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TOBACCO-RELATED SOCIO-ECONOMIC COST OF STROKE, LUNG CANCER AND COPD IN LAOS

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EXECUTIVE SUMMARY

BACKGROUND AND PURPOSE: Tobacco is becoming one of the single biggest causes of death worldwide. By 2030 it is expected to kill 10 million people per year and developing countries will account for 70% of all tobacco deaths. Previous tobacco studies performed in Laos, have reported the rate of active smoking in Lao population. However, no data concerning the burden and socio-economic impact of tobacco-related diseases in Laos is available as yet. The aims of this study are to determine the burden of active tobacco-related socio-economic cost of stroke, lung cancer and chronic obstructive pulmonary diseases (COPD) in Laos and to estimate the burden and national socio-economic impact of tobacco-related diseases**.**

METHODS: This is a cross-sectional and multi-centered study using a purposive sampling method. One hundred and nine patients hospitalized in Mahosot, Mittapab and Sethathirath hospitals due to stroke (cerebral thrombosis), lung cancer and COPD were included. A structured questionnaire form was used to collect data on tobacco smoking behavior and direct and indirect costs during hospitalization. Data were provided by patients and/or the patient's close care giver. Mean cost per event for each disease was calculated and the national smoking attributable fraction costs (SAF) of these tobacco-related diseases were estimated. Data entering, cleaning, processing and analysis were performed using the Epi Info statistical package.

RESULTS: The rate of tobacco smoking was 87% for lung cancer, 65% for COPD and 42% for stroke. Tobacco smoking was strongly associated with these major chronic diseases ($p < 0.0001$). The mean total direct and indirect costs during hospitalization period were 4.08 million kips (US$478) for lung cancer, 2.41 million kips (US$282) for COPD and 6.15 million kips (US$720) for stroke. Direct and indirect costs were mainly paid by out of pocket money from the victims' respective families (88%). At the macro level, the total estimated national social cost of these 3 diseases was 120.97 billion kips (US$14.14 million) and smoking attributable fraction accounted for 28.51 billion kips (US$3.34 million). SAF costs represented 0.10% of Lao PDR's gross domestic product (GDP) and 2.5% of the country's total health expenditures. Stroke, COPD and lung cancer are among the major chronic diseases and the patients will need long term follow ups and multiple hospitalization with significant healthcare cost burden, therefore, case illustration of the burden and economic impact of these 3 tobacco-related diseases, is necessary. The stroke case study for one included healthcare costs of both acute and rehabilitation phases that demonstrated its significant socio-economic impact on the victim's family accounting for eventual healthcare cost of US$7,500 and payment made came mainly from out of pocket money.

CONCLUSIONS: The results of this study confirmed that smoking leads to significant economic losses for society as a whole and that the households finance the majority of these costs. Government and private business sectors also finance some of these costs through either private (private insurance) or public (government) funds, depending on who pays the insurance premium. Anti-smoking measures are necessary to avoid tobacco-related diseases, to save lives as well as money.

LIST OF ABBREVIATIONS

Abbreviation	Meaning
CVD	Cardiovascular Disease
COPD	Chronic Obstructive Pulmonary Diseases
MOH	Ministry of Health
SAF	Smoking-attributable Fraction
WHO	Word Heath Organization
OOP	Out of pocket money
OPD	Outpatient Department
IPD	Inpatient Department
MCNS	Modified Canadian Neurological Score
ADL	Activity of daily living
GDP	Gross Domestic Product
HE	Health expenditure

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INTRODUCTION

1.1 Background on Lao PDR

The Lao People's Democratic Republic or Lao PDR or Laos, is located in Southeast Asia. Laos is a developing country with an income per capita of US$710 (http://www.state.gov/r/pa/ei/bgn/2770.htm). Consequently, Laos is ranked as one of the poorest countries in the world. Biomedical research has been under-financed. Few data on healthcare issues are available to be able to set up an appropriate healthcare prevention program. Although the health status of the population has improved, Laos' life expectancy is still low which stands at an average of 61 years. Infectious diseases such as malaria, dengue fever, respiratory infections and gastrointestinal diseases are still the main healthcare issues. Non communicable diseases such as hypertension and stroke are common and are causes of deaths in Laos (Khamtan A., 2004).

1.2 Economic Costs of Illness Assessment

The use of alcohol, tobacco, pharmaceuticals and illicit drugs involves a wide variety of adverse health and social consequences (WHO, 2005b). There is a strong need for improved estimates of the economic costs of substance abuse. Cost estimates help to prioritize substance abuse issues, provide useful information for targeting programming, and identify information gaps. The development of improved cost estimates also offers the potential to develop more complete cost-benefit analyses of policies and programs aimed at reducing the harm associated with the use of psychoactive substances *(*Single E. *et al*, 2003). There is a strong interest in many countries regarding the development of scientifically valid, credible estimates of the economic costs of drugs, alcohol and tobacco. The costs of substance abuse represent an issue of key interest to stakeholders, policymakers and the media. Knowledge of the costs of resources associated with alcohol, tobacco and drug abuse informs decisions related to funding and to interventions, which are designed to reduce abuse (Single E. *et al*, 2003). It is well established that the use of alcohol, tobacco and other drugs involves a large number of adverse health and social consequences (WHO, 2005a). Thus, in most countries there are national policies for substance abuse, unlike for most other commodities. Because the justification for special regulation is the economic and social costs, and also because economic policy instruments are used in the regulation of these substances, it makes good sense to have sound estimates of the costs of substance abuse (Single E. *et al*, 2003).

1.3 Study Justification

Tobacco is a major cause of deaths throughout the world, claiming the lives of an estimated 13,000 persons every day (RITC, 2002). By 2030 it is expected to kill 10 million people per year; half aged 35-69 years. The epidemic is increasingly affecting developing countries, where most of the world's smokers (82% or 950 million) live (World Bank, 2001). Close to half of all men in low-income countries smoke daily and the number have been increasing. Women's smoking rates are also increasing fast. By 2030, developing countries will account for 70% of all tobacco deaths. Many deaths and much disease could be prevented by reducing smoking prevalence (World Bank, 2001).

In Laos, for example, according to a 1995 study in Vientiane by the World Health Organization (WHO), 41% of males, 15% of females, and overall, 38% of the population over 15 years old were current daily smokers (WHO, 2005b; http://www.cdc.gov/ global/GYTS/factsheets/2003/Laos_PDR_vientiane). A study done at Mahosot Hospital in 2003 showed that 35% of the hospital doctors smoked (Tomson G., *et al*, 2003). Other studies at Mahosot have shown that 50% of patients suffering from an anterior heart attack and 31.4% of stroke patients smoked (Somebandith X & Vang C, 2005).

Stroke, which is one of the tobacco-related diseases, is the leading cause of mortality in Mahosot hospital in Laos (Khamtan A & Vang C, 2005). But to date, there are no available data concerning the burden of socio-economic impact of tobacco-related diseases in Laos.

Previous tobacco studies performed in Laos have reported the rate of active smoking in Lao population. However, no data concerning the burden of active smoking due to tobacco-related diseases is available in Laos as yet. In addition, neither is there data concerning the burden of socio-economic impact of tobacco-related diseases in Laos. Thus, this study aims to focus on the research gaps.

LITERATURE REVIEW

2.1 Why Does Tobacco Kill Those Who Use It?

The current pattern of tobacco use predicts the future burden of lung cancer and other smoking related diseases. The dried leaf of the plant, *Nicotiana tabacum*, is used globally in many forms including smoking, chewing or snuff. The product is cultivated in many regions and can be legally purchased around the world. In many countries, cigarette smoking is only a small part of actual tobacco use. In fact, in some places, more people use *hookah*, *bidis*, snuff or some form of chewing tobacco than manufactured cigarettes (WHO Infobase; WHO-The SuRF Report 1, 2003). In this study, it was detected that smokers in Laos who suffer from tobacco-related diseases and care providers used both manufactured and self-wrapped cigarettes.

Tobacco smoking causes atherosclerotic plaques to build up in the arteries. Nicotine is a vasoconstrictor and causes blood vessels to narrow. Obstructed vessels in the coronary arteries cause heart attacks and in the carotid arteries can cause strokes. Nicotine also causes increases in the pulse and blood pressure which further contributes to cardiac disease. Inhaled tobacco contains radioactive ingredients that go to the lungs and cause cancer. The carbon monoxide in cigarette smoke replaces oxygen in the blood and prevents enough oxygen from reaching vital organs such as the brain, the heart, and the extremities. Over 200 toxins including arsenic have been documented in inhaled or chewed tobacco (Davis K., 2006).

Each year at least, 4.9 million people die as a result of tobacco use (WHO, 2005a; 2005b). Tobacco kills by causing coronary artery disease, including heart attacks and congestive heart failure. Tobacco decreases immunity in the respiratory tract making smokers more likely to be infected and die of pneumonia. Smoking is toxic to the lungs and causes emphysema and chronic bronchitis which also can be fatal. Additionally, when a pregnant mother smokes, the baby receives less oxygen and can be stillborn (Davis K., 2006).

The harm from secondhand smoke on others, especially unborn and young children, further justifies intervening to reduce tobacco use. Seven hundred and ten million children live in households where someone smokes (World Bank, 2001). Many smokers do not know their risks, begin smoking at very young age and later most of them regret ever starting and would like to quit. For example, 60% of Chinese adult smokers say they want to quit but find it very difficult. In China and in other developing countries, the average age at which people begin to smoke is falling from early 20s to the teens. Nicotine is highly addictive, so it is important to discourage smoking initiation, especially among young people. But because many of the expected deaths from tobacco use will be among the 1.1 billion people who now smoke, persuading and helping people to quit is key to reducing disease and death from tobacco use (World Bank, 2001).

2.1.1 Association of Tobacco Use with Cardiovascular Disease and Stroke

Tobacco is a major cause of deaths throughout the world, claiming the lives of an estimated 13,000 persons everyday (WHO, 2005a). The prevalence of smoking among men over the age of 15 years was estimated in 1999 at over 72.8% in Vietnam, 66.7% in Cambodia, 49.2% in Malaysia, over 41% in Lao PDR, and 38.9% in Thailand (Ferry et al 2006).

The emergence of the cardiovascular disease (CVD) epidemic in the developing countries during the past two to three decades has attracted less comment and little public health response, even within these countries. It is not widely realized that at present, the developing countries contribute a greater share to the global burden of CVD than the developed countries. (Lopez A.D., 1993; Whelton P.K., 1995).

It has been estimated that 5.3 million deaths attributable to CVD occurred in the developed countries in 1990, whereas the corresponding figure for the developing countries ranged between 8 to 9 million (Lopez A.D., 1993). Regional estimates of CVD mortality indicate that the difference would be even higher if the term "developed countries" is restricted to established market economies only and excludes the former socialist economies. This high, yet inadequately recognized, contribution of developing countries to the absolute burden of CVD is readily explained by the fact that 78% of the 49.9 million global deaths (from all causes) in 1990 occurred in regions other than the established market economies or former socialist economies Although the relative contribution of CVD deaths to total mortality was higher in the developed countries (49%) than that in the developing countries (23%), the excess total mortality in the latter is translated into excess absolute CVD mortality due to the large populations involved. Thus, in 1990 the developing countries contributed 68% of the total global deaths due to non-communicable diseases and 63% of world mortality due to CVD (Murray C.J.L., 1994).

In this study, it was detected that stroke was the most common tobacco-related disease in Laos leading to a significant socio-economic impact, especially to the family of the victims who would bear most of the health care costs. In addition to being a major cause of death, many surviving stroke patients are disabled and need help in activities of daily living, which must be provided by family members, the health system, or other social institutions. Globally, stroke is the second leading cause of death. It is a disease that predominantly occurs in mid-age and older adults (WHO, 2006). WHO projects that in 2005, stroke would have accounted for 5.7 million deaths world wide, equivalent to 9.9% of all deaths. Over 85% of these deaths will have occurred in people living in low and middle income countries and one third will be in people aged less than 70 years. (WHO, 2005a; WHO, 2006). In Laos, stroke is the main killer among cardiovascular diseases (Khamtan A. *et al*, 2004).

Stroke is a multi factorial disease where a combination of risk factors, which do not all have to be present, will over time influence the subject's likelihood of suffering a stroke. Tobacco use is one of the modifiable risk factors, which include elevated blood pressure, tobacco use, physical inactivity, diet (low fruit and vegetable consumption), heavy alcohol consumption, overweight and diabetes. They also include environmental factors such as passive smoking and access to medical treatment. Non-modifiable risk factors include age, sex, family history and genetics.

In developed countries, diabetes mellitus as well as atrial fibrillation and other cardiac diseases are other important modifiable risk factors for ischemic stroke. The role of hypercholesteremia as risk factor for stroke is currently part of an ongoing discussion. There is evidence that lower total cholesterol levels might be associated with a decreased risk of ischemic stroke but it might also be accompanied by higher rates of hemorrhagic strokes. (WHO, 2006)

2.1.2 Association of Tobacco Use with Lung Cancer

In this study, lung cancer was also found in smokers. It is well acknowledged that tobacco smoking causes lung cancer. Cancer is potentially one of the most preventable and curable chronic life-threatening diseases. The major causes of chronic diseases are known, and if these risk factors were eliminated these chronic diseases can be prevented (WHO, 2005b). It is well known that cancer can be controlled. Declining mortality rates for many cancers in many developed nations prove it. In several countries, the application of existing knowledge has led to major improvements in the life expectancy and quality of life of middle aged and older people. For example, heart disease death rates have fallen by up to 70% in the last three decades in Australia, Canada, the United Kingdom and the United States (WHO, 2005b). But, without aggressive effort in intervention, similar results may not be seen elsewhere. Real progress requires a concerted effort at all levels of society (Seffrin J.R., 2006). A troubling fact is that cancer incidence, survival rates, and quality of life for the survivors vary greatly from country to country, depending on differences in exposure to risk factors, availability of public health resources for cancer control effort, and access to the latest advances in screening and treatment (Gerberding J.L., 2006)

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In 2002 there were an estimated 11 million new cancer cases and nearly 7 million cancer deaths worldwide (Seffrin J.R., 2006). About forty years ago, when the International Agency for Research on Cancer (IARC) was established, cancer was a disease largely confined to the industrialized, high-resources countries. Today, in marked contrast, the majority of the global cancer burden is in low- and medium-resource countries (Boyle P., 2006). By 2020, more than 16 million new cancer cases and 10 million deaths are expected worldwide. Seventy percent of these deaths will likely occur in developing countries that are unprepared to address their growing cancer burdens.

2.1.3 Association of Tobacco Use with COPD

It is well known that tobacco smoking also causes chronic obstructive respiratory diseases (COPD) such as chronic bronchitis and pulmonary emphysema. Chronic respiratory diseases also play an important part of mortality after cardiovascular diseases and stroke (Phommachanh B. & Vang C. 2007; WHO, 2005). A WHO report on the burden of respiratory diseases stated that respiratory conditions impose an enormous burden on society. According to the WHO World Health Report 2000, the top 5 respiratory diseases accounted for 17.4% of all deaths and 13.3% of all Disability-Adjusted Life Years (DALYs). Lower respiratory tract infections, COPD, tuberculosis and lung cancer are each among the leading 10 causes of death worldwide (WHO, 2002). These conditions accounted for an estimated 33.4 million

deaths worldwide in the year 2002; of these, 72% occurred in the developing countries. (WHO, 2003).

2.2 Quitting Tobacco Use Saves Lives

There is evidence that many smokers are not fully aware of the high risks of disease and premature death that their choice entails. In low- and middle-income countries, many smokers may simply not know about these risks. In China in 1996, for example, 61% of smokers questioned thought that tobacco did them "little or no harm." In high-income countries, smokers know they face increased risks, but they judge the size of these risks to be lower and less well established than do non-smokers, and they also minimize the personal relevance of these risks (World Bank, 1999).
Tobacco smoking is the single, largest, preventable and treatable public health problem (Peto R, 1994). Numerous measures are used for tobacco prevention — legislation, bans, fiscal policies/pricing, campaigns, educational programs — and for cessation — counseling and cognitive behavior therapy, pharmaceuticals, hypnosis, and acupuncture. Many of these interventions have been assessed for effectiveness (Fiore M.C., 2000; Stead L.H., *et al*, 2003), and some for their cost-effectiveness (Parrot S. *et al*, 1998; SBU, 1998; Tengs T.O., 1995; Warner K.E., 1997). It is widely acknowledged that the majority of smoking cessation methods are effective and cost-effective (Fiore M.C., 2000; World Bank, 1999). Telephone helplines (quitlines) have gained increased recognition as effective interventions for smokers (Stead L.H., *et al*, 2003; Zhu S.H., 2002).

A large randomized controlled study, done in the United States, and reported in 2005, showed that sustained quitters had a 50% lower death rate overall than continuing smokers, had one third less deaths from heart disease and more than 50% less deaths from lung cancer than those who did not quit. This study followed 5,900 middle-age smokers for an average of 14 years. It is the largest randomized controlled study of its kind and shows clearly that stopping smoking saves lives (Davis K., 2006).

Secondhand smoke, or environmental exposure to smoke generated by smokers, increases the rate of sudden infant death syndrome, asthma, and pneumonia and ear infections in children. Additionally, adults who are continuously exposed to secondhand smoke are at increased risk of developing lung cancer and lung disease. When a pregnant woman smokes, the baby is also smoking. The baby is exposed to decreased oxygen and has an increased chance of dying in the uterus. Newborns of smokers are decreased in size and as they grow may have decreased lung and brain development. When people chew tobacco, the prolonged exposure of tobacco to the mucous membranes of the mouth causes oral, neck, laryngeal and pharyngeal cancer. It also causes tooth decay and mouth infections. Tobacco is efficiently absorbed through the oral mucosa to the blood and throughout the body causing lung and esophageal cancer (Davis K., 2006).

2.3 Cost of Tobacco Smoking

Tobacco use is one of the most important contributors to premature death and avoidable morbidity in both low income and high-income countries (Esson K.M. & Leeder S.R., 2004). In addition, smoking attributable costs represent a significant loss for the whole economy.

The economic consequences of tobacco use are both direct (primarily in the form of higher healthcare costs) and indirect (related to productivity losses as a result of morbidity and premature mortality) (World Bank, 1999). These costs can also be categorized as public or private based on whether or not they are covered by the government.

Studies have found that these costs have reached 2.1%–3.4% of gross domestic product (GDP) in Australia, 1.3%–2.2% of GDP in Canada and 1.4%–1.6% of GDP in the United States (Lightwood J. *et al*, 2000). The economic impact of smoking in low-income and middle income countries is less documented. A study from China estimated that smoking led to 1.5% GDP loss in 1989 (Jin S.G. *et al*, 1995). A more recent estimate shows that these costs reached about 0.06% of Chinese GDP in 2000 (Sung H.Y. *et al*, 2006).

Smoking-related costs account for 6–15% of health care cost in high-income countries (World Bank, 1999). Limited research from low-income and middle-income countries indicates a lower estimate, but there are only a few studies to support this finding. It is possible that the full effect of the large increase in male smoking is not yet evident, because the tobacco epidemic is at its earlier stage (Liu B.Q. *et al*, 1998). In addition, access to and quality of medical care in low-income and middle-income countries lead to the underestimation of true smoking costs (World Bank, 1999). The role of these factors is expected to diminish in the near future and the countries that can least afford it are likely to see their smoking-related healthcare costs rise (World Bank, 1999). There are predictions, for example, that China will experience a 120–137% increase in cardiovascular diseases between 1990 and 2020, compared to a 30–60% rise in high income countries (Leeder S. *et al*, 2004).

Owing to differences in healthcare systems, the costs related to smoking depend heavily on local conditions. Therefore, it is important to provide country-specific estimates of the costs of smoking (World Bank, 1999).

2.4 Smoking Affects Poverty

Episodes of ill health, the costs of healthcare, and premature death are frequently cited by poor people as their gravest concerns, and as the precipitating cause that pushes families into poverty. Smoking prevalence tends to be higher among men with less education and lower incomes, so they bear a greater health risk. Also, the opportunity cost of money spent on cigarettes is obviously higher for people living on low incomes – money spent on tobacco products could help feed families. Tobacco is often a significant part of total family expenditure: low income households with at least one smoker in Bulgaria spent 10.4% of their total income on tobacco products in 1995; urban households in Tibet spent 5.5% of their monthly disposable income on tobacco products in 1992; and in China, smokers in 2,716 households in Minhang district spent 17% of household income on cigarettes (World Bank, 2001; Bobak *et al*, 2000).

Smokers who are poor spend a higher percentage of their income on cigarettes than smokers who are wealthy. Studies in East Europe show that smokers in Armenia pay 28% of their monthly wages on cigarettes. In Hungary, smokers spend 6% of their monthly average wages on cigarettes. Further studies in 1999 show that if a smoker

spent his money on food instead of cigarettes each week he could buy 25 kg of flour, 21 kg of potatoes or almost 10 mg of apples. These smokers would be healthier for not smoking and be able to afford more food (Davis K, 2006).

2.5 What Government Policies Are Proven to be Effective?

Few people now dispute that smoking is damaging human health on a global scale. However, many governments have avoided taking action to control smoking — such as higher taxes, comprehensive bans on advertising and promotion, or restrictions on smoking in public places — because of concerns that their interventions might have harmful economic consequences. For example, some policymakers fear that reduced sales of cigarettes would mean the permanent loss of thousands of jobs; that higher tobacco taxes would result in lower government revenues; and that higher prices would encourage massive levels of cigarette smuggling (World Bank, 1999). However, research of these issues brings the evidence that none of these concerns are justified. Therefore, governments should adopt tobacco control interventions to prevent children and adolescents from smoking, to protect non-smokers, and to help current smokers quit.

Excise taxes are the single most effective policy to reduce the number of children and teenagers starting to smoke, and to increase the number of smokers quitting for good. On average, an increase in the price of a pack of cigarettes by 10% decreases the smoking rate by 8% in low income countries and decreases by 10% the number of children and teenagers who become smokers. Increasing excise taxes to be approximately 66% to 80% of the price of a pack of cigarettes is particularly effective in helping the poor to quit and to discourage children and teens from starting (World Bank, 1999).

Sometimes governments worry that they will have less tax revenue if they increase the excise taxes and decrease consumption. Studies in over 100 countries show that although the rate of consumption of cigarettes decreases when taxes are increased, the revenue to the governments increases overall. A good example is shown in studies in Canada and Sweden. In both countries, smoking rates dropped significantly when excise taxes on cigarettes were increased. Tax revenues were also higher. Several years later, both countries decreased their excise taxes because they were worried about cheaper cigarettes being smuggled from other countries. When they lowered the excise tax on cigarettes, tax revenues from cigarettes fell; smoking rate increased, and more children and teens started smoking (World Bank, 1999).

Governments also worry that an excise tax would be unfair to the poor. But as mentioned before, increased rate of quitting in poor populations will not only markedly improve health but also make income available to buy food and other goods and services.

Studies in the United States had shown that significant amount of money can be saved by increasing cigarette taxes. California leads the United States in lowering the number of smokers in its population. The California data shows that a 10% increase in state cigarette taxes and the following decline in smoking in 1990-1999:

1. Saved 5,000 lives/year, and markedly decreased healthcare costs.

2. Saved US$3 billion in healthcare costs.
3. Saved US$390 million from decreased heart disease.
4. Saved US$107 million from decreased delivery and care of low birth weight babies (Davis K., 2006).

In addition to lower healthcare costs, healthier workers with less heart disease will produce more revenue for government as they are able to continue to pay taxes on income and purchased goods.

Multinational agreements to decrease smuggling of cheaper cigarettes are important as the government raises excise taxes**.** Restriction of smoking in public places, restaurants and workplaces is also an effective deterrent to smoking. The United States' experience has shown that restaurants do not lose revenue since non-smokers increased their use of non-smoking restaurants as many non-smokers prefer not to eat in an environment surrounded by smoke. Banning smoking in the workplace reminds smokers every day of the dangers of smoking, and sends the message that the government and employers are committed to helping smokers quit. These policies also decrease the incidence of illnesses from secondhand smoke (World Bank, 1999). Banning advertising, promotion and sponsorship by tobacco companies is also effective if the ban is complete. When exceptions are made, tobacco companies will spend increased resources to promote cigarettes and other tobacco products wherever promotion is allowed. The ban, in particular, should include sponsorship of sports events, free or cheap gifts with tobacco company logos, and all advertising. Warning labels on tobacco products should be in black and white, and cover at least half of the cigarette pack. Several warnings should be rotated so that several different messages are seen by smokers every time they smoke (World Bank, 1999).

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2.6 What Methods Have Been Shown To Be Not Effective?

Attempts to reduce tobacco supply are in general not effective. The only proven affective supply reduction measure is control of smuggling as discussed above. Attempts to reduce supply through trade barriers, prohibition, and youth access restriction by age are all difficult and expensive to enforce. When laws are not enforced they breed contempt for the law. Resources should be used instead for methods to decrease demand as discussed previously (World Bank, 1999).

2.7 Cigarette Price and Taxation Policy in Laos

The economy of Lao PDR is dominated by agriculture. In 2000, more than 52% of GDP at current prices was originated from the agricultural sector. The contribution of industry and services were both less than 25%. However, the share of agriculture in GDP went down to slightly over 50% in 2001. At the same time, those of industry and services went up to around 24 percent. This trend has continued over the following years. In 2006, the share of agriculture went down to around 42%, while those of industry and services went up to more than 31% and 25%, respectively. With regards to tobacco and tobacco products, a similar trend can be observed. Tobacco harvested area was found to decrease over the period while cigarette production significantly increased (National Statistical Center, 2003; Sarntisart I., 2008).

Cigarette production in Lao PDR is dominated by the Lao-China Lucky Tobacco Company Ltd. and Lao Tobacco Company Ltd., which are producing the two most popular cigarette brands in the country i.e. A Deng and Dok Mai Daeng (Red Flower). Production of the two companies is believed to account for most of the cigarette sales in Lao PDR. The World Health Survey in 2003 shows that smoking prevalence rate in Lao PDR was 40.3%. This rate was much higher than in other ASEAN member countries. (Sarntisart I., 2008)

Cigarette is also an important source of government revenue. The revenue derived from tobacco and tobacco products comes in the form of import tariff, excise tax, business tax, and profit tax. As a shareholder in one of the two major cigarette manufacturers in Lao PDR, the government also earns revenue from the manufacture's net profit. Moreover, in order to attract more investments, the cigarette industry has been put under the promotion policies (Sarntisart I., 2008).

The cigarette retail price consists of the production cost or imported price, import tariff (in the case of imports), excise tax, business tax, and profit margin. In the case of local cigarettes, factory price means production cost that includes the cost of tobacco leaves, materials, and capital cost, as well as labor cost. In the case of imported cigarettes, imported price is c.i.f. (cost, insurance and freight) price. Import tariff is applied on the c.i.f. price. The excise tax is applied on the factory price or the imported price that includes customs tariff. The ceiling rate that was 20% in 1989 continuously increased to 55% in 2005. However, the applied rate is much lower than the ceiling rate (Sarntisart I., 2008).

International trade agreements also have an important role to play for Lao PDR. Based on the Common Effective Preferential Tariff (CEPT) scheme of ASEAN Free Trade. Area (AFTA), the rate of customs tariff depends on countries of importing origin. But it should be noted that the impact of including tobacco and tobacco products in a free trade agreements (FTAs) such as AFTA differs from that of other goods and services. As reviewed from many past studies, the overall tobacco consumption has risen because of lower cigarette prices. Thus, rather than improving economic welfare, more tobacco consumption leads to an increase in cigarette demand and higher economic cost, i.e. health cost and forgone earnings due tobacco-related mortality. Moreover, all FTAs are relatively in favor of imported cigarettes. Thus, sooner or later imported cigarettes will gain more market share in the domestic market (Sarntisart I., 2008; ASEAN Secretariat, 1999).

OBJECTIVES

3.1 General Objective

- To determine the burden of tobacco-related socio-economic cost of stroke, lung cancer and COPD in Laos

3.2 Specific Objectives

- To determine the burden of active cigarette smoking in Lao patients hospitalized due to stroke, lung cancer and COPD
- To determine the direct and indirect costs of stroke, lung cancer and COPD during hospitalization in Laos
- To estimate the burden of national socio-economic impact of tobacco-related diseases in Laos

METHODOLOGY

4.1 Research Questions

This study is focused on the burden of socio-economical impact of tobacco-related diseases in Laos.

4.2 Hypothesis

It is expected that active and passive tobacco smoking may be one of the main risk factors that affect the health of the Lao population leading to several tobacco-related diseases such as stroke, lung cancer and COPD.

4.3 Study Design

A cross-sectional study was designed to fulfill the purpose of this study. This was a multi-centered study carried out from 2006 to 2007. Three large hospitals of Mahosot, Sethathirath, and Mittapab of the Lao University of Health Sciences participated in the study.

In Laos, primary and secondary care hospitals have not earned the trust of the population in terms of providing medical care. In addition, there is no rule stating that patients should go to seek for medical assistance from primary care health centers and then be referred to secondary and tertiary level care hospital, if necessary. For this reason, Lao patients are able to go to seek medical assistance directly at tertiary level care hospitals or wherever they trust, be it Mahosot, Sethathirath and Mittapab hospitals. Patients with stroke, lung cancer and COPD often go directly to these hospitals to seek medical assistance. Accordingly, by involving these 3 large university hospitals in this study, the research team would very likely be able to access most of the patients who are suffering from stroke, lung cancer and COPD. .

A purposive sampling method was used. There are number of diseases related to smoking. Consideration of all these diseases in our study would not be technically possible. Therefore, in this study we selected 3 diseases which account for a major part of smoking-related diseases: lung cancer (bronchial or pulmonary carcinoma), chronic obstructive pulmonary diseases (chronic bronchitis, pulmonary emphysema) and stroke (acute cerebral thrombosis).

Patients discharged with uncertain diagnosis, cerebral hemorrhage, subarachnoid hemorrhage and cerebral embolism with cardiac origin such as atrial fibrillation will be excluded from the study due to their uncertain relationship with tobacco smoking.

A structured questionnaire form was used (Appendix A) to collect data for this study. Data were provided by patients and/or patients' close care givers. The questionnaire was translated and pre-tested to ensure that all questions were correctly understood and that the skip pattern was correct. Information sheet and consent forms were provided to the patients involved in this study to explain clearly the purpose of this project as well as for ethical purpose (Appendices B and C). Data collection was conducted during a 12-month period starting from October 2006 to September 2007.

Four hundred and twenty-nine patients hospitalized in the 3 hospitals due to acute ischemic stroke (284 cases), COPD (129 cases) and lung cancer (16 cases) consented to participate in this study. In addition, 428 care givers of these patients were interviewed. Smoking behavior data recorded from current and ex-smokers were compared with data gathered from the non or passive smokers groups of the patients and care givers used as control cases in this study. In this study, direct costs included costs of previous medical care cost in other healthcare centers before admission to the current hospital, cost of investigation tests, medicine and other materials, and costs for staying in a room in the current hospital. On the other hand, indirect costs included in this study were cost of transportation of the patients to the hospital and other travel costs, cost of food as well as income lost for the patient and his/her care givers who were family members. Direct and indirect costs were added to give the total cost for the patients and family. Mean cost per event was also calculated. The total number of cases for each disease per year was recorded and the national burden of socio-economic impact was estimated at the end of this study (Appendix D).

Healthcare costs paid by family, insurance companies, government or a combination of these were also recorded. In Laos, the government subsidizes hospital care by paying for capital investment and depreciation, providing salary for the staff (doctors, nurses, etc) and covering administrative and other operational costs, except for the costs of drugs and medical supplies, which are covered by user fees. User fees are paid by either the patients or under public hospital welfare package for the poor (government) or by health insurance. The health insurance is non profit and run by the government, covering government staff and their respective family (oPl). Government staff patients and their respective family members receive free healthcare provided by Lao district, provincial and central hospitals. Health insurance for employees working in factories in the private sector and general Lao population is provided by private health insurance company called “Assurance General du Laos” (oPs).

4.4 Costing Procedure

4.4.1 Social Cost Perspective

This report examines cost from a wider perspective than just looking at how much individual client pays. It assesses both costs to clients, cost to health facilities and productivity lost cost. Figure 1 presents types of costs and source of data collection.

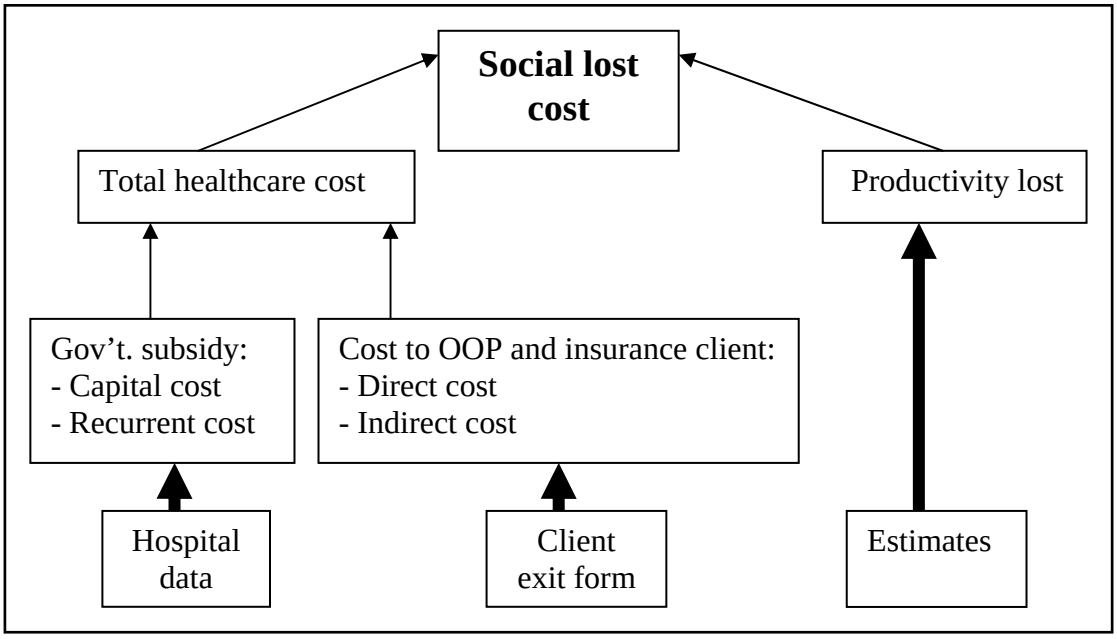

Figure 1. A social perspective of costing and data source

4.4.2 Government Costs (State Budget Expense)

In Lao PDR public hospitals, allocated government budget covers all capital purchases and depreciation, recurrent costs for staff salary, administrative and operating costs, except cost for drug and medical supplies which are covered by user fee or by insurance reimbursement.

Data concerning capital and recurrent costs from the 3 hospitals involved in this study were collected. We used annual recurrent costs and depreciation collected from hospital financial records for the year 2007. We obtained information on year and cost of purchase, lifetime for depreciation from hospital asset registry. Annual cost for capital items were calculated using direct depreciation method with provision of 10% for time value of money. First, we have to find the number of service units by number of OPD + (number IPD x Length of stay), and then we can calculate the unit cost, meaning 1 OPD or 1 day hospitalization government cost that were allocated to each patient diagnostic group (Appendix E).

4.4.3 Patient and Insurance Costs

We used questionnaires to collect patient costs. Client exit interviews were used to collect patients' costs including loss of time, informal expenses such as transport, food, informal payment, etc. We also use this form to collect individual socio-economic data and smoking history and habit, including frequency and number of cigarettes smoked.

Cost of formal fees and health insurance reimbursement were copied by hospital staff from hospital records, including drug cost, laboratory cost, x-ray cost and money charged by hospital to patients, kind of insurance, etc. Formal fees were then divided

into user fee and health insurance reimbursement where applicable. Hospital registry number was used to link exit interview and hospital records.
We also included patient's informal costs, opportunity costs for patient care and patient time into individual's costs. Informal costs were obtained as all other additional expense during hospital stay, excluding costs for additional medicines and diagnostic procedures, which were included in a separate question regarding additional treatment costs. Patient's opportunity costs and costs for family informal care were obtained based on number of inpatient days, average number of family members involved in patient care, and profession and region's specific average income.

Total healthcare cost is broken down into main categories following the formula:

$$C_t = C_i + C_f + C_o$$

where:
- C_t is total health care cost
- C_i is cost born by individual and his/her family in terms of travel, care giving, informal fee to health care provider, income loss, and other indirect cost
- C_f is cost born by hospitals, including recurrent cost (supplies, personnel, support service, administration…) and capital cost depreciation
- Co is cost born by other sectors, specifically cost born by the health insurance

Productivity lost

Productivity lost was estimated from patient income in client exit form, productivity cost of labor in Lao PDR (Mean = 20.58 million kips) is 4 times that of the laborer's income (Mean = 4.8 million kips) (Ministry of Social and welfare, 2007). First, we estimated the average working year lost of the patients who died or handicapped, from the sick year (in questionnaires) to retirement year (60 for men and 55 for women) and then the average productivity lost is average year lost multiply by number of days in a year (365) and 4 times income in 1 day.

Social lost cost was based on the following formula:

$$Cs = C_t + Cp$$

Cs = Social lost cost
C_t = Total healthcare cost
Cp = Productivity cost

4.5 Smoking-attributable Fraction of Costs

Total cases of each disease per year

Only data for year 2000 could be obtained because the following year MOH started to use the new statistic forms which collected only the top 10 diseases. Thus, diseases such as lung cancer may no longer appear in the collected data. Accordingly, it needed to estimate these total cases up to year 2007 based on the population growth rate of 2% per year. Details of the calculations are shown in Appendix F.

Association between tobacco smoking and each disease

We obtained from client exit form.

Smoking-attributable fraction of Costs

The SAF estimation was based on the epidemiological concept on the percentage of population-attributable risk (PAR %), the percentage of prevalence of a disease in a population that is caused by a risk factor, in this case, by smoking. So, we calculate PAR% first,

$$PAR\% = \frac{P^e(RR-1)}{1+P^e(RR-1)} \times 100$$

where:

P^e = Proportion of exposed (to smoking) population
RR= relative risk for smokers compared to that for non-smokers

And using PAR% results, we calculated SAF using this formula:

$$SAF = Cs \times \text{Total cases} \times PAR\%$$

where
SAF = Smoking-attributable fraction of Costs
Cs = Average of social lost cost
Total cases = Total cases of each disease per year
PAR% = % of prevalence of a disease in a population that is caused by a risk factor

Smoking-attributable fraction by sectors

- SAF in hospital/government budget
- SAF in private sector or out of pocket
- SAF in insurance sector
- SAF in productivity sector
- SAF in all society
- Compare SAF and GDP and Total Health expenditure of 2005 (WHO, 2007)

4.6 Stroke Case Illustration Data Collection

As stroke, COPD and lung cancer are among the major chronic diseases and the patients will need long term follow up and multiple hospitalization with significant healthcare cost, a case illustration to show the burden of economic impact is necessary. Accordingly, a stroke case presentation (Appendix G) was recorded to illustrate the burden of socio-economic impact on the victim's family. This patient was treated and followed by the Principal Investigator of this study. Details of the patient's medical history were recorded from the patient's medical record and data on subsequent follow up. Patient and family members (spouse and children) were

interviewed to assess the burden of socio-economical impact of stroke on the victim's family.

4.6.1 Functional Recovery Assessment

The degree of motor function impairment, disability and handicap of this case was assessed by using the Modified Canadian Neurological Scale (MCNS), the Barthel Activities of Daily Living Index (BI) and the Rankin Scale respectively.

Measurement of Motor Function Impairment

The Modified Canadian Neurological Scale (Cote *et al*, 1986) was used to quantify the degree of neurological impairment or stroke severity. Points were awarded according to the degree of motor weakness and could be added together to provide a total score ranging from 0 to 11.5 (see Appendix H).

In this study stroke severity was classified according to MCNS score as *mild*, *moderate* and *severe*. Stroke severity was defined as *mild* for a MCNS score greater than 9.0, *moderate* from 9.0 to 4.0 and *severe* when it was less than 4.0. Improvement of the neurological deficit after the onset of stroke was assessed according to the improvement of the MCNS scores as well as the degree of stroke severity.

Measurement of Disability

The Barthel ADL Index (Mahoney *et al*, 1965) was used to assess 10 different aspects of activities of daily living (ADL), most of which indirectly relate to motor function. Points were awarded for different levels of achievement in each category and could be added together to provide a total score ranging from 0 to 20 (see Appendix I). The information required was obtained from the principal career rather than the patient. At each test section the Barthel Score was expressed empirically as a score out of 20. Activities of daily living were defined as *poor* if the Barthel ADL Index score recorded was from 0 to 12 and as *good* from 13 to 20.

Measurement of Handicap

The Rankin or Oxford Handicap Scale (Bamford *et al*, 1989) was used to quantify the degree of handicap of the patients. In this assessment six categories were recognized, ranging from 0 with no disability or symptoms to 5 with severe handicap and totally dependent (see Appendix J). In this study, patients were classified as *independent* if the Rankin score ranged from category 0 to 2 and *dependent* from 3 to 5.

4.6.2 Glossary

Acute Ischemic Stroke

Acute ischemic stroke is defined as a sudden, non-convulsive, focal neurological deficit, lasting more than 24 hours due to a loss in the supply of oxygen and glucose secondary to vascular occlusion and an array of changes in cellular metabolism consequent upon the collapse of energy-producing processes, with disintegration of cell membrane. The term *acute* refers to the time between onset of stroke and

admission. The upper limit is set at 7 days (Adams *et al*, 1997; Corona 1989; Barnett *et al*, 1992).

Neurological Impairment

Impairment refers to systems or parts of the body that do not work due to any loss or abnormality of psychological, physiological or anatomical structure or function. For example, following stroke, paralysis of the right arm or dysphasia would be impairment. Impairment is defined by the World Health Organization (1980) in the International Classification of Impairments, Disability and Handicaps as "*an exteriorized loss of structure, or abnormality of function at the organ level*" that leads to different degrees of disability and handicap.

Disability

Disability refers to things people cannot do due to any restriction or lack (resulting from impairment) of ability to perform an activity in the manner, or within the range, considered normal for human beings. For example, following stroke, there can be difficulties in activities of daily living such as dressing and walking. Disability is defined in The International Classification of Impairments, Disability and Handicaps of the World Health Organization (1980) as "*a restriction of actions at a person level*" that leads to different degrees of handicap.

Handicap

Handicap refers to inability to carry out social functions. For example, disadvantage for a given individual resulting from an impairment or disability that limits or prevents the fulfillment of a role for that individual. For example, following stroke, being unable to go out to work or to go to tea with a friend represents a handicap. Handicap is defined by the World Health Organization (1980) in the International Classification of Impairments, Disability and Handicaps as "*a set of disadvantages within the individual's particular social context*" due to disability and neurological impairment.

RESULTS

5.1 Pattern of Tobacco-related Diseases in Victims

Table 1: Characteristics of the patients (n=429)

Variables	n	%	95% CI
Hospitals			
Mahosot hospital	279	65.0	60.3 to 69.5
Mittapab hospital	102	23.8	19.9 to 28.1
Sethathirath hospital	48	11.2	8.4 to 14.7
Gender			
Female	155	36.1	31.6 to 41.9
Male	274	63.9	59.1 to 68.4
Ethnic Groups			
Lao Lum	392	91.4	88.2 to 93.8
Lao Sung	18	4.2	2.6 to 6.7
Lao Kang	13	3.0	1.7 to 5.3
Others	6	1.4	0.6 to 3.2
Life Insurance			
Yes	41	9.6	7.0 to 12.8
No	388	90.4	87.2 to 93.0
General education level			
Illiterate	98	22.8	19.0 to 27.2
Primary school	178	41.5	36.8 to 46.3
Junior high school	65	15.2	12.0 to 19.0
Senior high school	88	20.5	16.9 to 24.7
Professional Education level			
Ph.D. or higher	1	0.2	0.0 to 1.5
Masters Degree	1	0.2	0.0 to 1.5
Bachelor degree	13	3.0	1.7 to 5.3
Sung (Diploma)	31	7.2	5.0 to 10.2
Kang (Middle level)	57	13.3	10.3 to 17.0
Tun (low level)	48	11.2	8.4 to 14.7
Non professional level	278	64.8	60.1 to 69.3
Occupation			
Unemployed *	166	38.7	33.9 to 43.3
Farmers	101	23.5	19.7 to 27.9
Pensioners	45	10.5	7.8 to 13.9
Staff (government & private)	42	9.8	7.2 to 13.1
Owners of small business	31	7.2	5.0 to 10.2
Employees	22	5.1	3.3 to 7.8
Owners of big business	12	2.8	1.5 to 5.0
Monks	10	2.3	1.2 to 4.4

***** Unemployed = no job (including housewives and elderly people)

Characteristics of the patients included in this study are shown in Table 1. In total 429 patients, where 155 were females and 274 males, with a mean age of 62 years old, consented to participate in this study. Most of them are from the Lao Lum ethnic group (91%) and only 10% of them have life insurance. As shown in this table, 23% of the patients were illiterate, 41.5% reached primary school, 15% junior high school and 20% senior high school. Of these, 65% f the patients did not have any professional study. Unemployed were 38%, 23% were farmers, 10% pensioners, 10% owners of businesses, and the rest were government and private staff, employees and monks.

The pattern of tobacco smoking of the patients included in this study is shown in Table 2. The rate of tobacco smoking detected in patients was 50% (9% for female and 73% for male). The type of tobacco smoked were mainly manufactured cigarettes (70%) and hand-rolled cigarettes (28%).

Table 2: Smoking pattern of the patients (n=429)

Variables	n	%	95 % CI
Rate of tobacco smoking			
Female	14	9.0	5.0 to 14.7
Male	201	73.4	67.7 to 78.5
Total	215	50.1	45.3 to 54.9
Types of tobacco smoked			
Manufactured cigarettes	172	69.9	63.8 to 75.6
Hand-rolled cigarettes	69	28.0	22.5 to 34.1
Wooden pipe	3	1.2	0.3 to 3.5
Bamboo pipe	2	0.8	0.1 to 2.9

5.2 Pattern of the Care Givers

Characteristics of the care givers of these tobacco-related diseases victims are shown in Table 3. As seen in the table, about 66% of the care givers were females. Care was provided mainly by the victims' children (54%) and their respective spouses (37%). There was a huge difference in the level of education among the care givers ranging from Ph.D. degree (0.2%) to non professional degree (64%). Many of these care givers have their own jobs or businesses to look after. Government and private staff accounted for 18%, while farmers, businesses owners and employees accounted for 22%, 19% and 12%, respectively.

Table 3: Characteristics of the care givers (n=428)

Variables	n	%	95 % CI
Gender			
Female	281	65.7	60.9 to 70.1
Male	147	34.3	29.9 to 39.1
Relationship			
Children	233	54.1	49.7 to 59.3
Spouse	160	37.5	32.9 to 42.3
Relatives	34	8.0	5.7 to 11.1
General education level			
Illiterate	39	9.1	6.6 to 12.3
Primary school	124	29.0	24.8 to 33.6
Junior high school	99	23.1	19.3 to 27.5
Senior high school	166	38.8	34.2 to 43.6
Professional education level			
Ph.D. degree	1	0.2	0.0 to 1.5
Masters degree	4	0.9	0.3 to 2.6
Bachelor degree	23	5.4	3.6 to 8.2
Sung (diploma)	21	5.0	3.2 to 7.6
Kang (middle level)	63	14.9	11.7 to 18.7
Tun (Low level)	40	9.5	6.9 to 12.8
Non professional level	271	64.1	59.3 to 68.1
Occupation			
Farmers	93	21.8	18.0 to 26.1
Unemployed *	89	20.8	17.2 to 25.1
Owners of small businesses	80	18.7	15.2 to 22.8
Staff (government & private)	78	18.3	14.8 to 22.3
Employees	48	12.2	8.5 to 14.7
Owners of big businesses	13	3.0	1.7 to 5.3
Students	13	3.0	1.7 to 5.3
Pensioners	11	2.6	1.4 to 4.7
Monks	2	0.5	0.1 to 1.9

***** Unemployed = no job (housewives, elderly people)

The pattern of tobacco smoking detected in the care givers group is shown in Table 4. The overall rate of tobacco smoking detected in the care givers group was 19% (4.6% for female and 46% for male). The type of tobacco smoked were mainly manufactured cigarettes (84%) and hand-rolled cigarettes (12%).

Table 4: Smoking pattern of the care givers (n=428)

Variables	n	%	95 % CI
Rate of tobacco smoking			
Female	13	4.6	2.5 to 7.8
Male	68	46.3	38.0 to 54.7
Total	81	19.0	15.4 to 23.1
Tobacco smoking types			
Manufactured cigarettes	70	84.3	74.7 to 91.4
Hand-rolled cigarettes	10	12.0	5.9 to 21.1
Wooden pipe	2	2.4	0.3 to 8.4
Bamboo pipe	1	1.2	0.0 to 6.5

5.3 Burden and Economic Impact of Tobacco-related Diseases

5.3.1 Impact of Tobacco Smoking on Health

The rate of tobacco smoking according to gender and occupation among the patients is shown below in Figure 2. The type of occupation has no influence on smoking pattern, but there is a gender difference in which males smoke more than females.

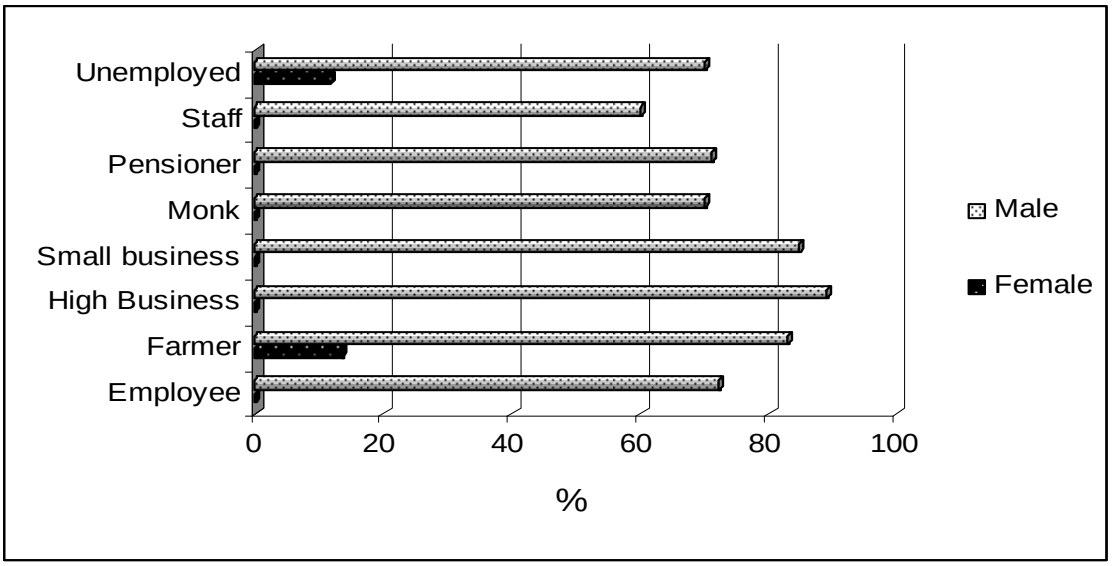

Figure 2: Rate of tobacco smoking in patients stratified by gender and occupation (n= 429)

The association between tobacco use and health is shown in Figure 3. The rate of tobacco smoking was 41% for stroke (cerebral thrombosis), 65% for COPD and 87% for lung cancer. The findings shown in Figure 3 confirm that lung cancer is more associated with smoking compared to stroke ($p < 0.0001$).

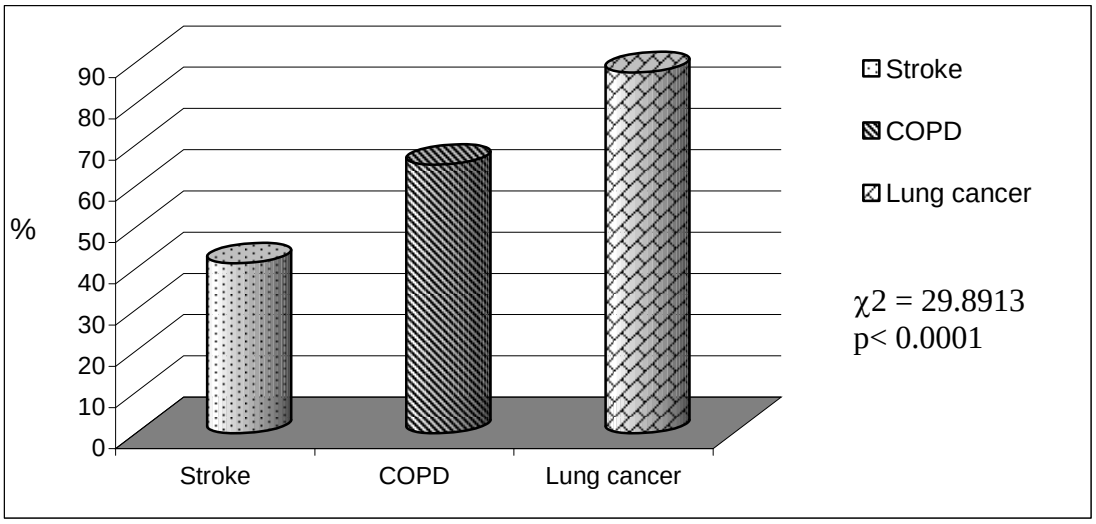

Figure 3: Association of tobacco smoking on stroke, COPD and lung cancer (n= 429)

Table 5: Types of patients and hospitalizations (n=429)

Variables	n	%	95 % CI
Diagnosis			
Stroke	284	66.2	61.5 to 70.6
COPD	129	30.1	25.8 to 34.7
Lung cancer	16	3.7	2.2 to 6.1
Previous Hospitalization			
No	295	62.2	63.1 to 72.2
Yes in Laos	108	25.2	21.2 to 29.7
Yes, in Overseas	10	2.3	1.2 to 4.4
Yes in both	3	0.7	0.2 to 2.2
Discharge status			
Home alive	395	92.3	89.2 to 94.6
Death at home	29	6.8	4.7 to 9.7
Intra-hospital death	2	0.5	0.1 to 1.9
Referred	2	0.5	0.1 to 1.9

As shown in Table 5, most of the 429 patients involved in this study had no previous hospital admissions (62%). Previous admission to other hospitals in Laos accounted for 25%, overseas 2.3% and in both Lao and overseas hospitals less than 1%. Most of the consented patients had stroke (72%). Chronic obstructive pulmonary diseases (30%) and lung cancer (4%) were less common. Twenty-nine of the patients (7%) were critically discharged only to pass away at home, while only 2 patients died in the hospital.

5.3.2 Costs to Users/Clients

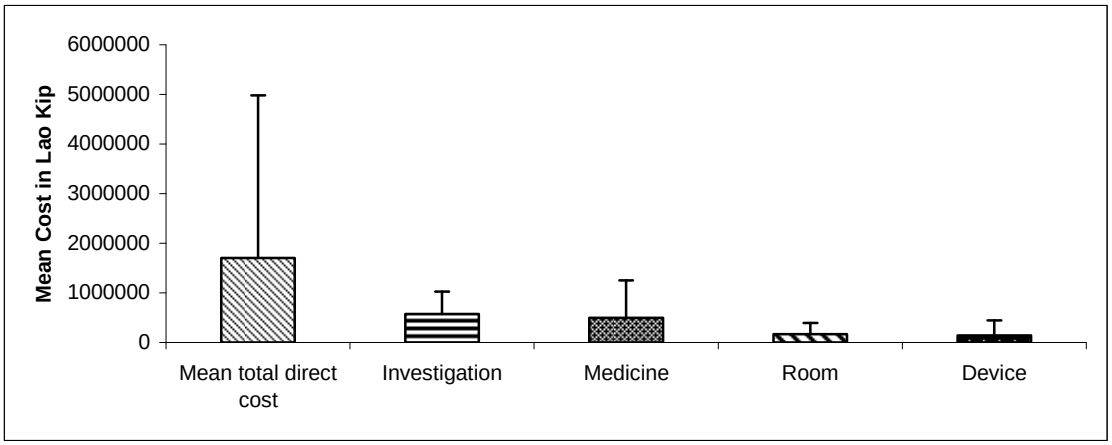

Figure 4: Mean total direct costs per event in Lao currency (n=429)

Total direct costs for the management of diseases included costs of investigations, medicines, consumable medical devices used and room (Figure 4). Mean total direct cost during hospitalization of the Lao patients included in this study was 1.7 million kips (US$198). Mean total direct costs according to diseases are shown in Figure 5. The mean direct cost per event per admission were 2.105 million kips (US$246) for stroke, 898,394 kips (US$105) for COPD and 1.0 million kips (US$117) for lung cancer.

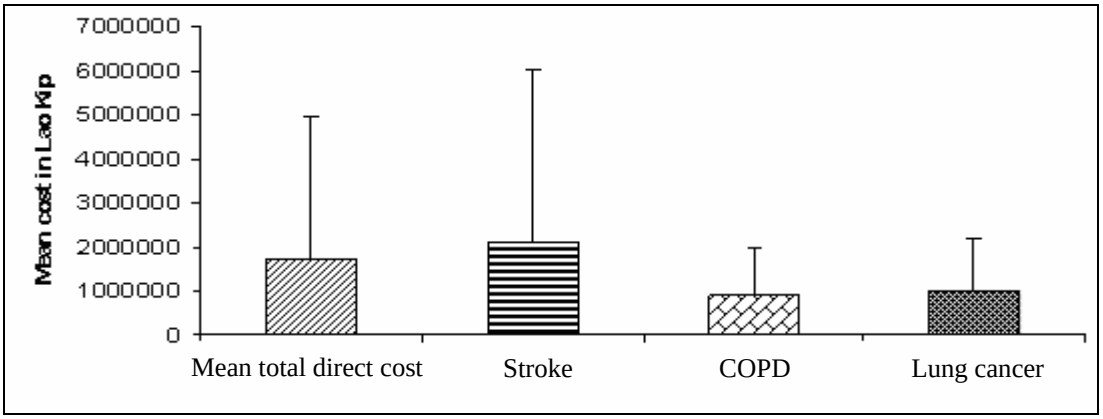

Figure 5: Mean total direct costs per event for stroke, COPD and lung cancer in Lao currency (n=429)

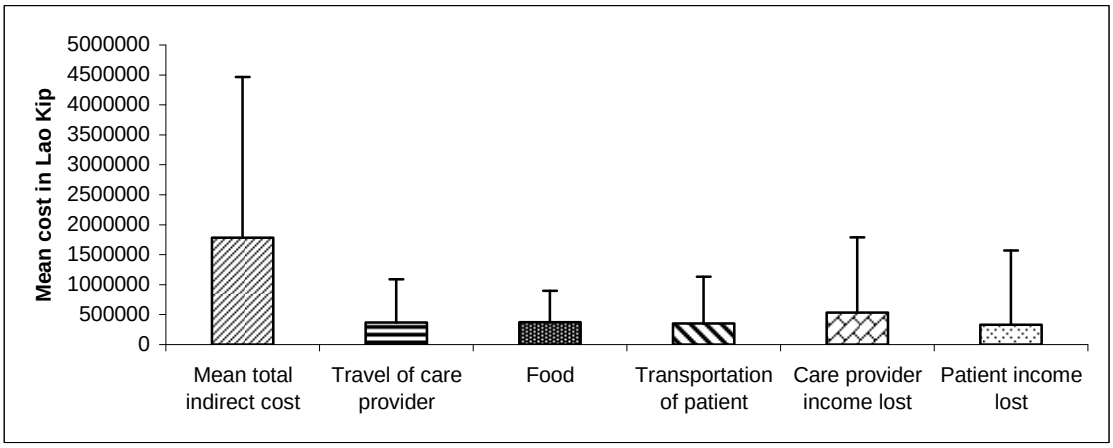

Figure 6: Mean total indirect costs per event in Lao currency (N=429)

Total indirect costs included the costs of daily travel of the care givers to the hospital and back home, transportation of the patient and relatives to hospital, food costs as well as income lost of both the care givers and patients. The mean indirect cost detected in this study for a Lao patient was 1.78 million kips or US$208 (Figure 6). The mean indirect cost per event per admission were 1.97 million kips (US$231) for stroke, 1.30 million kips (US$152) for COPD and 2.29 million kips (US$268) for lung cancer (Figure 7).

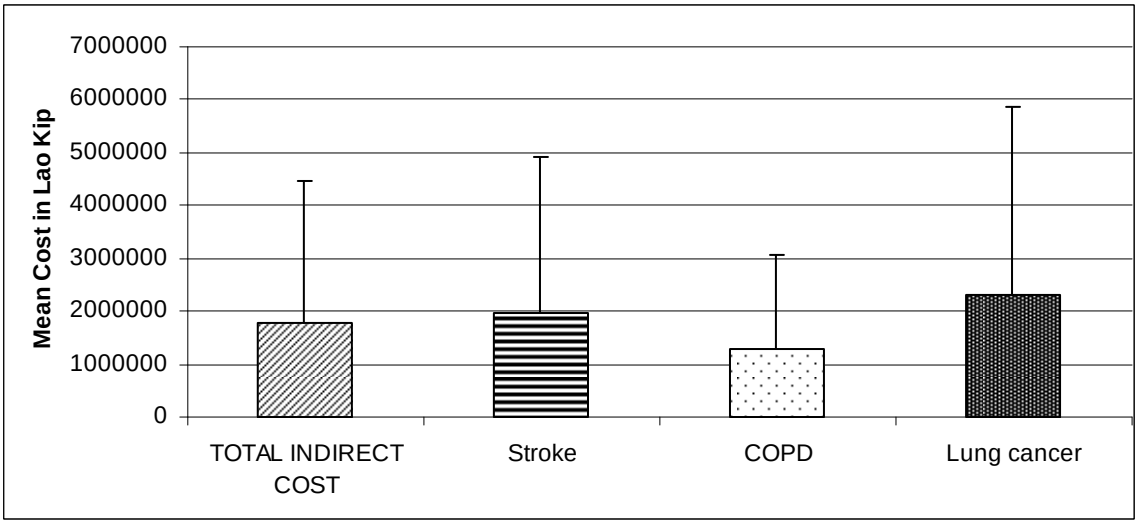

Figure 7: Mean indirect costs per event for stroke, COPD and lung cancer in Lao currency (n=429)

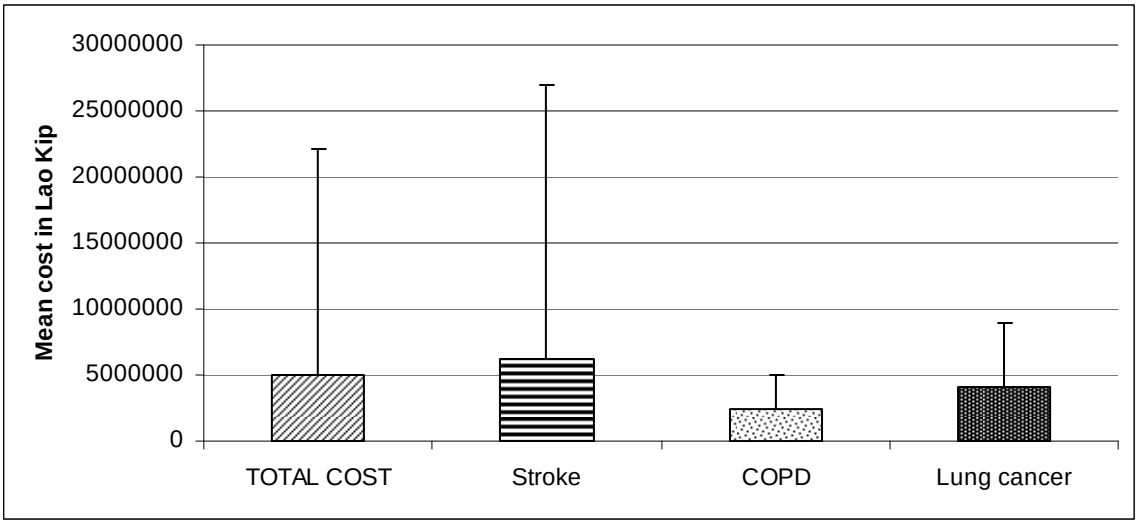

Figure 8: Total health care costs per event for stroke, COPD and lung cancer in Lao currency (n=429)

The mean diagnose-specific total health care costs per event are shown in Figure 8. The mean total health care costs (direct and indirect costs paid by out of pocket money) per event was 6.15 million kips (US$719) for stroke, 2.41 million kips (US$282) for COPD and 4.08 million kips (US$477) for lung cancer. User fee payers are shown in Figure 9. As seen, direct and indirect costs for the patients involved in this study are mainly paid by out of pocket money from the victim's family (88%). The contribution of government and insurance companies in healthcare cash payment was limited.

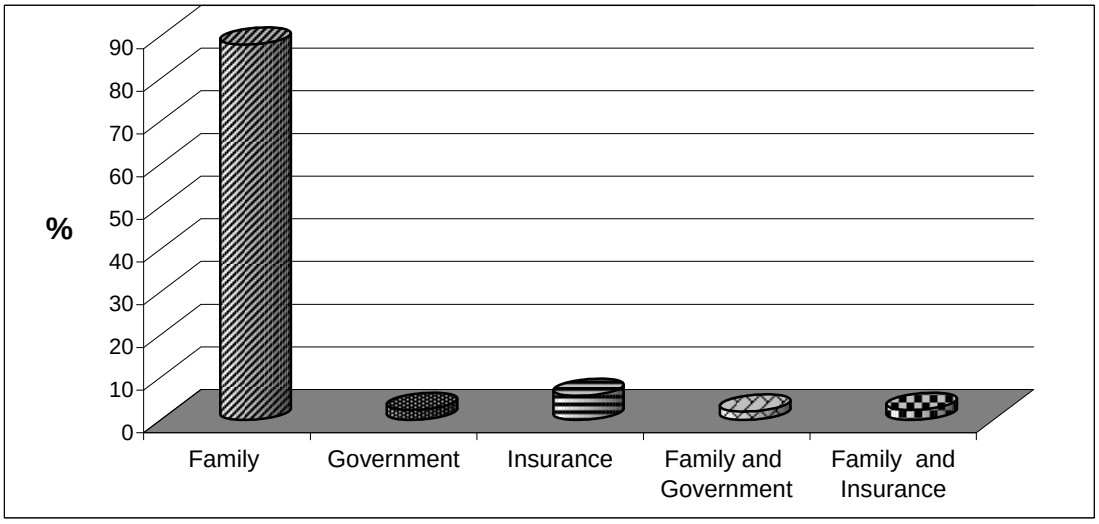

Figure 9: Direct and indirect costs' payers (n=429)

5.3.3 Costs to Hospital/Government

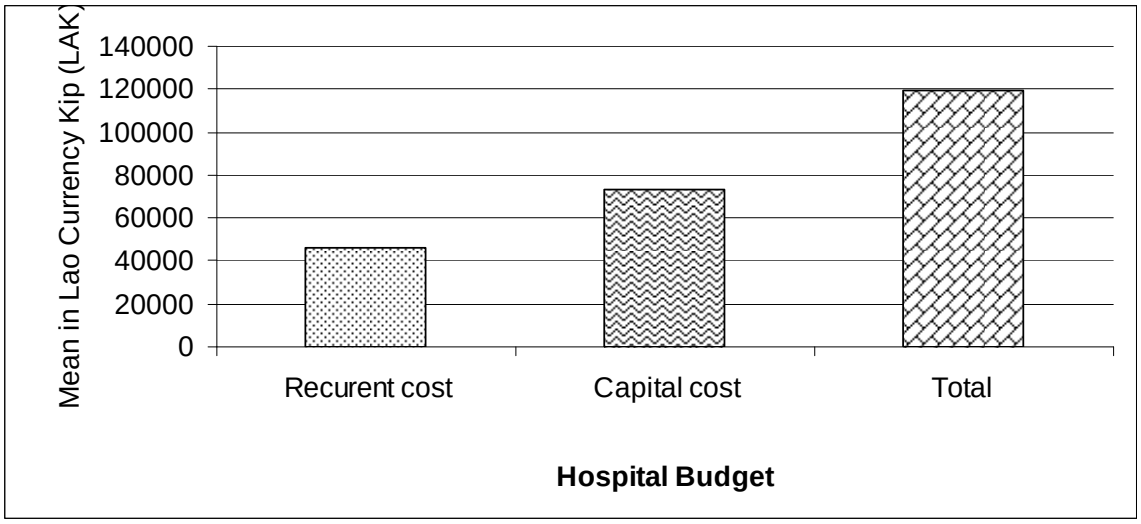

Figure 10: Mean hospital/government costs per day hospitalization in Lao currency (Kip)

The mean hospital or government cost per day of hospitalization is shown in Figure 10. As shown in this figure the total mean cost of 1 day hospitalization is around 119,448 kips (US$14) being 45,974 kips (US$5.40) for recurrent cost (hospital running budget) and 73,473 kips (US$8.60) for hospital capital cost (building, furniture, air conditioners, vehicle cost and other office equipments as well as medical equipments).

The mean total hospital or government cost per event for stroke, COPD and lung cancer calculated is shown in Figure 11. The mean hospital/government costs per event were 917,968 kips (US$107) for stroke, 956,514 kips (US$112) for COPD and 1.28 million kips (US$149) for lung cancer.

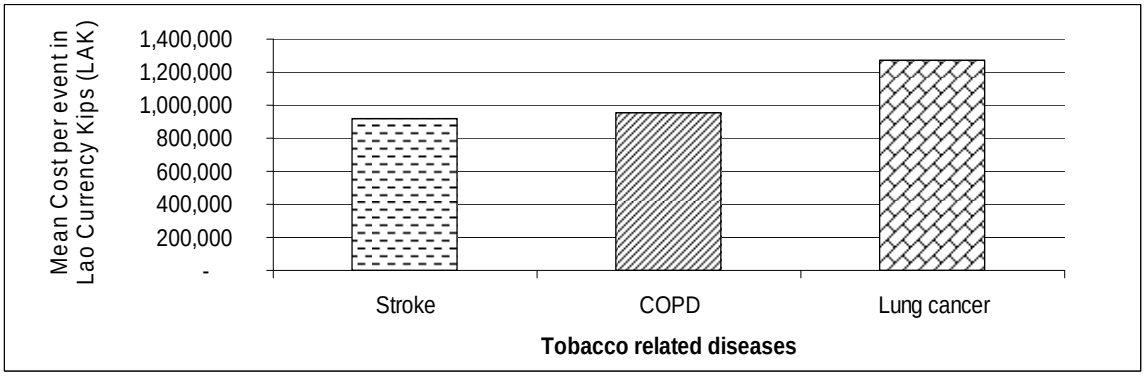

Figure 11: Mean total hospital/government costs per event in Lao currency (Kip) during hospitalization (n=429)

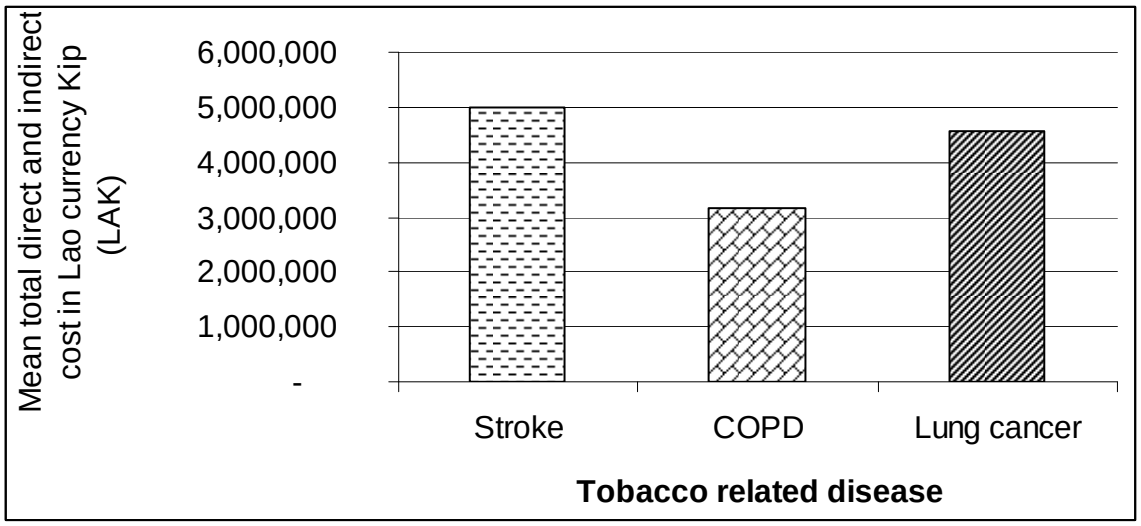

Figure 12: Mean total costs (direct, indirect and hospital/government cost) per event in Lao currency (Kip) during hospitalization (n=429)

The mean total healthcare costs for both users and government per event were 4.99 million kips (US$583) for stroke, 3.16 million kips (US$369) for COPD and 4.57 million kips (US$369) for lung cancer (Figure 12). The total healthcare costs for both users and government is 1.77 billion kips (US$206,848).

Healthcare cost was mainly paid by the victim's family (77%) with their out of pocket money. Government and health insurance contributed 21% and 2%, respectively. (Table 6).

Table 6: Cost in Lao currency (Kip) incurred by payers (n=429)

Variable	Government	Family	Insurance	Total cost
Stroke	259,780,000	1,121,650,000	33,360,000	1,414,800,000
COPD	123,390,000	277,380,000	6,480,000	407,260,000
Lung cancer	20,420,000	51,820,000	890,000	73,150,000
TOTAL	403,600,000	1,450,860,000	40,756,119	1,895,220,000
%	21.3	76.6	2.3	100

The permanent productivity lost is shown in Table 7. Lost of productivity was estimated on the lost years from the sick year to the retire year. As seen in this table, the total permanent productivity lost cost detected in this study was 20.05 billion kips (US$2.34 million), mean permanent productivity lost costs was 58.20 million kips

(US$6,801) for stroke, 6.30 million kips (US$736) for COPD and 171.10 million kips (US$19,995) for lung cancer.

Table 7: Permanent productivity lost in Lao currency (Kip) (N=429)

Variables	Mean per event	Total
Stroke	58,200,000	16,490,530,000
COPD	6,300,000	822,040,000
Lung cancer	171,100,000	2,738,260,000
TOTAL		20,050,830,000

The burden of social lost cost is shown in Table 8. Social cost included total cost and permanent productivity lost cost. The total social lost cost detected in this study was 21.91 billion kips (US$2.56 million). Social lost was 17.88 billion kips (US$2.09 million) for stroke, 1.22 billion kips (US$142,573) for COPD and 2.81 billion kips (US$328,502) for lung cancer.

Table 8: Social lost cost in Lao currency (Kip) (N=429)

Variables	Mean per event	Total
Stroke	63,200,000	17,883,000,000
COPD	9,500,000	1,220,000,000
Lung cancer	175,700,000	2,811,000,000
TOTAL		21,913,000,000

5.3.4 Estimation of National Smoking-attributable Costs

The key input for the estimation of national smoking attributable cost is shown in Table 9. The population of Lao PDR in 2005 was 5,609,997. The number of hospital admission registered in national statistical centre in 2002 was 1,491,523 patients. Of these 1,696 were stroke, 844 were COPD and 32 lung cancer. The relative risks (RR) of tobacco-related diseases calculated were 18.035 for lung cancer, 4.794 for COPD and 1.805 for stroke.

Table 9: Key input

Variables	Total	Smokers	Non-smokers	RR*
Population	5,609,997	27.96	72.04	
Stroke	1,696	41.2%	58.8%	1.805
COPD	844	65.1%	34.9%	4.794
Lung cancer	32	87.5%	12.5%	18.035

*Relative risks

Table 10: National Smoking-attributable Fraction (SAF) costs in Lao currency (Kip)

Variables	Number Of cases	Mean social lost	Total social lost	Population attributable Risk (PAR)	SAF
Stroke	1,696	63,200,000	107,305,000,000	0.183	19,721,000,000
COPD	844	9,500,000	7,783,270,000	0.514	4,139,000,000
Lung cancer	32	175,700,000	5,609,690,000	0.826	4,646,000,000
TOTAL			120,967,000,000		28,507,000,000

Taking into account the smoking rate detected in this study together with data of social lost shown previously the total national social lost cost was 120.97 billion kips (US$14.14 million) and smoking attributable fraction calculated was 28.51 billion kips (US$3.33 million). This social lost cost was 19.72 billion kips (US$2.30 million) due to stroke, 4.14 billion kips (US$483,814) due to COPD and 4.65 billion kips (US$543,415) due to lung cancer (Table 10).

Smoking-attributable fraction costs by sectors are shown in detail in Table 11. The total smoking attributable fraction costs was 28.51 billion kips (US$3.33 million), where 735.49 million kips (US$85,951) was paid by the Lao government, 2.26 billion kips (US$264,111) by the victim's family and 59.80 million kips (US$6,988) by insurance company.

Table 11: Smoking-attributable Fraction (SAF) Cost in Lao currency (Kip) by sectors

Variables	Government-	Family	Insurance	Total productivity lost	Social lost
Cerebral Thrombosis					
- Per admission	920,000	3,960,000	110,000	58,270,000	63,260,000
- Total	1,556,840,000	6,721,990,000	199,960,000	98,826,640,000	107,305,430,000
- SAF	435,130,000	1,135,400,000	36,750,000	18,162,820,000	19,721,090,000
COPD					
- Per admission	960,000	2,150,000	50,000	6,370,000	9,530,000
- Total	807,300,000	1,814,810,000	42,460,000	5,376,280,000	8,040,380,000
- SAF	415,610,000	934,180,000	21,730,000	2,767,790,000	4,139,310,000
Lung cancer					
- Per admission	128,000	3,230,000	50,000	171,140,000	175,700,000
- Total	40,480,000	103,650,000	1,600,000	5,476,480,000	5,622,280,000
- SAF	33,750,000	85,430,000	1,320,000	4,526,230,000	4,646,730,000
TOTAL SAF	**735,490,000**	**2,255,010,000**	**59,800,000**	**25,456,840,000**	**28,507,130,000**

Smoking attributable fraction was compared with Lao Gross Domestic Products (GDP) (30.61 trillion kips or US$3.58 billion) and total Lao health expenditure (1.10 trillion kips US$128.79 million) registered in 2005. As shown in Table 12, the total percentage of SAF in GDP was 0.093% and 2.587% of the total health expenditure in 2005.

Table 12: Smoking-attributable fraction (SAF) cost compared with Lao GDP and health expenditure

Variables	SAF/GDP in 2005* (%)	SAF/health expenditure in 2005** (%)
Stroke	0.064	1.790
COPD	0.013	0.376
Lung cancer	0.015	0.422
TOTAL	0.093	2.587

* Lao Gross Domestic Products (GDP) in 2005= 30.61 trillion kips
** Total Lao health expenditure in 2005 = 1.10 trillion kips

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DISCUSSIONS

The findings showed patients with tobacco-related diseases have a higher smoking rate (50%) with smoking rate at 41% for stroke, 65% for COPD and 87% for lung cancer ($p<0.0001$). Male patients dominated the sample (64%), which reflects their higher smoking prevalence compared to women: 73% of male patients were current or ex-smokers, as opposed to 9% of female patients. The sex difference in smoking rates is statistically significant. Hana Ross and colleagues reported similar findings in the Vietnam tobacco-related disease study (Ross H. *et al*, 2007).

The smoking-related costs in Laos expressed as a percentage of GDP is only 0.10% and are lower compared to estimates from higher-income countries. However, the true costs of smoking in Laos were underestimated due to several limitations of this study. First, because of the scope of this analysis, outpatient costs were excluded from the calculations. And outpatient costs may be responsible for 35–50% of the total costs of smoking, as suggested in a study from Taiwan (Yang MC et al, 2005).

Second, the smoking-related mortality costs were not included due to lack of reliable data on the cause of deaths in Laos. The majority of chronic disease patients in Laos die at home. The patients' families usually request for discharge if their patients have only a small chance of survival. As a result, our data do not capture any patients' mortality. A recent study from Hong Kong (McGhee SM et al, 2006) estimated that smoking-related mortality costs represent about 30% of the total social cost of active smoking.

Third, in this study, the mean healthcare cost for lung cancer is low compared to what has been reported in other countries (Ross H et al, 2007). Radiotherapy is not available in Laos. Chemical treatment is often difficult due to drug availability. Thus, the real mean cost for lung cancer should be much higher.

Fourth, it is well known that stroke, COPD and lung cancer are among the major chronic diseases (WHO, 2005a) caused by smoking. But long term follow up research of these diseases is needed. Multiple hospitalizations occurred and significant health care costs incurred. It is difficult to follow and detect the true health care costs of each patient from the onset of the diseases until death.

Fifth, in this study, health care cost was recorded only in one of the hospitalization episodes of each patient. In addition, the number of care givers is more than one. However, only the main care giver was interviewed to detect his or her income lost. If the income lost of all care givers was recorded, then the mean indirect cost should be much higher.

Finally, the study covers only three smoking-related diseases, thus excluding other smoking-related conditions. Also, the focus was only on the impact of active smoking,

but passive smoking can represent as much as 23% of the total costs of smoking (McGhee SM et al, 2006).

Lightwood and colleagues (Lightwood *et al*, 2000) reviewed studies that attempt to estimate the costs of tobacco use, focusing on the costs for health systems. Since the methods for these estimates are complex and subject to debate, the authors first review the various methods and their strengths and weaknesses. They showed that estimates of the gross costs of healthcare related to tobacco use – that is, all care costs in any given year that can be attributed to the extra health needs of smokers – ranged from 0.1% to 1.1% of gross domestic product (GDP) in the high-income countries. We found similar percentage of SAF compared to Lao GDP in our study. The total estimated Lao national social lost cost of these 3 diseases was 120.97 billion kips (US$14.18 million) and smoking attributable fraction accounted for 28.5**1** billion kips (US$3.34 million). SAF costs represented 0.1% of Lao GDP.

STUDY'S LIMITATIONS

It is well known that Stroke, COPD and lung cancer are among the major chronic diseases (WHO, 2005a) and long term follow up of these diseases are needed. Multiple hospitalizations and significant healthcare cost occurred. It is difficult to follow and detect the true health care costs of each patient from the beginning of the disease to the end of his/her life. In this study, healthcare cost was recorded only in one of the hospitalization of these patients. In addition, in reality the number of care givers is more than one. However, only the main care giver was interviewed to detect his or her income lost. If income lost of all care givers was recorded, then the mean indirect cost should be much higher.

Accordingly, the real mean healthcare cost should be much higher than what is reported in this study. For this reason, a case illustration to show the real burden of economical impact is incorporated as part of this report in the following section.

CONCLUSIONS

The results of this study confirmed that smoking leads to significant economic losses for society as a whole and that the households finance the majority of these costs. Government and private business sectors also finance some of these costs through either private (private insurance) or public (government) funds, depending on who pays the insurance premium.

The health care cost of the patients in this study is mainly paid by family savings (77%). Costs paid by health insurance accounted for only 2%. This is because health insurance in Laos covers only working people - government staff and employees in the private sector. Only a small percentage of the general population has insurance coverage.

Further, a significant socio-economic impact of tobacco-related diseases was detected. Anti-smoking measures are necessary to avoid tobacco-related diseases and to save lives as well as money. Previous data presented could be summarized as follows:

1. The rate of ever tobacco smoking detected is 50% among the patients.
2. Only 9% of the Lao female patients included in this study smoked. In contrast, the number of male smokers was 73%.
3. The rate of tobacco smoking was 87.5% for patients with lung cancer, 65.1% for those patients with COPD and 41.2% for the stroke patients. The data demonstrated that there is a strong relationship between tobacco smoking and lung cancer, COPD and stroke ($p<0.0001$).
4. Mean total cost of economic burden per event for the victim family were:
   - 6.15 million kips (US$720) for stroke
   - 4.08 million kips (US$478) for lung cancer
   - 2.41 million kips (US$282) for COPD
5. The total estimated national social lost of these 3 diseases was 120.97 billion kips (US$141.16 million) and smoking attributable fraction accounted for 28.51 billion kips (US$3.34 million).
6. National smoking attributable fraction costs represented 0.10 % of the Lao GDP and 2.5 % of the total Lao health expenditure.
7. About 76.6% of costs were borne by out of pocket money of the victim's family. Public hospital or government contributed 21.3% to the cost and 2.1% by health insurance.
8. The stroke case study included in this study, in which healthcare costs of both acute and rehabilitation phases demonstrated that there is a significant socio-economic impact on the victim's family, accounted for US$7,500 and healthcare cost payment is mainly paid from out of pocket money.
9. More than half of the care givers were females (66%) and care was provided mainly by the victims' children (54%) and their respective spouses (37 %).

RECOMMENDATIONS

Based on the data shown previously, the following recommendations are made to assist health care policy and decision-makers in rethinking and giving priority to tobacco control that will help to curb tobacco hazards among the Lao population:

1. Strong policy to control tobacco use is urgently needed.
2. Public awareness on health and economic impact from tobacco use is needed.
3. Health professionals should play active role in helping smokers to quit smoking and prevent youth from smoking at earlier age.
4. Early detection of smoking status among hospital patients should be in place and health education should be provided to encourage smoking cessation.
5. Tobacco tax should be increased to a level not affordable.
6. Some percentage of tobacco tax should be used for tobacco control.

REFERENCES

Adams R.D., Victor M, Ropper A.H. Approach to the Patients with Neurologic Diseases. In: Adams RD, Victor M, Ropper AH (eds): *Principles of Neurology*, 6th edition, McGraw-Hill Inc, New York, 1997; p 38.

ASEAN Secretariat. "ASEAN Free Trade Area (AFTA): An Update," Mimeo., November, 1999.

Bamford J.M., Sandercock PAG, Warlow C.P., Slattery J. Inter-observer Agreement for the Assessment of Handicap in Stroke Patients. *Stroke* 1989; 20(6): 828

Barnett H.J.M., Mohr J.P., Stein B.M., Yatsu F.M. (eds). *Stroke, Pathophysiology, Diagnosis and Management, 2nd ed*., Churchill Levingston, NewYork, 1992.

Bobak *et al*. Poverty and smoking. In: Jha P, Chaloupka FJ, eds. *Tobacco Control in Developing Countries*, Section I, Chapter 3. Oxford: Oxford University Press, 2000.

Boyle P. Message from the Director of the International Agency for Research on Cancer. in: The Cancer Atlas, American Cancer Society, Georgia, 2006; P 10

Chollatarn Vitsarutwongse (2008). "A Comparative Study of Cigarette Excise Tax," A Research Report Submitted to Tobacco Research Centre (in Thai).

Corona J.D. Cerebrovascular disorder. In: Kelly W.N. *Textbook of Internal Medicine*. Lippincott, Philadelphia, 1989; pp 2386-2394.

Cote R, Hachinski V.C., Shurvell B.L., Norris J.W., Wolfson C. The Canadian Neurological Scale: A preliminary study in acute stroke. *Stroke* 1986; 17(4): 731-737.

Davis K. Effective Measures to Control Tobacco Abuse. III Internal Medicine Symposium. Done Chanh Palace Hotel, Vientiane, Lao PDR, 16- to17th March 2006

Esson K.M., Leeder S.R. The Millennium Development Goals and Tobacco Control: An Opportunity for Global Partnership. Geneva: World Health Organization, 2004.

Fiore M.C., Bailey W.C., Cohen S.J., *et al*. *Treating Tobacco Use and Dependence. A Clinical Practice Guideline*. Rockville, MD: U.S. Department of Health and Human Services. Public Health Service; 2000.

Gajalakshmi *et al*. Global Pattern of Smoking and Smoking Attributable Mortality. In: Jha P, Chaloupka F.J, eds. *Tobacco Control in Developing Countries*, Section I, Chapter 2. Oxford: Oxford University Press, 2000.

Gerberding J.L. A message from Julie Louis Gerberding, MD, MPH, Director of the Centers for Disease Control and Prevention. In. Mackay J, Jemal A, Lee NC, Parkin DM (Editors): The Cancer Atlas. American Cancer Society, Atlanta, USA. 2006.

Health Status of the People in Lao PDR 2006. http://www.cdc.gov/global/GYTS/factsheets/2003/Laos_PDR_vientiane.

Jin S.G., Lu B.Y., Yan D.Y., *et al*. An Evaluation on Smoking-induced Health Costs in China (1988–1989). *Biomed Environ Sci* 1995; 8:342–9.

Khamtan A, Thepsouvanh K, Vang C. Causes of cardiovascular mortality in the Mahosot hospital. 15th ASEAN Congress of Cardiology, October 23-27, 2004, *Programme & Abstract Book* Pattaya, Thailand

Leeder S, Raymond S, Greenberg H, *et al*. *A Race Against Time: the Challenge of Cardiovascular Disease in Developing Economies.* New York: Columbia University, 2004.

Lightwood J, Collins D, Lapsley H, *et al*. Estimating the costs of tobacco use. In: Jha P, Chaloupka FJ, eds. Tobacco control in developing countries, Section I, Chapter 4. Oxford: Oxford University Press, 2000.

Liu B.Q., Peto R, Chen Z.M., et al. Emerging tobacco hazards in China: 1. Retrospective proportional mortality study of one million deaths. BMJ 1998; 317:1411–22.

Lopez A.D. Assessing the burden of mortality from cardiovascular disease. *World Health Stat Q*. 1993; 46:91–96.

Mahoney F.I, Barthel D.W. Functional Evaluation, the Barthel Index. *Maryland State Medical Journal* 1965; 14: 61-65.

Ministry of Social and welfare of Lao PDR, Master plan to 2020, Vientiane 2007.

Murray C.J.L., Lopez A.D. *Global Comparative Assessments in the Health Sector*. Geneva, Switzerland: World Health Organization; 1994.

National Statistics Centre. Lao Statistics 1975-2000. Vientiane National Statistics Centre. 2000

National Statistics Center. Annual Statistics 2003.

Parrot S, Godfrey C, Raw M, *et al*. Guidance for commissioners on the cost effectiveness of smoking cessation interventions. *Thorax.* 1998; 53 (Suppl 5):1-38.

Peto R, Lopez AD, Boreham J, Thun M, Heath C. *Mortality from Tobacco in Developed Countries 1950-2000: Indirect Estimates from National Vital Statistics*. Oxford: Oxford University Press; 1994.

Peto R. Smoking and Death: The Past 40 Years and the Next 40. *BMJ*. 1994; 309:937-939.

Phommachanh B, Vang C. The Burden of Chronic Diseases Detected in Mittaphab, Mahosot and Sethathirath Hospitals. Thesis for the degree of Doctor of Medicine. Faculty of Medical Sciences, National University of Laos, 2007

Research for International Tobacco Control (RITC). Bridging the Research Gaps in Global Tobacco Control. Report on the meeting in Ottawa, Canada: RITC, November 4–6, 2002.

Ritthiphakdee B. SEATCA Country Workshop on Health Care Cost from Tobacco in Lao PDR: Research Protocol Development.15 May 2006, Vientiane, Laos.

Ross H, Vu D, Vu T, Phu X. The Costs of Smoking in Vietnam: the Case of Inpatient Care. *Tobacco Control* 2007; 000:1–5.

SBU—The Swedish Council on Technology Assessment in Health Care. *Metoder f¨or r¨okavv¨anjning. [Methods for smoking cessation]*. Rapport nr 138, Stockholm: Swedish Council on Technology Assessment in Health Care; 1998.

Sarntisart I. *et al*. Tax Policies for Tobacco Industry in Lao PDR. 2008, Southeast Asia Tobacco Control Alliance Country Research Report, Bangkok, Thailand.

Seffrin J.R. A message from John R Seffrin, PhD., Chief executive of the American Cancer Society. In. Mackay J, Jemal A, Lee NC, Parkin DM (Editors): The Cancer Atlas. American Cancer Society, Atlanta, USA. 2006.

Single E, Collins D, Easton B, Harwood H, Lapsley H, Kopp P, Wilson E. World Health Organization's International guidelines for estimating the costs of substance abuse. 2nd Ed, Alberta, Canada, 2003

Somebandith X, Vang C, Phengsavane A. Risk Factors of Stroke Detected in the Mahosot Hospital. Thesis for the degree of Doctor of Medicine. Faculty of Medical Sciences, National University of Laos, 2005

Southammavong T: Tobacco Free in Mahosot Hospital. Workshop on Healthcare Cost from Tobacco in Lao PDR: Research Protocol Development.15th May 2006, Vientiane, Laos. 2006

Southeast Asia Tobacco Control Alliance. *Tobacco Tax in ASEAN Countries Report Card*, April 2008, Bangkok, Thailand.

Stead L.H., Lancaster T, Perera R. Telephone counselling for smoking cessation. (Cochrane Review) In: The Cochrane Library, Volume 1. Oxford: Update Software; 2003.

Sung H.Y., Wang L, Jin S, *et al*. Economic Burden of Smoking in China, 2000 (authors' estimate based on this article and GDP estimate from the National Statistics Bureau of China). *Tob Control*, 2006; 15(Suppl 1), i5–11.

Syhakhang L. The Quality of Private Pharmacy Services in a Province of Lao PDR: Perceptions, Practices and Regulatory Enforcements. Thesis for the degree of Doctor of Philosophy. IHCAR, Karolinska Institute, Stockholm, Sweden, 2002

Tengs T.O., Adams M.E., Pliskin J.S., *et al*. Five-hundred Life-saving Interventions and their Cost-effectiveness. *Risk Anal.* 1995;15:369-390.

Tomson G , Boupha K, Gilljam H, Helgason AR. *Southeast Asian J Trop Med Public Health*. 2003 Mar; 34(1):213-9)

Vang C, Tomson G, Kounnavong S, Southammavong T, Phanyanouvong A, Johansson R, Eriksson B, Wahlstrom R. Improving the Performance of Drug and Therapeutics Committees in Hospitals - a Quasi-experimental Study in Laos. *Eur J Clin Pharmacol.* 2005 Dec 22; 1-7

Warner K.E. Cost Effectiveness of Smoking Cessation Therapies. Interpretation of the Evidence and Implications for Coverage. *Pharmacoeconomics* 1997; 11:538-549.

Whelton P.K., Brancati F.L., Appel L.J., Klag M.J. The Challenge of Hypertension and Atherosclerotic Cardiovascular Disease in Economically Developing Countries. *High Blood Press*. 1995; 4:36–45.

World Bank (WB13429). M:\PH Fact Sheets\Latest Versions\tobacco at a glance.doc. March 16, 2001.

World Bank. *Curbing the Epidemic: Governments and the Economics of Tobacco Control*. Washington, DC: The World Bank; 1999; 8:196-201.

WHO InfoBase Brief. http://www.who.int/ncd_surveillance/infobase/en/

WHO The SuRF Report 1. Surveillance of Risk Factors Related to Noncommunicable Diseases: Current Status of Global Data. Geneva, Switzerland, 2003

WHO. The World Health Report 2003 - Shaping the Future. Geneva, Switzerland: World Health Organization, 2003.

World Health Organization. Building Blocks for Tobacco Control. New York: WHO, 2005b.

World Health Organization: International Classification of Impairments, Disabilities and Handicaps. Geneva, WHO, 1980.

World Health Organization National Health account series, Geneva 2007

World Heath Organization, Preventing Chronic Diseases - A Vital Investment, http://www.who.int/chp/chronic_disease_report/en/, 2005a

World Health Organization, WHO Health Report, 2000

World Health Organization, WHO STEPS Stroke Manual: the WHO STEPwise Approach to Stroke Surveillance, 2006

World Heart Federation: 4th World Congress on Cardiology, 26-30 Sydney 2002

Zhu S.H., Anderson C.M., Tedeschi G.J., *et al*. Evidence of Real World Effectiveness of a Telephone Quit Line for Smokers. *N Engl J Med.* 2002; 347:1087-1093.

APPENDICES

Appendix A
Questionnaire Form

TITLE OF STUDY: TOBACCO-RELATED SOCIO-ECONOMIC COST OF STROKE, LUNG CANCER AND COPD IN LAOS

Interviewer's name_____
Date of interview: _____ (dd/mm/yyyy)
Date of admission _____ (dd/mm/yyyy)
Hospital admitted _____
1. Mahosot hospital
2. Mittapab hospital
3. Sethathirath hospital

Medical record number: _____

I Patient information

1.1 Patient's name_____
1.2 Age _____ (in years old)
1.3 Sex_____ (M/F)
1.4 Ethnic group_____ (1. Lao Sung 2. Lao Kang 3. Lao Lum)
1.5 Number of children (<15 years old) living in the same house _____
1.6 Education level of the patient: _____
0. Illiteracy
1. Primary school
2. Junior high school
3. Senior high school
4. Bachelor degree
5. Master degree
6. PhD or higher
1.7 Occupation of the patient _____
0. Unemployed or no job (housewife, elderly people, pensioner)
1. Student
2. Monk
3. Employee
4. Farmers
5. Business Staff
6. Government staff
1.8 Health insurance _____ (Y/N)

II Tobacco Smoking Data of the Patient

2.1 Do you currently smoke? _____ (Y/N), if NO go to question 2.3.

2.2 If yes, how old were you when you started to smoke? _____ (Go to question 2.5).
2.3 Have you ever smoked? _____ (Y/N), if no go to Section III.
2.4 How long ago have you stopped smoking? _____
1. smoking cessation time <5 years
2. smoking cessation time 5-10 years
3. smoking cessation time >10 years
2.5 How many cigarettes do you use per day? _____
2.6 If you currently smoke or ever smoke, what type of tobacco you use? _____
1. Manufactured cigarette
2. Self wrap tobacco
3. Wooden pipe
4. Bamboo pipe
2.7 Are there any other people who smoke in your home? _____(Y/N), if NO go to Section III.
2.8 If yes, how many? _____

III Care Provider Information

3.1 Age _____ (in years old)
3.2 Sex_____ (M/F)
3.3 Relationship to the patient: _____
1. Spouse 2. Children 3. Relatives
3.4 Do you live in the same house as the patient? _____ (Y/N)
3.5. Does he/she smoke? _____ (Y/N)
3.6 Number of children living in the same house _____
3.7 Education level of the care provider: _____
0. Illiterate
1. Primary school
2. Junior high school
3. Senior high school
4. Bachelor degree
5. Master's degree
6. PhD or higher
3.8 Occupation of the care provider _____
0. Unemployed (housewife, elder people, pensioner)
1. Student
2. Monk
3. Employee
4. Farmers
5. Business Staff
6. Government staff
3.9 Do you currently smoke? _____ (Y/N) if NO, go to question 3.11.
3.10 If yes, how old were you when you started to smoke? _____ (Go to question 3.13.

3.11 Have you ever smoked? _____ (Y/N) if no, go to question 3.15.
3.12 How long ago have you stopped smoking? _____
1. smoking cessation time <5 years
2. smoking cessation time 5-10 years
3. smoking cessation time >10 years
3.13 How many cigarettes do you use per day? _____
3.14 If you currently smoke or ever smoke, what type of tobacco you use? _____
1. Manufactured cigarette
2. Self wrap tobacco
3. Wooden pipe
4. Bamboo pipe
3.15 Are there any other people who smoke in your home? _____(Y/N), if NO, go to Section IV.
3.16 If yes, how many? _____

IV Diagnosis of the current tobacco-related illness

Discharged diagnosis: _____
1. Lung cancer (Bronchial or pulmonary carcinoma)
2. COPD (Chronic obstructive pulmonary diseases)
    2.1 Chronic bronchitis
    2.2 Pulmonary emphysema
3. Stroke (cerebral thrombosis)

V Tobacco-related diseases management costs

5.1 **<u>Direct Cost in Lao kip</u>**:

A Previous Cost in other Healthcare Centers before Admission to this Hospital
Was the patient admitted to any other hospital apart from the current admission to this hospital? _____ (If no, go to question B).
0. No 1. Yes, in Lao hospital 2. Yes, in overseas hospital
If yes, how much did it cost you? _____

B <u>Investigations performed in this hospital</u>
1. Blood tests ____ (Y/N) if yes, total costs _____
2. Urine analysis ____ (Y/N) if yes, total costs_____
3. CT scanning____ (Y/N) if yes, total costs _____
4. Chest X ray____ (Y/N) if yes, total costs _____
5. ECG ____ (Y/N) if yes, total costs _____
6. Echocardiography____ (Y/N) if yes, total costs _____
7. Abdominal echodiography ____ (Y/N) if yes, total costs_____
8. Spyrometry____ (Y/N) if yes, total costs_____

9. Others_____

Total investigations cost (1+2+3+4+5+7+8+9) _____

C Medicine and Equipment Cost (a & b)

Medicine used	Cost
_____	_____
_____	_____
_____	_____

a. Total medicine cost _____

Equipment device used	Cost
_____	_____
_____	_____
_____	_____

b. Total equipment cost _____

Total medicine and equipment costs (a+b) _____

D Total room cost _____

E Total cost for doctors and nurse _____*?*

TOTAL DIRECT COST (A+B+C+D+E) _____

5.2 **Indirect Cost in Lao kip**

A Total costs for care provider traveling to hospital and back home

- Average cost per trip (a) _____
- Number of trips per day (b) _____
- Length of stay (c) _____
- Total cost calculated (a x b x c) _____

B Total transportation cost to take the patient to hospital

- Cost for the patient and relatives to come to hospital (a) _____
- Cost for the patient and relatives to go back home (b) _____
- Total transportation cost calculated (a+b) _____

C Food costs

- Estimated total food cost per day (a) _____
- Length of stay (b) _____
- Total food cost during hospital stay for care providers and patient calculated (a x b) _____

D Income loss for care provider

- Income per day (a) _____
- Length of stay (b) _____
- Estimated total income lost during hospitalization (a x b)

_____

E Income loss for the patient

- Income per day (a) _____
- Length of stay (b) _____
- Estimated total income lost during hospitalization (a x b)

_____

TOTAL INDIRECT COST (A+B+C+D+E) _____

_____

5.3 **TOTAL HEALTHCARE COST** (total direct cost + total indirect cost)

_____

VI Healthcare cost payers

Healthcare costs paid by _____

1. Hospital/Government (100%)
2. Insurance company (100%)
3. Self pocket/private (100%)
4. Self pocket/private + Insurance
   If so, how much paid by self pocket _____
   And how much paid by insurance _____
5. Self pocket/private + Government/hospital
   If so, how much paid by self pocket _____
   And how much paid by government/hospital

_____

VI Length of hospital stays _____

VII Discharge status _____

1. Death (intrahospital)
2. Home with critical condition (death at home)
3 Home alive
4 Referred

Appendix B
Interview Request Letter

We are conducting a study concerning tobacco-related diseases costs entitled “Tobacco-related socio-economic costs of stroke, lung cancer and COPD in Laos”. Your support as a patient or care provider for the interview will help to collect data for the study.

If you consent to participate in this study we will ask you several questions on your habits and about your family as well as how much money you have spent on the management of your illness during this hospitalization. Denying us your participation in this project will not affect your disease management.

All the information provided will be confidential and will be used only for research purposes.

Assoc. Prof. Dr. Vang Chu, MD., Ph.D.
Principal Investigator of the research project

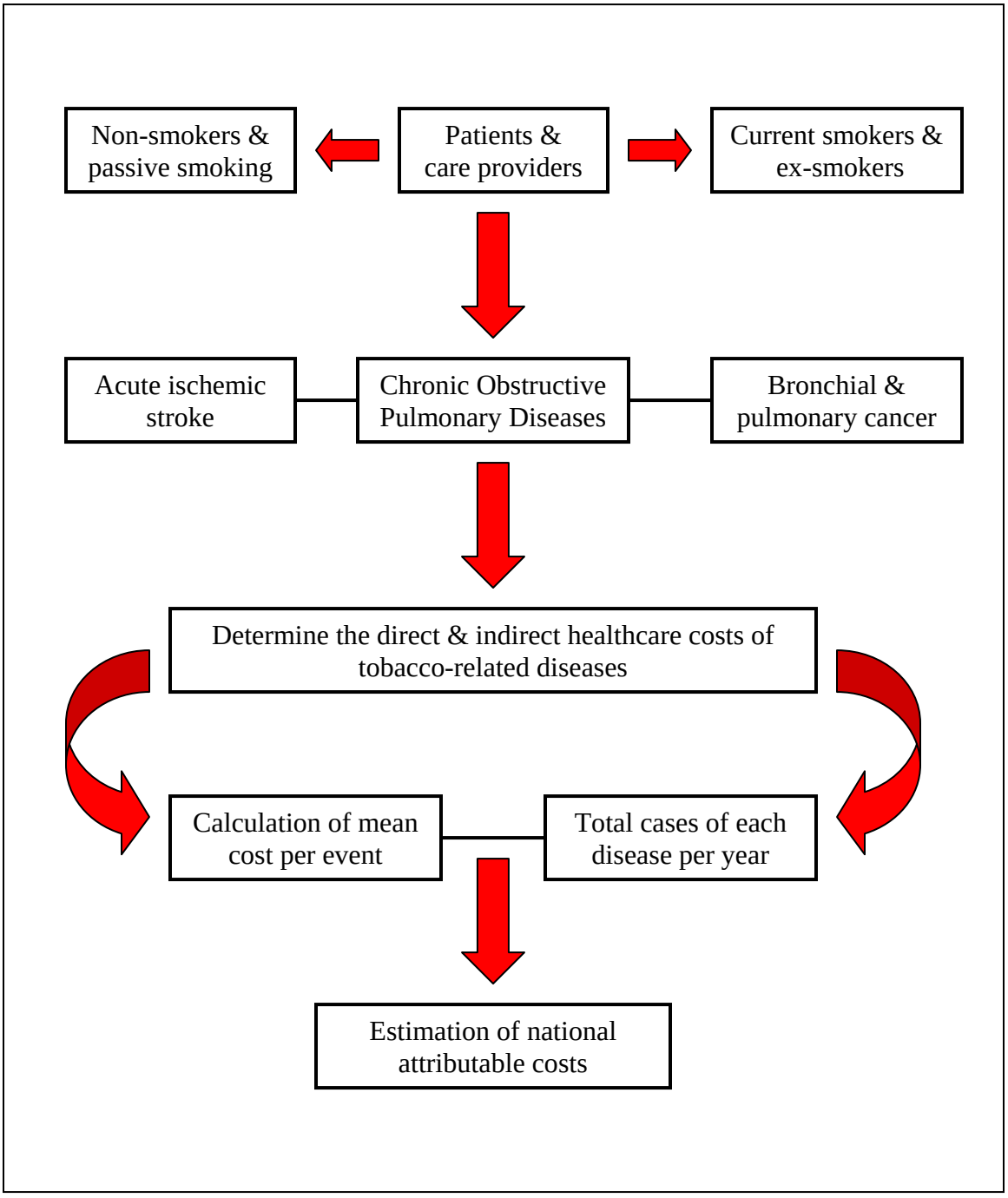
Appendix C
Consent Form

I, _____ have read the interview request letter concerning tobacco-related diseases cost project entitled “Tobacco-related socio-economic costs of stroke, lung cancer and COPD in Laos” and as explained by _____. I fully understand all aspects of my involvement if I give my consent to participate in the study.

I hereby sign this consent form and will provide all the information necessary for this project.

Date _____
Care provider/patient name_____
Signature_____

Appendix D
Data Collection and Analysis Processes



Appendix E
Hospital Running Costs Data

Expenditure	Source	unit	Setthathirath hospital	Friendship hospital	Mahosot hospital
Grand Total		**kip**	**22,662,501,926**	**12,409,241,196**	**42,427,017,103**
Total Expenditure	Government	Kip	12,147,277,745	7,446,712,808	11,045,311,309
		%	53.60	60.01	26.03
	Community	Kip	10,515,224,181	4,962,528,388	31,381,705,794
		%	46.40	39.99	73.97
Total Capital Expenditure		**kip**	**9,008,805,057**	**4,357,298,484**	**4,794,944,889**
Capital Expenditure	Government	Kip	9,008,805,057	4,357,298,484	4,794,944,889
		%	100	100	100
	Community	Kip	0	0	0
		%	0	0	0
Total Recurrent Expenditure		**kip**	**13,653,696,869**	**8,051,942,712**	**37,632,072,214**
Recurrent Expenditure	Government	Kip	3,138,472,688	3,089,414,324	6,250,366,420
		%	22.99	38	17
	Community	Kip	10,515,224,181	4,962,528,388	31,381,705,794
		%	77.01	62	83
Staff Expenditure	Government	Kip	2,235,366,543	2,747,500,324	5,086,733,786
		%	76.55	81	71
	Community	Kip	684,642,439	629,000,201	2,077,291,565
		%	23.45	19	29
Admin. Expenditure	Government	Kip	903,106,145	341,914,000	1,163,632,634
		%	25.80	42	18
	Community	Kip	2,597,214,417	469,473,049	5,468,495,991
		%	74.20	58	82
Drug Expenditure	Government	Kip	0	-	0
		%	0	-	0
	Community	Kip	7,233,367,325	3,864,055,138	23,835,918,238
		%	100	100	100
				Capital: 2200000000	Capital: 1448645999

Source: Hospital service costing 2006-2007, WHO SSO MOH

Appendix F
Smoking Attributable Fraction (SAF) Cost Calculation

	Admissions	% of patients smokers in this study	% of patients non-smokers	Total Lao population in 2005	Overall % of smokers in Laos	% of population non-smokers
	1491523	50.10%	49.90%	5609997	27.96%	72.04%
	Patient smoker	Popn not ill	Popn non-smokers			
	747253	821313	1568566			
	Patient not smoker	Popn not ill	Popn non-smokers			
	744270	3297161	4041431		**RR**	
			Total population 5609997		2.586841	

COPD					
Smokers	549		1568566		
Non-smokers	295		4041431		**RR**
Total	844		5609997		4.794936
Lung cancer					
Smokers	28		1568566		**RR**
Non-smokers	4		4041431		18.0356
Total	32		5609997		
Stroke					
Smokers	699		1568566		**RR**
Non-smokers	997		4041431		1.805313
Total	1,696		5609997		
SAF	SAF=Total social lost/RR * (RR-1)				
	COST UNIT IN MILLION KIPS				
COPD	6160.043014				
Lung cancer	5298.655683				
Stroke	47643.38346				
Total	59102.08215				
PAR	PAR = % popnsmokers*(RR-1)/(1+% Pop smoke*(RR-1))				
COPD	0.51481542				
Lung cancer	0.826484836				
Stroke	0.183784671				
SAF by PAR	SAF= PAR *N*Average social lost				
COPD	4,006				
Lung cancer	4,636				
Stroke	19,628				
	28,270				

Appendix G
Case Illustration of Socio-Economic Impact of Stroke on the Victim's Family

In this study, health care cost was recorded only in one of the hospitalization of the patients. In reality the number of care givers is more than one. However, only the main care giver was interviewed to detect his or her income lost. If income lost of all care givers was recorded, then the mean indirect cost should be much higher. Accordingly, a case illustration of stroke is shown in this section including the burden of economic lost during the acute and rehabilitation phases.

Personal information

- Name: Mr. HP
- Age= 68
- Sex: Male
- Ethnic group: Lao Lum
- Address: Sayaboury Province, Lao PDR
- General Education: Graduate, junior high school
- Professional level education & profession:
  - He studied agriculture
  - He was a teacher in Sayaboury Agriculture School
  - Later he became a businessman in construction and wood trading

History and symptoms of current illness

- Headache, vomiting
- Progressive onset of left side hemiplegia
- Consciousness: drowsy
- BP= 220/120
- Pulse=80
- Other system= normal

Past medical history

- Personal medical conditions:
  - HTN irregularly treated with renitec etc…
  - Epistaxis due to HTN
- Allergy: none
- Social life:
  - Heavy drinker
  - Heavy smoker (around 20 cigarettes per day)

Physical examination on admission

- Motor deficit:
  - Total left side hemiplegia (Power=0/5)
- Level of Consciousness:
  - Drowsy for 1 day
- Reflex: decreased in the affected side

- Cardiovascular System:
  - BP=220/120 mmHg; Pulse=80 beats per minutes
  - No other abnormality detected
- Others: Normal

Neurological assessment on admission
- Severe neurological impairment (MCNS= 1.5)
- Poor ADL (Barthel Index= 0)
- Dependent (Degree of Handicap = 5)

Laboratory test
- Blood tests
  - TC= 5, HDL-c=1.2, LDL-c=3.7, TG=0.7 , Glu=100, Crea= 110,
- Urine Analysis= normal
- ECG: LVH
- CT scan: Large right side Ischemic stroke with cerebral edema and mass effect (right ventricle nearly disappeared)

Problem list and Diagnosis
- Hypertension + heavy smoker
- Complications occurred
  - LVH
  - Severe epistaxis
  - Ischemic stroke (cerebral thrombosis)
  - Cerebral edema with mass effect

Management plan used
- Resuscitation in ICU for 2 days
  - Oxygen
  - Mantitol for 3 days
  - Cerebrolysine (5 Ampoules per day) for 20 days
  - Others required medicine (RL, etc….)
- Physiotherapy for 3 months in rehabilitation centre
- Acupuncture etc…

Hospitalization
- Acute phase:
  - 1 month in Mahosot hospital due to acute ischemic stroke (2 days in ICU)
- Rehabilitation phase
  - 3 months in the Lao National rehabilitation Institute
  - 2 months at home

Care givers during the acute phase of stroke
- In reality, there are many care givers in each admitted patient
- Mr. HP’s constant care givers include
  - His wife (a shop owner)

  - His 2 daughters (NGO staff)
  - His son-in-law (NGO staff)
  - His 2 sons (students), one of them had to leave his thesis writing to look after his dad
  - His 2 sisters (one is a doctor)
  - His brother-in-law (a doctor)
  - His friends:
    - a shop owner
    - unemployed friend

Care givers during the rehabilitation phase of stroke

- Part time care givers
  - His 2 daughters (NGO staff)
  - His son-in-law (NGO staff)
  - His friends:
    - a shop owner
    - unemployed friend
  - His 2 sons (students), one of them had to leave his thesis writing to look after his dad
  - 2 sisters (one is a doctor)
  - His brother-in-law (a doctor)
- Constant care givers include
  - His wife (shop owner)

Follow up treatment after discharge

- Private physiotherapy (for 2 months)
- Private acupuncture (for 3 weeks)
- Medical check up every 3 months
- Regular medicine intake for hypertension and stroke prevention

Patient current status

- Suffering from mild neurological impairment (MCNS= 10)
- Good ADL (Barthel Index= 15)
- Independent (Degree of Handicap = 1)
- BUT he lost his job! The patient is handicapped and he can no longer work for the Lao government or manage his own business

Economic impact on the victim and his family

- Enormous economic lost for his relatives and for the family
- Total amount of money spent during the acute and rehabilitation phase
  - *Around 64.18 million kips during this period (US$7,500)*
  - *All income from his wood trading spent on his stroke hospitalization and rehabilitation management*

Health care cost payer

- Out of pocket money from the victim's family
- Foreign aid from NGO (of son-in-law and daughters' NGO offices)

Case illustration conclusion

This case confirms that there is a significant socio-economic impact from tobacco-related diseases in Laos, not only on the victims but also on the family of the victims and healthcare cost payment is mainly from family savings in Laos.

Appendix H
The Modified Canadian Neurological Scale Report Form

MENTION

1. Level of consciousness: _____
   Alert = 3.0. Drowsy = 1.5 (If less than drowsy refer to G C S)
   Alert: Normal consciousness
   Drowsy: Patient when stimulated remains awake and alert for a short period of time but tends to doze even when examined
2. Orientation: _____
   Oriented = 1.0. Disoriented or non-applicable = 0.0
   Oriented: Patients is oriented in both place (i.e. city of hospital) and time (i.e. patient must give at least correct month and year). Speech can be dysarthric but intelligible
   Disoriented or non applicable*:* If for any reason patient can not answer the preceding question on orientation (i.e. does not know answer, gives wrong answer, answer only partially, can not express himself either by lack of words or unintelligible speech or finally ignores question.)
3. Speech: _____
   Normal = 1.0. Expressive defect = 0.5. Receptive defect = 0.0
   Receptive language test*:* Patient is asked:
   (I) Close your eyes.
   (ii) Does a stone sink in water?
   (iii) Point to the ceiling.
   Expressive language test: Objects needed: pencil, key, watch
   Patient is asked:
   (i) To name each object. If the patient named correctly the 3 objects then will proceed to the following questions.
   (ii) What do you do with a pencil?
   (iii) What do you do with a key?
   (iv) What do you do with a watch?

Interpretation:

Normal speech*:* Patient answers all commands and questions in speech section (patient can have dysarthria but still intelligible)

Expressive defect*:* Patients obeys commands in receptive language section but makes one or more errors in section on expressive language and/ or mispronunciation of words (slurred speech), with speech totally or partially non intelligible (severe dysarthria).

Receptive defect*:* Patient obeys only two or less commands in section on receptive language.

SECTION A1

MOTOR FUNCTIONS: WEAKNESS (No comprehension deficit)

1. Face: _____
   None = 0.5. *Present = 0.0*
   Test: Patient is asked to show teeth or gums.
   Grading of Deficit
   No weakness: Symmetrical grin, no asymmetry in smile
   Weakness: Facial asymmetry. One corner of mouth is lower than the other, either at rest or while showing teeth.
2. Arm proximal: _____
   None = 1.5 *Mild = 1.0.* *Significant = 0.5.* *Total = 0.0*
   Test: patients are asked to
   (i) do abduction arms to 90 degrees (if can stay in sitting position).
   (ii) elevate arms to approximately 45 to 90 degrees.
   Strength in both arms is tested simultaneously. Resistance applied at midpoint between shoulder and elbow at all times.
3. Arm distal: _____
   None = 1.5 *Mild = 1.0.* *Significant = 0.5.* *Total = 0.0*
   Test: Patient is asked to make fists and extend wrists.
   Compare range of movements in both wrists simultaneously. If full range of extension in both wrists, strength is tested by applying resistance separately to both fits while stabilizing patient's arm firmly.
4. Leg proximal: _____
   None = 1.5 *Mild = 1.0* *Significant = 0.5.* *Total = 0.0*
   Test: Hip flexion. Patient is asked to flex thighs towards trunk and knees flexed at 90 degrees. Movement of both thighs tested separately. Resistance is alternately applied to each thigh after the full movement has completed to test strength.
5. Leg distal: _____
   None = 1.5 *Mild = 1.0* *Significant = 0.5.* *Total = 0.0*
   Test: Dorsiflexion foot. Patient is asked to point toes and foot upwards. Compare feet simultaneously (i.e. complete or partial movement). Apply resistance alternately to each foot after the full movement has been completed to test strength.

Gradation of Motor Deficit

No weakness No detectable weakness.
Mild weakness Normal range in motion against gravity, but succumbs to resistance by observer either partially or totally.
Significant weakness Cannot completely overcome gravity in range of motion (i.e. partial movement)

SECTION A2

MOTOR RESPONSE (With Comprehension Deficit)

This section is to be used for patients with comprehension problems (i.e. receptive defect in Speech Scale)

1. Face: _____ *Symmetric = 0.5* *Asymmetric = 0.0*
   Test: Comparison of motor response in facial power to noxious stimuli to see whether the facial grimace is symmetrical or asymmetrical.
2. Arm: _____
   Equal = 1.5 *Unequal = 0.0*
   Test: The observer will alternately place the upper limbs in the desired position i.e. arms are placed outstretched at 90 degrees in front of the patient. If there is no cooperation from the patient then, comparison for motor response to noxious stimuli is proceeded.
   Equal motor response: Patient can maintain the fixed posture equally in both upper limbs for a few seconds or withdraws equally on both sides in pain.
   Unequal motor response: Patient can not maintain the fixed posture, weakness is noted on one side or there is an unequal withdrawal to pain.
3. Leg: _____
   Equal = 1.5 *Unequal = 0.0*
   Test: The observer will alternately place the lower limbs in the desired position i.e. the thighs are flexed with knees at 90 degrees. If there is no cooperation from the patient then, comparison for motor response to noxious stimuli is proceeded.
   Equal motor response: Patient can maintain the fixed posture equally in both lower limbs for a few seconds or withdraws equally on both sides in pain.
   Unequal motor response: Patient can not maintain the fixed posture, weakness is noted on one side or there is an unequal withdrawal to pain.

Total score: _____

* Maximum score on the MCNS is 11.5.
* Section A1 refers to the side affected by paresis.

Appendix I
The Barthel Activity of Daily Living Index Report Form

What the patient actually does?

1. FEEDING: _____
   - 0 Need to be fed (Unable to feed self. No sitting balance)
   - 1 Need help (Needs help cutting, spreading butter etc. Able to eat normal food. Food cooked and served by others, but not cut up. Patient feeds self.)
   - 2 Independent (food provided in reach)
2. BATHING: _____
   - 0 Need help
   - 1 Able to wash all over (Able to get in and out unsupervised and wash self.)
3. GROOMING: _____
   - 0 Dependent in some way (Needs help with personal care)
   - 1 Totally independent (Able to do personal hygiene: doing teeth, hair, shaving, washing face. Implements can be provided by helper.)
4. DRESSING: _____
   - 0 Dependent (Unable to do any without help)
   - 1 Need help with some items (need help but can do about half unaided)
   - 2 Independent (Can dress independently including buttons, zips laces etc.)
5. BOWELS: _____
   - 0 Incontinent (or need to be given enema)
   - 1 Occasional accident/help with enema (once/week)
   - 2 No accident
6. BLADDER: _____
   - 0 Incontinent (incontinent or catheterized and unable to manage)
   - 1 Occasional accident (maximum once per 24 hours)
   - 2 No accident
7. TOILET: _____
   - 0 Dependent (Unable to use)
   - 1 Minor assistance (need some help but can do something alone)
   - 2 Independent (able to reach toilet/commode, get on and off, dressing, and wiping)
8. TRANSFER: _____
   - 0 Unable (no sitting balance)
   - 1 Major help (Can sit, major help by one skilled or two normal people for transfer)
   - 2 Minor help (Need minimum verbal or physical help)
   - 3 Totally independent
9. AMBULATION: _____
   - 0 Immobile
   - 1 Independent in wheelchair for 50 m
   - 2 Walk 50 m with help of one person (physical or verbal)
   - 3 Independent for 50 meters (may use any help, e.g. stick)

10. STAIRS: _____
    0 Unable = 0
    1 Need physical/verbal support
    2 Independent

Total score: _____

Appendix J
The Ranking Scale Report Form

0 No symptoms.
1 Minor symptom which do not interfere with the lifestyle of the patient.
2 Minor handicap, symptoms that lead to some restriction on lifestyle, but do not interfere with the patient's capacity to look after themselves.
3 Moderate handicap, symptoms which significantly restrict lifestyle and/or prevent totally independent existence.
4 Moderately severe handicap, symptoms which clearly prevent independent existence though not needing constant attention.
5 Severe handicap, totally dependent existence, requiring constant attention day and night.
6 Death

Score: day 1 _____ day 14 _____ 3 months _____

Appendix K
Data Used for Figures

Figure 3: Association of tobacco smoking on stroke, COPD and lung cancer (n= 429)

Tobacco-related diseases	Smokers	Smoking rate (%)
Stroke	117 of 284	41.2
COPD	84 of 129	65.1
Lung cancer	14 of 16	87.5

Figure 4: Mean total direct costs for per event in Lao currency (n=429)

	Mean	SD
Mean total direct cost	170,0439	328,0563
Investigation	572,302	454,451
Medicine	497,611	754,088
Room	167,467	223,723
Device	144,418	302,090

Figure 5: Mean total direct costs per event for stroke, COPD and lung cancer in Lao currency (n=429)

	Mean	SD
TOTAL DIRECT COST	1,700,439	3,280,563
Stroke	2,105,393	3,899,561
COPD	898,394	1,080,119
Lung cancer	1,004,300	1,174,249

Figure 6: Mean total indirect costs per event in Lao currency (n=429)

	Mean	SD
Mean total indirect cost	1,784,194	2,679,289
Travel of care provider	367,550	721,419
Food	371,285	528,324
Transportation of patient	353,681	776,784
Care provider income lost	535,469	1,254,725
Patient income lost	331,648	1,241,035

Figure 7: Mean total indirect costs per event for stroke, COPD and lung cancer in Lao currency (n=429)

	Mean	SD
TOTAL INDIRECT COST	1,784,194	2,679,289
Stroke	1,975,952	2,937,721
COPD	1,302,166	1,760,274
Lung cancer	2,291,281	3,576,871

Figure 8: Mean total health care costs per event for stroke, COPD and lung cancer in Lao currency (n=429)

	Mean	SD
TOTAL COST	4,946,917	17,115,442
Stroke	6,150,720	20,856,919
COPD	2,413,310	2,527,074
Lung cancer	4,081,862	4,788,677

Figure 9: Direct and indirect costs to payers (n=429)

Cost to payers	n	%
Family (100%)	376	87.9
Government (100%)	10	2.3
Insurance (100%)	24	5.6
Family and Government	8	1.9
Family and Insurance	10	2.3

Figure 11: Mean total hospital/government costs per event in Lao currency (Kip) during hospitalization (n=429)

	Mean	Total SAF
Stroke	622,724.7951	435,130,196
COPD	648,873.224	356,519,500
Lung cancer	866,009.7133	24,248,272
Total		815,897,968

Figure 12: Mean total costs (direct, indirect and hosp/gov't cost) per event in Lao currency (Kip) during hospitalization (n=429)

	Mean	Total
Stroke	4,704,070	3,286,978,177
COPD	2,849,433	1,565,603,988
Lung cancer	4,161,591	116,524,540
Total		4,969,106,706

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About SEATCA

The Southeast Asia Tobacco Control Alliance (SEATCA) works closely with key partners in ASEAN member countries to generate local evidence through research programs, to enhance local capacity through advocacy fellowship program, and to be catalyst in policy development through regional forums and in-country networking. By adopting a regional policy advocacy mission, it has supported member countries to ratify and implement the WHO Framework Convention on Tobacco Control (FCTC)

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