patients was about UGX 1.2 billion (USD 461,538.46) of which the highest proportion (44 percent) was on nursing and medical procedures, and 24 percent was on medicines as shown in Table 6. Other direct healthcare costs such as inpatient and outpatient admission, consultations and medicines constituted about 31 percent. Further analysis showed that the total expenditure varied by costing areas and disease conditions. Lung cancer patients had the highest proportion of the total direct healthcare costs on drugs (62 percent) while about 70 percent of the total direct healthcare costs for CVD patients were on nursing care and medical procedures. Diabetes patients had their highest direct costs (47 percent) on nursing care, while stomach cancer was on admission (32 percent).

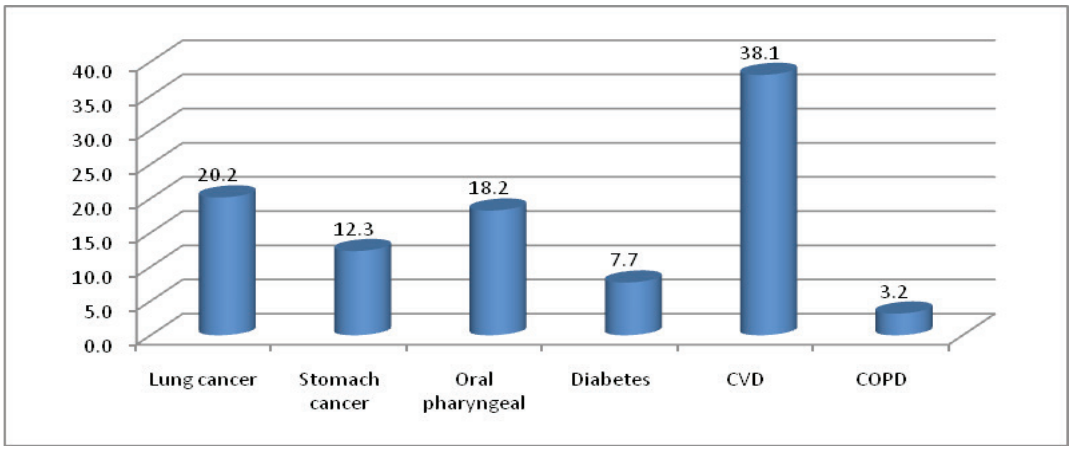
[1]This excludes costs on treating disease outside study hospital which was not available

Table 6: Direct Healthcare costs by disease condition and costing area in UGX

Disease Condition	Inpatient Admission	Outpatient Consultations	Inpatient Consultations	Investigations	Medicines	Nursing care	Total
Lung cancer	22,300,000	24,505,000	2,560,000	33,100,000	155,000,000	34,500,000	252,000,000
Stomach cancer	49,500,000	5,030,000	1,400,000	29,100,000	34,800,000	34,100,000	154,000,000
Oral pharyngeal	24,000,000	35,600,000	780,000	41,500,000	32,200,000	93,800,000	228,000,000
Diabetes	16,600,000	2,320,000	1,405,000	10,100,000	21,100,000	45,000,000	96,500,000
CVD	29,700,000	9,176,000	4,045,000	45,500,000	53,800,000	333,000,000	476,000,000
COPD	9,100,000	840,000	1,010,000	7,001,000	8,305,807	13,400,000	39,700,000
Total	151,000,000	57,400,000	11,200,000	166,000,000	305,000,000	554,000,000	1,250,000,000
			Proportions				
Lung cancer	8.8	1.8	1.0	13.1	61.5	13.7	100
Stomach cancer	32.1	3.3	0.9	18.9	22.6	22.1	100
Oral pharyngeal	10.5	15.6	0.3	18.2	14.1	41.1	100
Diabetes	17.2	2.4	1.5	10.5	21.9	46.6	100
CVD	6.2	1.9	0.8	9.6	11.3	70.0	100
COPD	22.9	2.1	2.5	17.6	20.9	33.8	100
Total	12.1	4.6	0.9	13.3	24.4	44.3	100

The data shows that stomach cancer, CVD, Oral pharyngeal and lung cancer patients incurred significantly higher direct health care costs. The breakdown of the total direct health care costs by disease condition is shown in Figure 5 with CVD patients (38 percent) incurring the highest costs, followed by lung cancer patients (20 percent), oral pharyngeal cancer patients (18 percent) and stomach cancer patients (12 percent).

Figure 5. Proportions of direct healthcare costs to patients by disease conditions



4.6.3 Sources of funding for direct health care services

The review established who met the costs of health care. This was assessed through interviews with the patients and caregivers since the records could not reveal who met the costs.
The findings revealed that a big proportion of the cost was borne by the patient and their family (67 percent). Government met about a third of the costs (33 percent) as indicated in Table 7.

Table 7: Sources of overall funding

Disease Condition	Self	Government	Donation	Total	% Total cost
Lung cancer	3,449,500	31,000,000	-	34,500,000	6.2
Stomach cancer	1,870,000	31,600,000	600,000	34,100,000	6.2
Oral pharyngeal	5,660,000	88,200,000	-	93,800,000	16.9
Diabetes	27,900,000	17,100,000	-	45,000,000	8.1
CVD	330,000,000	3,500,400	-	333,000,000	60.1
COPD	598,000	12,800,000	-	13,400,000	2.4
Total	369,000,000	184,000,000	600,000	554,000,000	100.0
% Total cost	**66.6**	**33.2**	**0.1**		**100**

4.7 The Direct Non-healthcare Costs to Patients and Caregivers

The direct non-health care costs included; patient costs on transport and communication, and caregiver's costs on transport, communication and opportunity cost of care giving. Unlike the direct health care costs that were extracted from medical records, the direct non-health care costs were computed based on interviews conducted among patients. The estimates provide an overall in-direct cost incurred by the patients. On average, patients incurred about UGX160,000 (USD 61.5) and UGX 230,000 (USD 88.5) on communication and transport respectively during the study period as shown in Table 8. On the other hand, the Caregivers recorded an average total expenditure of UGX 300,000 (USD 115.4) and UGX 410,000 (USD 157.7) on communication and transport respectively during the study period.

Table 8: Average total expenditure to patient on transport and communication (UGX)

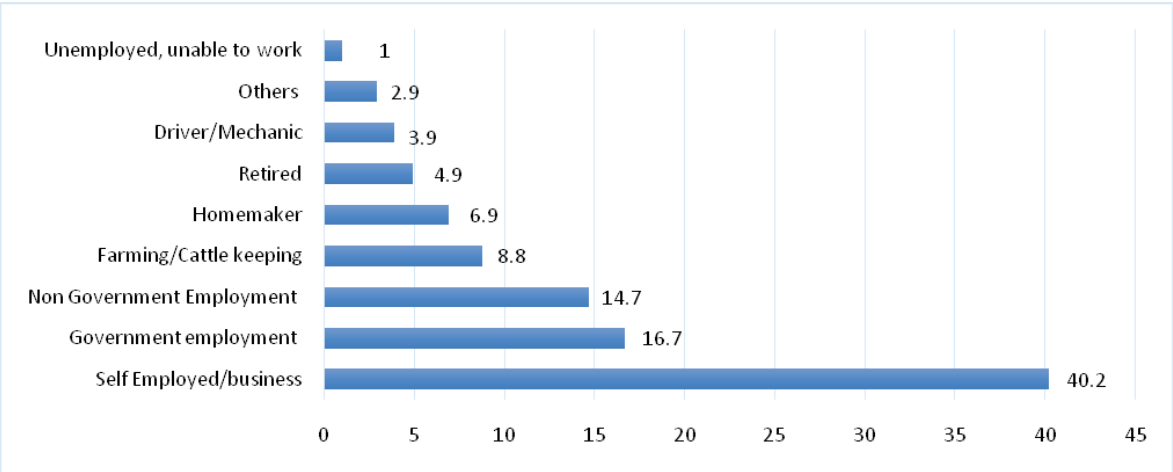
	Patient		Caregiver	
Cost Area	**Mean**	**Median**	**Mean**	**Median**
Expenditure on communication	157,775	91,000	298,574	201,000
Expenditure on transport	233,554	160,000	407,555	282,000

4.8 The Indirect costs of healthcare

4.8.1 Patients

The indirect costs of healthcare included the number of workdays lost by the patient due to disability or sickness and the caregiver due to time foregone to provide care. Just like the direct non-health care costs, indirect costs of healthcare were computed based on information collected from the patients who were interviewed. The key factor to explain the indirect healthcare costs for both patients and caregivers is the cost of unemployment and lost income. Results suggest that at the time when the illness started, 40 percent of the patients were either self-employed or engaged in various business activities (Figure 6).

Figure 6: Patient employment

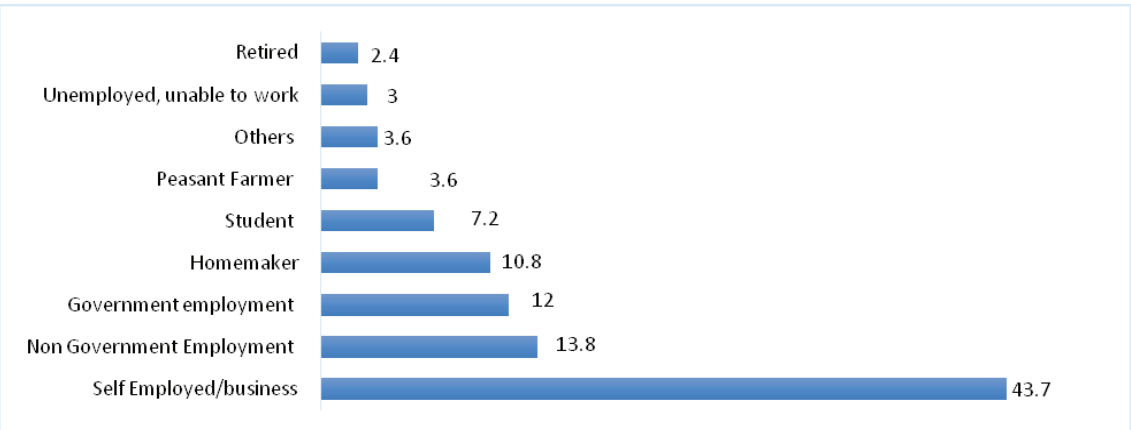


The patients had a mean monthly income of about UGX 380,000 (USD 146.2) and on average lost 6 days in a month due to illness. The average retirement age due to illness among those that retired below the official retirement age of 60 years was 51 years. The total annual work loss due to disability and illness was UGX 930,000 (USD 357.7).

4.8.2 Caregivers

With regard to Caregivers indirect costs were estimated based on the days lost to caregiving. Most caregivers (43 percent) were self-employed as shown in Figure 7.

Figure 7: Caregivers employment



Caregivers had a mean monthly income of about UGX 370,000 (USD 142.3) and the average number of days they lost in a month was 6 days as indicated in Table 9. On average, caregivers made an annual loss of UGX 900,000 (USD 346.2).

Table 9: Number of days lost by caregivers and income lost by disease condition

Disease Condition	Number of days lost in a month		Annual income Loss	
	Mean	Median	Mean	Median
Lung cancer	5.9	4.5	977,000	800,000
Stomach cancer	7.0	8.5	1,840,000	1,800,000
Oral pharyngeal	5.5	4.5	921,804	600,000
Diabetes	3.5	1	410,667	240,000
CVD	6.8	7	1,172,522	840,000
COPD	4.8	3	438,933	384,000
TOTAL	5.8	5	907,893	800,000

4.9 Total Costs

The annual average medical cost of a current or former smoker suffering from a tobacco-attributable disease is UGX 3,697,255 (USD 1,422) which is 2.28 times the annual average medical cost of a never smoker that is UGX 1,619,309 (USD 622.8). The relative risk (RR) ratio is thus 2.28. With a population level tobacco use prevalence of 11.76 percent (GATS, 2013) and RR of 2.28, the population attributable risk (PAR) is 0.94 percent. It means that about 1 percent of the total cost of tobacco-related illnesses can actually be attributed to tobacco use in Uganda. The direct cost of tobacco-attributable illnesses in Uganda is estimated to be UGX 108.05 billion (USD 41.56 million) (Table 10).

Table 10: Direct Cost of Tobacco-Attributable Illnesses in Uganda, 2014

Costs	Amount/%
Average cost per patient for treatment in the surveyed health care facility (UGX)	2,683,456
Average cost per patient for treatment outside the surveyed health care facility (UGX)	3,300,000
Total average health care expenditure per patient (UGX)	5,983,456
Total population, 30+ (UN Population Statistics, 2015)	9,432,000
Prevalence of self-reported NCDs (Wandera et al, 2015a)	23%
Access to health care (Wandera et al, 2015b)	76%
Number of cases of NCDs accessing health care	1,648,714
National health expenditure on NCDs (Billion UGX), 2014	9,865.01
Average expenditure on transport and communication by patients (UGX)	390,955
Average expenditure on transport and communication by caregivers (UGX)	613,290
Total expenditure on transport and communication (Billion UGX)	1,655.71
Total direct costs on health care services for NCDs (Billion UGX)	11,520.72
Population-attributable risk (PAR)	0.94%
Smoking attributable direct costs (Billion UGX), 2014	108.05
Official exchange rate, 2014	2,600
Tobacco attributable direct costs (Million USD), 2014	41.56

The indirect morbidity cost of tobacco-attributable illnesses is estimated to be UGX 30.96 billion (USD 11.91 million) (Table 11).

Table 11: Indirect morbidity cost of tobacco-attributable illnesses

Costs	Amount/%
Number of patients	2,169,360
Employment rate of patients (%)	72%
Average monthly income per employed patient (UGX)	380,000
Loss of working days in a month per patient	6
Loss of annual income per employed patient (UGX)	1,243,636
Total loss of annual income by employed patient (Billion UGX)	1,942
Number of caregivers	2,169,360
Employment rate of caregivers (%)	69%
Loss of annual income per caregiver (UGX)	907,893
Total loss of annual income by employed caregiver (Billion UGX)	1,359
Total loss of forgone income by patients and caregivers (Billion UGX)	3,301
Population-attributable risk (PAR)	0.94%
Indirect cost of morbidity attributable to tobacco use (Billion UGX)	30.96
Official exchange rate, 2014	2600
Tobacco attributable indirect cost of morbidity (Million USD), 2014	11.91

The estimate of the indirect mortality cost is much higher at UGX 189.80 billion (USD 73.01 million) (Table 12). In total, the health cost of tobacco use in Uganda is UGX 328.82 billion, which is equivalent to USD 126.48 million. The total health cost outweighs the market value of tobacco products or the so-called benefits of tobacco use in Uganda given by UGX 211.15 billion (USD 81,211,538 million). These benefits accrue to the wages and salaries of the farmers and employees employed in the tobacco sector, profit of the tobacco growers and manufacturers, and government revenue generated from tobacco taxes. The fact that the cost of tobacco use in Uganda exceeds the benefits justifies government intervention in tobacco control to combat tobacco use in the country. The cost of tobacco use constitutes 0.5 percent of GDP and the health case expenditure for treating tobacco-induced diseases accounts for 2 percent of the national health expenditure in 2013. These resources could have been diverted to competing and more productive uses benefiting public health as well as the economy.

Table 12: Total and Net Cost of Tobacco Use in Uganda, 2011

	Billion UGX	Million USD
Direct cost	108.05	41.56
Indirect morbidity cost	30.96	11.91
Indirect mortality cost	189.80	73.01
Total health cost of tobacco use	328.82	126.48
Total market value of cigarettes	211.15	81.22
Net cost of tobacco use	117.66	45.26
GDP, 2014	66,155.63	25573
Health cost as % of GDP	0.5%	0.5%
Health expenditure as % of GDP, 2013	9.76	9.76
Health expenditure, 2013	6458.80	2496.70
Health expenditure on tobacco-induced diseases as percent of total health expenditure	2%	2%

Note: The market value of cigarettes has been sourced from WHO's country level work in 2013 with the Ministry of Finance in Uganda on tobacco taxation.

CHAPTER 5

5.0 Policy Implications and Recommendations

5.1 Health cost of tobacco use in Uganda

Tobacco use has enormous negative consequences to the economy and therefore requires solid control measures. This study is one of the forerunner studies on the economic cost of tobacco use in Africa, based on fairly complete data drawn from patient records on costs incurred. This study shows that the cost of managing tobacco related illnesses is greater than the benefits of tobacco to government, individuals and their families. Based on the findings, the net cost of tobacco use to society and the economy is high. The study therefore recommends that, government of Uganda urgently implements the Tobacco Control Act 2015 and special focus should be placed on revision of the tax structure from tiered specific to a uniform specific tax system, and raising the tax on tobacco products. Tax increases should reduce the affordability of tobacco products in Uganda especially among the youth and poor.

In addition, a strong tax administration is critical to minimize tax avoidance and tax evasion. Tax increases on tobacco products are likely to result in higher prices and more tax revenues which will in turn reduce tobacco use and its negative health consequences. This is in tandem with the WHO and World Bank recommendations on how

to finance the 17 sustainable development goals of which goal 3 and 3a is directly related to controlling NCDs by focusing on tobacco control. The second recommendation is to strengthen the NCD program at MoH, following the Global NCD action plan targets on the risk factors of which tobacco use is one of them.

5.2 Health care cost on individuals

In Uganda, the health cost of tobacco use can only be met by those in the wealthy quintile, who are very few. This means managing tobacco related illnesses is a collective effort of the patient and their family. Hence the impact is shared among many households. More so the biggest percentage of the economic cost of tobacco attributable illnesses is borne by the individual and their family.

Therefore, government interventions to improve household incomes should take note of household expenditures on items such as tobacco and how these expenditures deprive households of basic necessities including food, education and health care which further impoverish the households. Based on these costs, we recommend that Civil Society Organizations should work with the patients and their families who have incurred these costs to trigger advocacy for strengthening tobacco control regulation including establishing smoke free environments, education on the health consequences of tobacco use and litigation against the tobacco industry for compensation. These activities will highlight the health hazards of tobacco use hence propelling government to strengthen the tobacco control program.

5.3 Productivity cost of tobacco use

Although patients with tobacco attributable illnesses lose slightly more income compared to their caregivers, the caregiver loss is equally high. The losses incurred by the patients are manifested in form of absenteeism and/or early retirement due to illness, while on the side of the caretaker it's the number of days not worked. The total cost of tobacco related illness forms 2 percent of the total health expenditure, which if avoided government would use the savings to run the country's health system that is still over burdened by infectious diseases, limited medical personnel and infrastructure. As shown by the study, tobacco related illness heavily reduce life expectancy of the individuals and ultimately their economic productivity, thus depleting the quality and quantity of the countries' labour force.

It is pertinent to note that estimates, based on lost earnings, underestimate the costs to households since they ignore the value of lost household production, adverse impacts on the health and education of family members, costs of sub-optimal land use, the value of lost leisure, and the pain and suffering associated with tobacco related illnesses. In the Ugandan

setting, if an individual gets ill with a chronic condition; care giving, medical expenses; the physical and emotion drain is borne by the whole family who actively participate in the health care process. Most times the ill person is the bread winner of the family; therefore, the lost income due to illness adversely affects the family wellbeing since the family has to generate money for treatment through sell of property like land to meet the costs. The impacts of chronic diseases such as those related to tobacco use are not confined to the infected person only.

The illness or death of an adult can increase the morbidity or mortality of their spouse; the illness or death of a mother or father can result in excess mortality among bereaved persons including their children.

In conclusion, the study indicates that tobacco use causes substantial economic and health burden on Uganda. It further shows that for every one Uganda shilling government earned from tobacco, the government spent four times on tobacco related illnesses (1:4). Timely measures are necessary to control tobacco use when it is still at an early stage of the epidemic and not yet beyond control.

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