



# Tobacco

## Health Cost in Egypt

## 1. Introduction

### 1.1 Overview

Interest in the health cost of smoking originates from the desire to identify the economic burden inflicted by smoking on a society. This burden consists of medical costs plus productivity losses attributable to smoking related morbidity, disability and premature mortality<sup>1</sup>. Over the past 30 years, many cost-of-illness studies have been conducted, and many of these studies were used as instruments in public health policy debates.<sup>2</sup>

A comprehensive cost-of-illness study includes both direct and indirect costs. Direct costs measure the opportunity cost of resources used for treating a particular illness, whereas indirect costs measure the value of resources lost due to a particular illness. The opportunity cost, is defined as “the value of the forgone opportunity to use in a different way those resources that are used or lost due to illness”<sup>2</sup>.

### 1.2 Health care system in Egypt

Egypt is a lower middle-income country and has a pluralistic and fragmented health system with multiple sources of financing, financing agents and providers. The financing sources include government spending that comes from direct tax revenues, out-of-pocket spending by households as premium payments for insurance and as direct spending on health, employers’ spending on the health of their employees, a dedicated cigarette tax and donor assistance. In 2007–2008, Egypt spent 42.5 billion Egyptian pounds (LE) on health, representing 4.75% of the country’s gross domestic product (GDP) leading to a per capita spending of LE 566.4. Household spending (out-of-pocket expenditure) financed 60% of total health spending, followed by Ministry of Finance spending (35%); the rest is accounted for by public and private firms and external assistance. Spending on pharmaceuticals remains high, at about 26% of total health spending in the country.<sup>3</sup>

## 2. Rationale of the study

Given the high and increasing rate of tobacco use in Egypt, it can be assumed that much of the healthcare expenditure originates from tobacco-related illnesses. Although there is a growing body of evidence documenting the high rates of smoking and smoking-related diseases, research documenting the resulting economic impact in terms of increasing healthcare spending in Egypt is lacking. Meanwhile, there is an ongoing debate with policy-makers about the high need to implement and enforce tobacco control interventions and the effectiveness of tobacco prohibiting laws because of the governmental revenues gained from taxes on tobacco products taxes. The findings of this study are expected to provide an assessment of the economic burden of tobacco smoking on health and health care services. The study is therefore timely and necessary to enable policy makers and stakeholders to take evidence based decisions on tobacco control in Egypt.

## 3. Goal and objectives

### 3.1 Overall goal

The goal of the study is to provide policy-makers with the scientific evidence supporting the significant importance of enhancing tobacco control measures through estimating the economic cost of tobacco use in the country.



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The study measured the economic burden of active smoking on the healthcare system, its financing and on the productivity of the Egyptian adult population.

### 3.2 Specific objectives

1. Determine direct medical costs of treating four of the main tobacco related diseases: ischaemic heart disease, cerebrovascular stroke, chronic obstructive pulmonary disease and malignant neoplasms of trachea, lung and bronchus in Egypt.
2. Determine morbidity-related productivity loss attributable to tobacco use (e.g. absenteeism due to illness and value of work loss due to illness).
3. Determine mortality-related productivity loss attributable to tobacco use.

## 4. Methodology

To estimate the economic burden of smoking related illnesses on individual and at the national level, this study used the cost-of-illness approach. The economic consequences of illness within this approach are divided into direct costs and indirect costs.

Smoking Attributable Fraction (SAF) which indicates the proportion of expenditures or deaths that could be attributed to smoking was estimated and applied to the total measures of interest<sup>4</sup>.

### 4.1 Tobacco-related diseases

This study focused on four of the major diseases which are identified in the 2004 United States' Surgeon General's Report as being causally related to cigarette smoking<sup>5</sup>:

- Respiratory diseases: chronic obstructive pulmonary disease (COPD)
- Cardiovascular diseases: ischaemic heart disease (IHD)
- Malignant neoplasms: trachea, lung and bronchi
- Cerebrovascular stroke.

### 4.2 Data collection

Secondary data were obtained from the Central Agency for Public Mobilization and Statistics (CAPMAS). They comprised a sample of 3860 families distributed throughout the governorates of Egypt. Records of 16631 individuals within those families were obtained. The study analysed data from 6650 individuals who were above the age of 30 years. The smoking variable in this survey was coded as current smoker or non-smoker at time of survey. The data were analysed using all possible stratification variables such as age, sex, education level and residence. However the results obtained were unexpected and always in favour of smoking as if smoking is a protective behaviour this could be explained that smoking variable was not well defined and missing the ever smoker category.

Record review hospital based studies were performed for four targeted diseases for one year duration. In case of data availability.

In case of data unavailability, a follow up hospital-based studies were then performed. Data were collected from

7 hospitals of different types of health care facilities (Table A).

Smoking status was defined as: ever smoker, for current and ex-smokers; or never smoker, for those who were non-smokers and never smoked in the past. (Ex-smoker was not coded as a category as it was not reliably reported by patients).

The hospital costs were obtained from specialized hospital accounts for Internal medicine departments, Intensive care departments and Oncology departments. Variable cost includes all types of investigations and treatment cost while the fixed cost includes the equipment, nutrition, maintenance and salaries.

An expert opinion was implemented using predefined questionnaire for three diseases COPD, lung cancer and ischaemic heart disease in four specialized hospitals according to the protocol of management in each. The individual health cost of investigations in outpatient and inpatient stay was calculated by taking the average of private and general hospitals. The treatment costs were the market prices of drugs.

### 4.3 Estimation of tobacco-attributable health costs

#### 4.3.1 Direct costs

To estimate the direct costs of tobacco use, the study took into account the expenses due to the four illnesses, including hospitalization, management and medications.

Health care cost was calculated for each disease including inpatient and outpatient care. Hospital records were used for one year inpatient care, including different types of hospitals for smokers and non-smokers. A small-scale patient survey (500 patients per hospital) was performed for outpatient at the same hospitals. Expert opinion was obtained to get the cost for every investigation and medical intervention and the cost of possible hospital stay days and outpatient visits.

The study used the utilization ratio approach. The smoking attributable fraction (SAF) for each disease was calculated directly using the relative risk (RR).

$$\text{SAF} = \frac{(\text{RR}-1)\text{Ps}}{1 + (\text{RR}-1)\text{Ps}}$$

where Ps= proportion of population exposed to tobacco smoking

$$\text{RR} = \frac{\text{percent of disease } i \text{ within ever smoked}}{\text{percent of disease } i \text{ within never smoked}}$$

#### 4.3.2 Indirect morbidity costs resulting from productivity losses

The average annual numbers of working days lost per employed person for inpatient and outpatient "work-loss days" due to illness from each disease were calculated directly from hospital records and outpatient survey. Inpatient days were extracted from the hospital records, while outpatient days were obtained from the outpatient survey by a direct question. The calculated SAF was used to estimate the smoking attributable cost using the average salary per-day.

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### 4.3.3 Indirect mortality costs resulting from tobacco-related diseases

As a measure of the value of lives lost prematurely is the number of years of potential life lost (YPLL). Which is determined by the number of years of life expectancy remaining at the age of death. The disease specific death rate used was from the WHO global report (Mortality Attributable to Tobacco 2008). The SAF, calculated for the four Tobacco related diseases, was used and multiplied by the estimated number of years lost, then multiplied by per capita GNP. Deaths attributed to smoking in employed population (15-59) were calculated, considering the official retirement age in Egypt to be 60 years.

**Table A. Sample (after exclusion of those below 30 years old)**

City	Type of hospital	Inpatients No.	Outpatients No.
Alex	Health insurance hospital	For all 4 diseases <b>7339</b>	<b>467</b> For all 4 diseases
		2 m follow-up <b>3819</b> (From 1 year registry)	
Cairo	Specialized Governmental Heart Institute	For IHD <b>2930</b> (From 1 year registry)	<b>487</b>
	Chest Hospital	For COPD and lung cancer <b>4894</b> (From 1 year registry)	<b>261</b>
	Governmental Cancer Institute	For Lung Cancer <b>229</b> 2 m follow-up	<b>483</b>
	University Hospital	<b>Inpatient Oncology</b> <ul style="list-style-type: none"> <li>• For lung cancer <b>117</b> (From 8 m registry)</li> <li>• For lung cancer <b>82</b></li> <li>• For COPD, IHD <b>1078</b></li> </ul> (From 3 years registry)	<b>501</b>
	General Hospital	For all the 4 diseases <b>145</b> From 3 m registry	<b>142</b>
	Private Hospital	For all the 4 diseases <b>932</b> (From 3 m registry)	—

### 4.Results

**Table (1): Distribution of patients by health facility and age, Egypt 2012**

	Age (years)					Total
	30-	40-	50-	60-	70+	
<b>Inpatients</b>						
Heart Institute	312	605	952	690	341	2900
Insurance Hospital	11	42	137	189	163	542
Private Hospital	38	128	338	281	146	931
Chest Hospital	546	828	1323	1295	878	4870
Cancer Institute	49	53	72	40	14	228
General Hospital	10	18	40	49	21	138
<b>Total</b>	<b>966</b>	<b>1674</b>	<b>2862</b>	<b>2544</b>	<b>1563</b>	<b>9609</b>
<b>Emergency and outpatients</b>						
Heart Institute	106	143	125	78	17	469
Insurance Hospital	12	78	136	114	126	466
Chest Hospital	65	72	53	49	15	254
Cancer Institute	114	140	123	79	17	473
University Hospital	133	183	109	49	4	478
General Hospital	29	36	30	27	4	126
<b>Total</b>	<b>459</b>	<b>652</b>	<b>576</b>	<b>396</b>	<b>183</b>	<b>2266</b>

**Table (2): Distribution of the four tobacco-related diseases among inpatients and outpatients by sex**

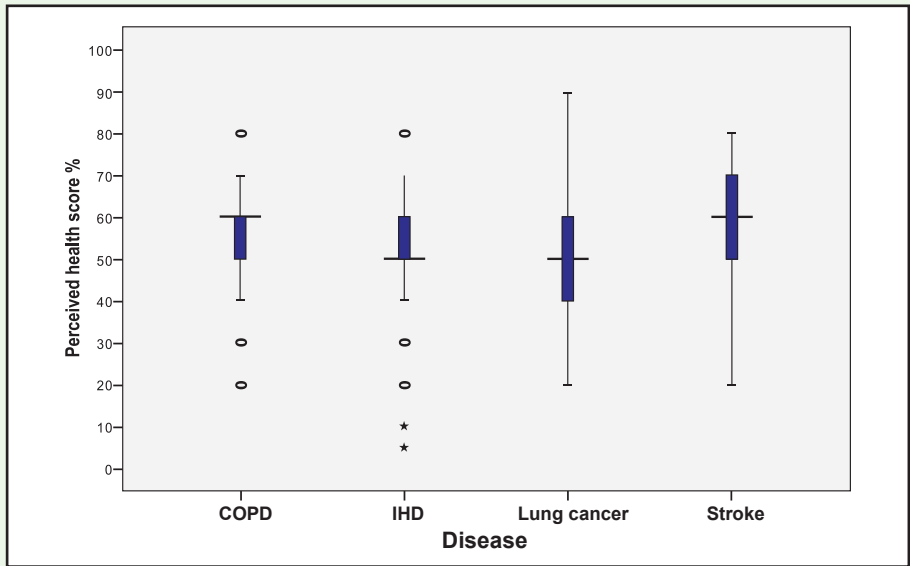
	Inpatient		Outpatient		Total	
	No.	%	No.	%	No.	%
Males	(n=6628)		(n=1922)			
COPD	1726	26.1%	365	19.0%	2091	24.5%
IHD	1214	18.4%	415	21.6%	1629	19.1%
Lung cancer	173	2.6%	103	5.4%	276	3.2%
Stroke	39	.6%	75	3.9%	114	1.3%
Females	(n=3231)		(n=409)			
COPD	390	12.1%	11	2.7%	401	11.0%
IHD	381	11.8%	27	6.6%	408	11.2%
Lung cancer	63	2.0%	16	3.9%	79	2.2%
Stroke	10	.3%	14	3.4%	24	.7%
Total	(n=9859)		(n=2331)			
COPD	2116	21.5%	376	16.2%	2492	20.5%
IHD	1595	16.2%	442	19.0%	2037	16.8%
Lung cancer	236	2.4%	119	5.1%	355	2.9%
Stroke	49	.5%	89	3.8%	138	1.1%

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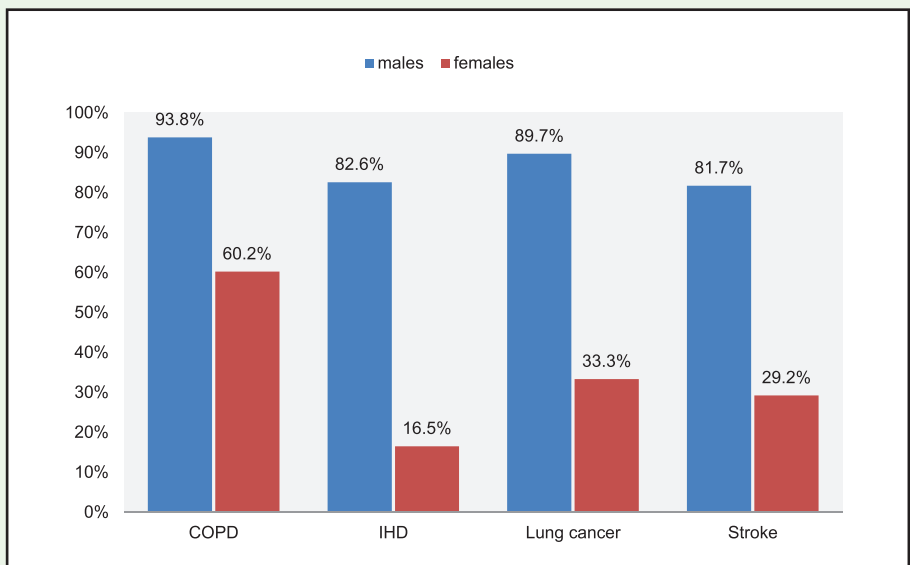


The surveyed sample is described by age group for each of the health facilities studied (Table 1). The distribution of the four tobacco-related diseases among inpatients and outpatients, by sex, is shown in (Table 2). Concerning inpatients, COPD formed the highest percent of the four studied diseases (21.5% of total inpatients) followed by IHD (16.2%) then Lung cancer and stroke (in only 2.4% and 0.5%, respectively). However, as regards outpatient visits, IHD was the highest percent of the four studied diseases (19% of outpatient visits) followed by COPD (16.2%) then Lung cancer and stroke (in only 5.1% and 3.8%, respectively). The same order applied after stratification by gender; however, it was noticed that female visiting outpatient clinics for COPD were of a very small percent (2.7% of females visiting outpatient clinics)



**Figure(1): Self- Perceived health score percent for the four tobacco related diseases patients attending emergency and outpatients clinics**

Figure (1) shows the Self perceived health scores reported by patients, when they were asked in the outpatient survey to rate their health status out of 100%. On average, patients with lung cancer recorded the lowest score (49%) followed by those with IHD (53%), COPD and stroke (56% and 57%, respectively).



**Figure (2): Distribution of those who ever smoked by gender and diseases**

**Table (3): Distribution of the Four Tobacco-related diseases among inpatients and outpatients, by smoking status**

Disease	Smoking status			
	Never smoked		Ever smoked	
	No.	%	No.	%
<b>Males</b>	(n=1050)		(n=5029, 82.7%)	
COPD	92	6.2%	1386	93.8%
IHD	228	17.4%	1084	82.6%
Lung cancer	22	10.3%	192	89.7%
Stroke	20	18.3%	89	81.7%
<b>Females</b>	(n=1411)		(n=419, 22.9%)	
COPD	53	39.8%	80	60.2%
IHD	177	83.5%	35	16.5%
Lung cancer	26	66.7%	13	33.3%
Stroke	17	70.8%	7	29.2%
<b>Total</b>	(n=2466)		(n=5456, 68.9%)	
COPD	145	9.0%	1466	91.0%
IHD	405	26.6%	1119	73.4%
Lung cancer	48	19.0%	205	81.0%
Stroke	37	27.8%	96	72.2%

As expected, in general, the percentage of smokers was higher among males (82.7%) than among females (22.9%) for each of the four tobacco-related diseases studied. The highest percentage of smokers was found among COPD patients, followed by lung cancer patients, IHD patients and stroke patients (Table 3 & Figure 2) .

**Table(4): SAF calculated for the four tobacco-related diseases**

	Smoking status				RR	SAF%	95%CI around SAF	
	Never smoked		Ever smoked				LL	UL
	No.	%	No.	%				
<b>COPD (n=1612)</b>	145	5.9%	1467	27.0%	4.58	72.41	70.23	74.59
<b>IHD(n=1525)</b>	406	16.5%	1119	20.6%	1.25	15.43	13.62	17.24
<b>Lung cancer (n=257)</b>	49	2.0%	208	3.8%	1.90	39.78	33.80	45.76
<b>Stroke (n=133)</b>	37	1.5%	96	1.8%	1.20	12.80	7.12	18.48

\*Smoking status could not be obtained in some cases and as a result they were excluded from the analysis

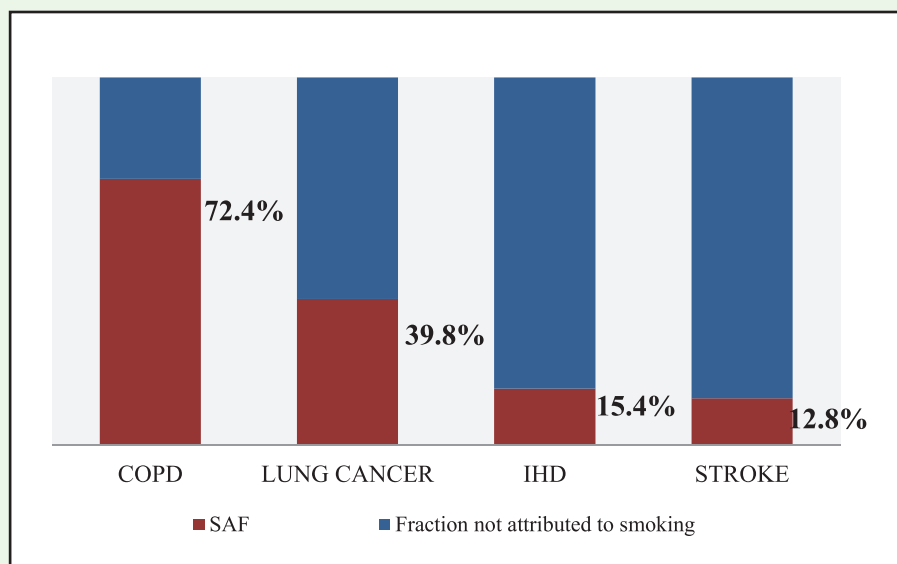
The highest SAF was calculated for COPD which ranged from 70.2% to 74.6%, followed by the SAF for lung cancer



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(33.8%–45.8%), ischaemic heart disease (13.6%–17.2%) and stroke (7.1%–18.5%) (Table 4 and Figure 3).



**Figure (3): SAF for the four smoking-related diseases**

In the year 2008, there were 138,475 deaths in Egypt caused by COPD, stroke, IHD and lung cancer. According to SAF calculated for each disease, the smoking attributed deaths from those 4 diseases amounted to approximately 24,077 deaths; those caused an estimated 278,150.9 life years lost. Deaths attributed to smoking in employed population (15-59) ranged from approximately 191 deaths for lung cancer to 976 deaths for IHD (Table 5).

**Table (5): Hospital expenses of inpatients for the four smoking related diseases (Direct cost) in the year 2011.**

	Cost of inpatients EGP (L.E.)		
	Total cost of diseases	SAF %	Smoking Attributable Cost
COPD	5,413,439	72	3,919,871
IHD	320,724,923	15	49,487,856
LUNG CANCER	760,907	40	302,689
STROKE	774,178	13	99,095
Total	327,673,447		53,809,510

Data was extracted for one year (2011) hospital expenses from the documents of 3 hospitals as variable cost including all types of investigations and drugs' cost while the fixed cost includes the equipment, nutrition, maintenance and salaries which are very expensive components especially in ICU and Oncology staff salaries. The Total Smoking Attributable Cost of inpatients from 3 different hospitals reached 54 Million L.E. Approximately 92 % from this cost come from Ischemic heart disease (49 million), then COPD (4 million), lung cancer (303 thousands), and Cerebrovascular stroke is the lowest value (99 thousands) (Table 5).



**Table (6): Cost of working days lost due to outpatients visit (Indirect morbidity cost)**

	patient taking day of visit off				SAF%	average smoking attributed cost/ patient/year (LE)
	No.	% from visits	Median frequency of outpatient visits	average cost*/ patient/year (LE)		
COPD	39	15.2%	10	461	72.41	333.8
IHD	183	70.7%	5	230.5	15.43	35.6
Lung cancer	36	43.9%	6	276.6	39.78	110.0
Stroke	17	27.0%	2	92.2	12.8	11.8
Total	542	38.9%	6			

\*Cost = Median of working days lost \* average salary per day (46.10 L.E.)

**Table (7): Cost of working days lost due to Inpatient stay (Indirect morbidity cost)**

	N	Length of stay					average cost*/ patient/year (LE)	SAF%	average smoking attributed cost/ patient/year (LE)
		Min	Max	Mean	Median	Sum			
COPD	2110	1	51	10.5	9	21954	414.9	72.41	300.4
IHD	4940	1	368	7.0	4	12454	184.4	15.43	28.5
Lung cancer	231	1	71	14.3	12	3140	553.2	39.78	220.1
Stroke	129	1	82	5.5	3	616	138.3	12.8	17.7
Total	7410	1	368	5.15	8	38164	368.8		

\*Cost = Median LOS \* average salary per day (46.10 L.E.)

As regards the cost of working days lost, average smoking attributed cost/ patient/year (LE) for outpatient visits ranged from 11.8 LE for Stroke to 333.8 LE for COPD. Moreover, average smoking attributed cost/ patient/year (LE) for inpatient stay ranged from 17.7 LE for stroke to 300.4 LE for Lung cancer (Tables 6 and 7)<sup>8</sup>.

Considering the official retirement age in Egypt to be 60 years, and per capita GDP= 2801\$, discount rate =3% per annum, the cost of employment years lost attributable to smoking was found to be \$103,899,826.9 estimated using the below formula.

**Cost of employment years lost attributable to smoking =**

$$\sum \frac{\sum \text{deaths (15-59)} * \text{employment rate} * \text{SAF} * \text{per capita GDP}}{(1+0.03)^t} = \sum \frac{2126.5 * 2801}{(1+0.03)^t} = 103,899,826.9\$$$

(where t=sequence of years from 0 till 23)

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**Table (8): Deaths and Mortality-related years lost attributable to tobacco use for COPD, stroke, IHD and lung cancer (For indirect mortality cost)**

Disease	SAF %	Deaths(15 years and more) <sup>(i)</sup>			Deaths attributed to smoking	Average years lost attributed to smoking			Deaths attributed to smoking in employed population (15-59)
		(15-59)	(60+)	total		Deaths (15-59)	Deaths (60+)	Total	
COPD	72.41	949.6	4,789.96	5739.6	4156.0	23,378.9	19,943.4	43,322.3	295.7
STROKE	12.8	12,075.1	38,701.90	50777	6499.4	52,550.6	28,484.6	81,035.2	664.6
IHD	15.43	14,704.4	64,070.27	78774.7	12154.9	77,142.3	56,844.7	133,987.0	975.6
LUNG CANCER	39.78	1,114.4	2,069.60	3184	1266.6	15,072.5	4,733.9	19,806.4	190.6
Total		28,843.5	109,631.7	138,475.2	24,077	168,144.3	110,006.6	278,150.9	2,126.5

<sup>(i)</sup> WHO 2008

(15-59) average years lost =  $71.5 - 37.5 = 34$

(60+) average years lost =  $71.5 - ((71.5 + 60)/2) = 5.75$

@life expectancy (World bank) = 71.5 years, Egypt employment rate (2011) = 43%

Deaths attributed to smoking in employed population (15-59) = deaths (15-59) \* 0.43 \* SAF

**Table (9): Average individual annual cost attributed to smoking for 3 diseases according to expert estimations ( Individual direct cost)**

Disease	Investigation	Treatment	Outpatient visits	Inpatient visits	Total (LE)	SAF%	Smoking attributed cost (LE)
COPD	702	18348	30-600	2000-20000	21080-39650	72.41	15264.03-28710.57
Lung cancer	13459	26500	60-1500	750-6000	40769-47459	39.78	16217.91-18879.19
IHD	2108	9456	30-600	500-4000	12094-16164	15.43	1866.1-2494.11

As per expert opinion, on the average, the direct annual cost attributed to smoking for one COPD patient is estimated to range from 15264-28710.6 LE, while that estimated for one Lung cancer patient ranged from 16217.9-18879.2 LE and the direct annual cost attributed to smoking for one IHD patient estimated to range from 1866 -2494 LE. (Table9)

**Table (10): Summary of calculated costs attributed to smoking in the present study**

Component of cost	Disease				Total
	COPD	IHD	Lung cancer	Stroke	
In the studied health facilities					
Total inpatients cost for one year (LE)	3,919,871	49,487,856	302,689	99,095	53,809,510
average cost/ patient/year (LE) due to days lost or out-patients visit	333.8	35.6	110	11.8	
average cost/ patient/year (LE) due to days lost due to inpatient stay	300.4	28.5	220.1	17.7	
Total cost due to work days lost/patient/year	634.2	64.1	330.1	29.5	
From Expert opinion (LE)..... per-capita GDP (2108\$) is almost 14,756 LE					
Average individual annual cost	15,264-28,711 Mean 21,9875	1,866 -2,494 Mean 2,180	16,218 -18,879 Mean 17,548.5		
cost compared to GDP per capita	149%	15%	119%		
cost compared to health expenditure per family	2276%	226%	1817%		
In the Egyptian population <sup>6</sup>					
Deaths attributed to smoking in employed population	14,447,768.07 (101134376 LE)	47,667,374.14 (333671619 LE)	9,312,629.675 (65188408 LE)	32,472,054.99 (227304385 LE)	103,899,826.9\$ (727,298,788 LE)

Table 10 displays some tobacco attributed costs for only four of the diseases (COPD, IHD, Lung cancer and stroke) identified in the 2004 United States' Surgeon General's Report as being causally related to cigarette smoking. Studying the inpatients for only 6 of the main hospitals in Alexandria and Cairo out of 1997 hospitals in Egypt as a whole (the national declared number in 1/1/2013); total inpatients cost attributed to smoking for one year amounted to 53 million and 809,510 thousand LE. While the calculated cost due to deaths in 2008 attributed to smoking from the four diseases in the employed Egyptian population was 727 million and 298,788 thousand LE.

According to expert opinion, on the individual level, compared to 14,756 LE (per-capita GDP in Egypt) ; The average annual health expenditure attributed to smoking for a COPD patient amounts to 15,264-28,711 LE, for



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a lung cancer patient amounts to 16,218 - 18,879LE and for an IHD patient ranges from 1,866 to 2,494 LE. Individual cost as estimated from expert opinion compared to GDP per capita for COPD, IHD and lung cancer patients is 149%, 15% and 119% respectively.

The individual level health expenditure attributed to smoking to the total spending for an Egyptian family on healthcare services, in COPD or IHD or lung cancer is 2276%, 226% and 1817% respectively. It is deduced that the individual annual cost for any of the three diseases is many times the money spent on healthcare by the whole family<sup>1</sup>

## 6. Conclusion

The current study is one of the pioneer tobacco economic studies in the country, even in the whole EMR region. The results revealed from the study will be considered as the evidence based tool to convince the concerned stakeholders and decision makers with the urgent need to enforce all tobacco control measures in the country especially the most effective measure highly recommended by the WHO Framework Convention of Tobacco Control (FCTC) the tobacco tax increase. With the main objective of making tobacco products unaffordable to lower the consumption rate, the country has to adopt the policy of progressive tobacco tax increase proportionate with the inflation rate and reaching the accepted global standard. This would prevent the uptake by the sensitive sectors in the community, the poor and youth, and support the current smokers to quit. Also, percentage of these gained governmental revenues from tobacco tax increase could be allocated to support the national health care system in general and the tobacco control measures specifically. Moreover, this highly effective policy will help to lower the burden of tobacco related morbidity, mortality and economic cost which have been proven to be of considerable magnitude.

In the current work the hospital based study included 9859 inpatients and 2331 outpatients. Percentage of tobacco related diseases by our case definition were 40.6% among inpatients and 44.1% among outpatients. While the percentages of ever- smokers were 64.8% and 68.9% among inpatient and outpatients respectively.

The Smoking Attributable Fraction (SAF) was calculated for the four targeted diseases. The highest SAF was for COPD (72%), followed by the SAF for lung cancer (39.8%), Ischemic heart disease (15.4%) and stroke (12%). This means that 12% to 72% of the total cost of illness for those diseases were attributed to a high extent to smoking.

In the current study, as expected from the national profile in general, the percentage of smokers was higher among males (82.7%) than among females (22.9%) and the same pattern was observed among patients of each of the four studied tobacco related diseases. In both sexes the highest percentage of smokers was found among COPD patients, followed by lung cancer, IHD and stroke patients.

The direct cost of inpatients were collected only from 3 Hospitals; the Insurance Hospital, Chest Hospital and National Heart Institute due to unavailability, restrictions and limited access to the hospital accounts and any financial data. The hospitalization cost for those 3 hospitals, as a measure of the direct cost was 53 million and

1- According to CAPMAS report in 2011, the total spending for Egyptian families was 285 billion LE, while numbers of families were 18.9 million in the same year .therefore the single spending for each family was 15,084 LE, while 6.4% of this spending for healthcare services which is equal 966 LE

809,510 thousand LE per year for the four smoking related diseases inpatients.

Regarding the indirect morbidity cost, COPD showed the highest average cost/ patient/year (634.2 LE) due to days lost either from outpatients visit or inpatient stay. COPD showed also the highest Individual cost as estimated from expert opinion compared to either per capita GDP or total spending for an Egyptian family on healthcare services (149% and 2276% per year respectively).

Indirect mortality costs were calculated depending on the WHO Global Report on Mortality Attributable to Tobacco 2008. COPD, stroke, IHD and lung cancer were responsible for 138,475 deaths in Egypt. According to calculated SAF of the four diseases, the smoking attributed deaths from these four diseases amounted to approximately 24,077 deaths; causing an estimated 278,150.9 life years loss (considering the average life expectancy in Egypt to be 71.5 years and employment rate of 43%). Deaths attributed to smoking in employed population for the four diseases, were 3.673.424 deaths.

727 million and 298,788 thousand LE is the indirect mortality cost as years lost for employed people for the four diseases due to smoking.(Egypt per capita GNP of the year 2011 = 2801 \$).

21,987.5 LE is the average direct individual annual cost attributed to smoking for one COPD patient as estimated by Expert opinion. While that estimated for one Lung cancer patient is 17,548.5 LE and for one IHD patient is 2,180 LE.

Unavailability of national morbidity data for chronic diseases was a great limitation for calculating the national direct cost of the tobacco related diseases, so we recommend improving the health care recording system, integrating the non communicable diseases prevalence in the national health information system and adding smoking status to outpatient and inpatient records.

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# Tobacco

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