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**Smoking and cancer**

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## **Written Declaration**

I declare that I completed the submitted work individually and only used the mentioned sources and literature. Concurrently, I give my permission for this diploma/bachelor thesis to be used for study purposes.

Prague 31.03.2010

Mari Slaatta

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# INTRODUCTION

It is a fact today that smoking has many negative consequences on our health, among them many types of cancer.

As some countries have stricter smoking legislation than others, one would suspect that this will have a positive impact on peoples smoking habits.

The fact that these days the legislation concerning cigarettes and smoking is so strongly emphasized makes smoking and cancer an interesting topic as this should change the smoking trends in the different countries and thereby the cancer statistics.

Lung cancer is a devastating disease, and most cases of it are caused by smoking. I will for the most part discuss this disease as it is the most fatal and obvious consequence of smoking.

## SUMMARY

Tobacco is the most common exogenous cause of human cancers, being responsible for 90 % of human lung cancers.

Cigarette smoking causes, worldwide , more than 4 million deaths annually , mostly from cardiovascular disease, various types of cancers, and chronic respiratory problems. It is expected that there will be more than 8 million tobacco-related deaths yearly by 2020, the major increase occurring in the developing countries. It has been estimated that of the people alive today, approximately 500 million will die from tobacco-related illnesses.

Smoking is probably the most preventable cause of human death. It reduces overall survival and the impact is dose dependent.

Unfortunately the prevalence of smoking is increasing in young people, particularly women. (Robbins, Basic Pathology, 2006)

When people think of cancers caused by smoking, the first one that comes to mind is always lung cancer. Most cases of lung cancer death, close to 90% in men, and 80% in women are caused by cigarette smoking. There are several other forms of cancer attributed to smoking as well, and they include cancer of the oral cavity, pharynx, larynx, esophagus, bladder, stomach, cervix, kidney and pancreas, and acute myeloid leukemia. (about.com-cancer statistics, smoking and cancer in U.S , 2005)

In this thesis I will try to put my emphasis on lung cancer. I will look if there are any differences in smoking habits across Europe, and if the pattern is changing. Also, I will take a further look at the smoking ban that has been introduced in some countries now and see if there has been an effect on lowering the rate of smoking among their population.

## **Chapter 1**

### **History of the Surgeon General's Reports on Smoking and Health**

On January 11, 1964, Luther L. Terry, M.D., Surgeon General of the U.S. Public Health Service released the first report of the Surgeon General's Advisory Committee on Smoking and Health.

On the basis of more than 7,000 articles relating to smoking and disease already available at that time in the biomedical literature, the Advisory Committee concluded that cigarette smoking is—

- A cause of lung cancer and laryngeal cancer in men
- A probable cause of lung cancer in women
- The most important cause of chronic bronchitis

The release of the report was the first in a series of steps, still being taken more than 40 years later, to diminish the impact of tobacco use on the health of the American people.

For several days, the report furnished newspaper headlines across the country and lead stories on television newscasts. Later it was ranked among the top news stories of 1964.

During the more than 40 years that have elapsed since that report, individual citizens, private organizations, public agencies, and elected officials have pursued the Advisory Committee's call for "appropriate remedial action."

Early on, the U.S. Congress adopted the Federal Cigarette Labeling and Advertising Act of 1965 and the Public Health Cigarette Smoking Act of 1969. These laws—

- Required a health warning on cigarette packages
- Banned cigarette advertising in the broadcasting media
- Called for an annual report on the health consequences of smoking

·  
(<http://www.cdc.gov/tobacco>)

## The 2004 Surgeon General's report

Cancer is the second leading cause of death and was among the first diseases causally linked to smoking.

- Lung cancer is the leading cause of cancer death, and cigarette smoking causes most cases.
- Compared to nonsmokers, men who smoke are about 23 times more likely to develop lung cancer and women who smoke are about 13 times more likely. Smoking causes about 90% of lung cancer deaths in men and almost 80% in women.
- In 2003, an estimated 171,900 new cases of lung cancer occurred and approximately 157,200 people died from lung cancer.
- The 2004 Surgeon General's report adds more evidence to previous conclusions that smoking causes cancers of the oral cavity, pharynx, larynx, esophagus, lung and bladder.
- Carcinogens in tobacco smoke damage important genes that control the growth of cells, causing them to grow abnormally or to reproduce too rapidly.
- Cigarette smoking is a major cause of esophageal cancer in the United States. Reductions in smoking and smokeless tobacco use could prevent many of the approximately 12,300 new cases and 12,100 deaths from esophageal cancer that occur annually.
- The combination of smoking and alcohol consumption causes most laryngeal cancers cases. In 2003, an estimated 3800 deaths occurred from laryngeal cancer.
- In 2003, an estimated 57,400 new cases of bladder cancer were diagnosed and an estimated 12,500 died from the disease.

- For smoking-attributable cancers, the risk generally increases with the number of cigarettes smoked and the number of years of smoking, and generally decreases after quitting completely.
- Smoking cigarettes that have a lower yield of tar does not substantially reduce the risk for lung cancer.
- Cigarette smoking increases the risk of developing mouth cancers. This risk also increases among people who smoke pipes and cigars.
- Reductions in the number of people who smoke cigarettes, pipes, cigars, and other tobacco products or use smokeless tobacco could prevent most of the estimated 30,200 new cases and 7,800 deaths from oral cavity and pharynx cancers annually in the United States.

**New cancers confirmed by this report:**

- The 2004 Surgeon General's report newly identifies other cancers caused by smoking, including cancers of the stomach, cervix, kidney, and pancreas and acute myeloid leukemia.
- In 2003, an estimated 22,400 new cases of stomach cancer were diagnosed, and an estimated 12,100 deaths were expected to occur.
- Former smokers have lower rates of stomach cancer than those who continue to smoke.
- For women, the risk of cervical cancer increases with the duration of smoking.
- In 2003, an estimated 31,900 new cases of kidney cancer were diagnosed, and an estimated 11,900 people died from the disease.
- In 2003, an estimated 30,700 new cases of pancreatic cancer were diagnosed, attributing to 30,000 deaths. The median time from diagnosis to death from pancreatic cancer is about 3 months.
- In 2003, approximately 10,500 cases of acute myeloid leukemia were diagnosed in adults.

- Benzene is a known cause of acute myleoid leukemia, and cigarette smoke is a major source of benzene exposure. Among U.S. smokers, 90% of benzene exposures come from cigarettes.

**(U.S. Department of Health and Human Services. The Health Consequences of Smoking: A Report of the Surgeon General. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and)**

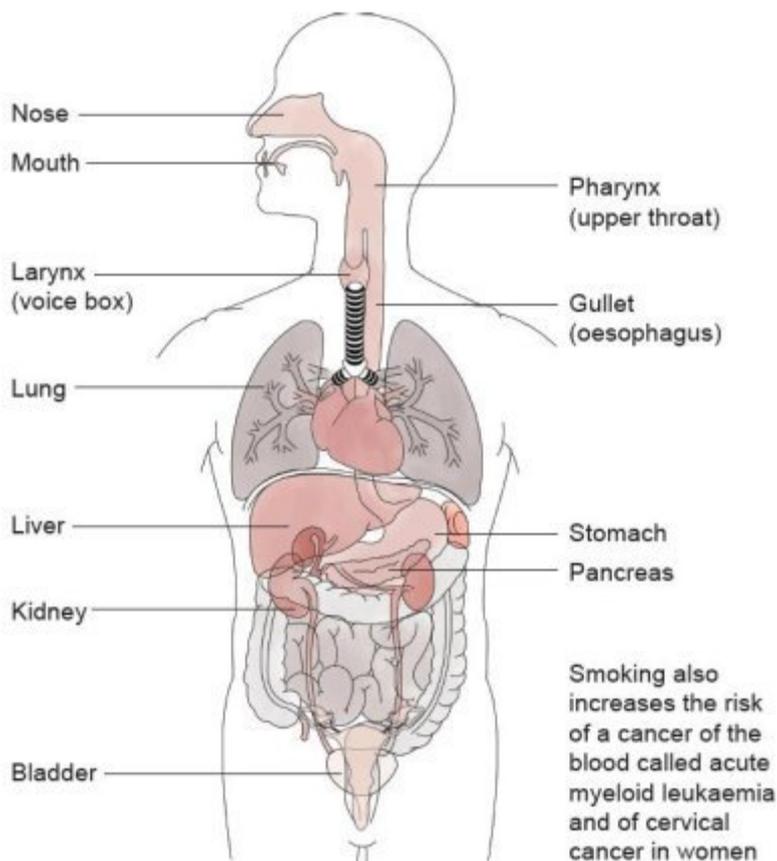
## Chapter 2

### Cancers caused by smoking

Tobacco's role in increasing the chance of lung cancer is one of the most widely known of tobacco's harmful effects on human health. Although lung cancer is the cancer I will discuss mostly in this paper, it is not the only type of cancer with significant increase in risk from the use of tobacco. In the next section I am presenting the specter of different cancer types that can be caused by smoking.

Tobacco use increases risks of cancer at many sites in the body in addition to the lungs. These include the head and neck, (covering cancers of the esophagus, larynx, tongue, salivary glands, lip, mouth, and pharynx), urinary bladder and

kidneys,  
uterine cervix,  
breast,  
pancreas, and  
colon. Each of  
these will be  
described  
below.



((<http://info.cancerresearchuk.org>))

## Lung cancer

Sir Richard Doll's paper from 1950 describing the association between tobacco use and lung cancer stands as a classic in public health. On average, smokers increase their risk of lung cancer between 5 and 10-fold and in developed countries, smoking is responsible for upwards of 80% of all lung cancers. Using American data, 24% of men who smoke can expect to develop cancer during their expected life time.

Recently, the spread of tobacco use to developing countries has led to papers describing similar patterns there. Thus, in a report from India, roughly two-thirds of all patients with lung cancer were smokers, using either cigarettes and/or bidis, hand-rolled tobacco. Among 54 female patients, only 5% were smokers, reflecting both the low prevalence of tobacco use among women and the cancer-causing effects of environmental tobacco smoke. In a study of 1,000,000 deaths in China, lung cancer risk was two to four times higher among men who smoked compared to men who did not smoke and this association was generally consistent over both rural and urban areas.

Lung cancer remains a disease with a poor prognosis. Although one-year all-stage survival is reported to have increased from 32% in 1973 to 41% in 1994, five-year survival has remained unchanged at 14%. Early detection has been promoted as a potentially valuable intervention but its cost-effectiveness puts it beyond the reach of all but the most wealthy health care systems, and even then, pales in comparison to the cost-effectiveness of comprehensive programs and policies to reduce tobacco consumption.

In most people, lung cancer is related to cigarette smoking. Although some people who have never smoked get lung cancer, smoking causes 9 out of 10 cases.

The more you smoke, the more likely you are to get lung cancer. But the length of time you have been a smoker is most important. Cigarette smoking is the main cause of lung cancer. But pipe and cigar smokers are still much more likely to get

lung cancer than non smokers. Passive smoking (breathing in other people's cigarette smoke) does increase the risk of lung cancer, but it is still much less than if you smoke yourself.

As soon as you stop smoking, your risk of lung cancer starts to go down. However long you have been smoking, it is always worth giving up (<http://www.cancerhelp.org.uk/type/lung-cancer>)

#### Head and neck cancer

Tobacco use has long been linked to head and neck cancers, particularly in tissues through which inhaled tobacco smoke must pass. For oral cancers, men who smoke have a 27-times higher rate of oral cancer than men who do not smoke. For laryngeal cancer, rates are 12 times higher among smokers.

Part of the explanation for tobacco's effects may come from mutations in a gene called p53 - mutations which are far more common among smokers with squamous cell head and neck cancers than among nonsmokers. In addition, the pattern of mutations in nonsmokers reflected endogenous mutations, likely to arise spontaneously, while those in the genes of smokers were changes more likely to arise from an external mutagenic agent. p53 is thought to be a tumor suppressor gene, meaning that mutations in this gene leave the body less well-equipped to prevent the growth of tumors.

#### Urinary bladder & kidney cancer

In the Western world, tobacco use is the single most important cause of bladder cancer, accounting for an estimated 40-70% of all cases. Smokers' risks of bladder cancer are 2-3 times higher compared to nonsmokers. Despite the fact that the bladder is not exposed directly to tobacco smoke, polyaromatic hydrocarbons, known to be carcinogenic, may well be absorbed into the blood and transported to the bladder where the bladder cells are then unable to withstand that carcinogenic effects of these compounds.

Cigarette smoking is a major risk factor. Cigarette smokers are twice as likely as nonsmokers to develop kidney cancer. Cigar smoking also may increase the risk of this disease. (<http://www.cancer.gov/cancertopics>)

#### Breast cancer

For women in developed countries, rates of breast cancer have been rising over the last few decades, eerily tracking with the rapid increase in female smoking that occurred in the middle of the 20th century. Data on links between breast cancer and smoking have, however, been mixed, and this has led to conflicting health messages. Among Danish women interviewed at the time of mammography, smoking for more than 30 years was associated with a 60% higher risk of breast cancer and onset at an average of eight years earlier, when compared with nonsmokers.

Given that breast cancer incidence is soon to be eclipsed by lung cancer incidence among women, further data clarifying the role of smoking in causing breast cancer should be of value in strengthening efforts to inform and assist women to quit smoking.

#### Pancreas cancer

Smoking is estimated to be responsible for 30% of pancreatic cancer. Similar to bladder cancer, carcinogens inhaled by the smoker are thought to enter the blood stream and reach the pancreas via the blood and also bile, secreted by the liver to aid digestion. Pancreatic cancer prognosis remains very poor with 5-year survival less than 5% in most reports.

Researchers at Michigan State University have added yet another piece to the puzzle that links cigarette smoking with cancer of the pancreas.

*International Journal of Cancer*, MSU's James Trosko and colleagues zeroed in on the mechanism by which a healthy cell turns cancerous. Specifically, they found that the chemicals produced by the burning of tobacco products - polycyclic aromatic hydrocarbons, or PAHs - interfere with communication between the

body's cells. More importantly, the work showed that some of these chemicals don't necessarily initiate the cancer, but rather contribute to the promotion of it. (<http://www.medicalnewstoday.com>)

## Colon cancer

Like bladder and pancreatic cancer, colon cancer risk is increased among smokers, probably due to the transport of carcinogens to the colon from inhaled or swallowed tobacco smoke. Data supporting this association come from several long lasting studies in which groups of people are followed over many years to record the occurrence of various illnesses.

Based on data from both male and female health professionals in the USA, smoking appears to double the risk of colon cancers. Most colon cancers begin as polyps, precursor growths for cancer. Risk of cancer increases with polyp size and there is a dose-response relationship with increasing years of tobacco use associated with larger polyps and, after 35 years of smoking, colon cancer (.<http://www.who.int/tobacco>).

Thun and colleagues tested the association between long-term cigarette smoking and colorectal cancer after adjusting for multiple other factors that are generally associated with risk, including screening. From 1992 through 2005 the researchers followed almost 185,000 participants aged 50 to 74 years old; participants described their behaviors and medical conditions.

Participants who smoked cigarettes for 40 or more years, or who did not quit before age 40, had a 30 percent to 50 percent increased risk of developing colon or rectal cancer during the follow-up, even in analyses that adjusted for 13 other potential risk factors, according to Thun. After 13 years of follow-up, the researchers identified 1,962 cases of invasive colorectal cancer.

(<http://www.sciencedaily.com>)

## Cervical cancer

Tobacco's effect on cervical cancer was only recognized recently, in part because women who smoke may have other risk factors for cervical cancer, particularly exposure to human papilloma virus which increases risks of cervical cancer.

Nevertheless, there is now general consensus that cigarette smoking increases risks of cervical cancer, particularly among women smoking as many as 40 cigarettes daily, and is responsible for approximately 30% of cervical cancer deaths in the USA (-<http://www.who.int/tobacco>)

If you smoke, you have an increased chance of developing precancerous lesions of the

cervix (called moderate or severe dysplasia) and an increase in the chance of developing

cervical cancer. Smoking greatly increases your risk for dysplasia and cancer compared

to your risk for those problems if you don't smoke.

Smoking weakens your immune system. You become more likely to be affected by HPV(human papilloma virus). This virus can cause genital warts, precancers, and cancer of the cervix and genital area. Smoking reduces the immune system cells that are important in fighting the HPV virus. That means that people who smoke have less of a chance of getting rid of the HPV virus, and more of a chance of developing a precancer or cancer.

Also, high concentrations of nicotine and other cancer-causing harmful substances from cigarettes have been found in cervical mucus. These substances, called carcinogens, may damage the genes in cervical cells. Because HPV can block our cancer fighting genes, the damage to the cervical cell genes caused by smoking cannot be repaired. This allows the cells to form a precancer that can lead to cancer (.<http://www.asccp.org>)

## Chapter 3

### How tobacco interacts with the human body

The number of potentially noxious chemicals in tobacco smoke are many. Tobacco contains between 2000-4000 substances (Robbins, Basic pathology, 2006)

Substance	Effect
Tar	Carcinogenesis
Nicotine	Ganglionic stimulation and depression,
Polycyclic aromatic HC	Carcinogenesis
Phenol	Tumor promotion, mucosal irritation
Benzopyrene	Carcinogenesis
Carbon monoxide	Impaired oxygen transport and utilization
Formaldehyde	Toxicity to cilia, mucosal irritation
Oxides of nitrogen	Toxicity to cilia, mucosal irritation
Nitrosamine	Carcinogenesis

## Nicotine

Nicotine is an alkaloid found in the nightshade family of plants which constitutes about 0.6–3.0% of dry weight of tobacco. It functions as an antiherbivore chemical with particular specificity to insects; therefore nicotine was widely used as an insecticide in the past, and currently nicotine analogs such as imidacloprid continue to be widely used.

In low concentrations the substance acts as a stimulant in mammals and is the main factor responsible for the dependence-forming properties of tobacco smoking. According to the American Heart Association, the "nicotine addiction has historically been one of the hardest addictions to break." The pharmacological and behavioral characteristics that determine tobacco addiction are similar to those that determine addiction to drugs such as heroin and cocaine. Nicotine content in cigarettes has slowly increased over the years, and one study found that there was an average increase of 1.6% per year between the years of 1998 and 2005. This was found for all major market categories of cigarettes

[www.wikipedia.org](http://www.wikipedia.org)

According to Robbins nicotine is not a direct cause of tobacco-related diseases, but it is addictive. Nicotine binds to receptors in the brain and, through release of catecholamines, is responsible for the acute effects of smoking, such as the increase in heart rate and blood pressure, and the increase in cardiac contractility and output (Robbins, Basic pathology, 2006)

## **Chapter 4**

### **Smoking and lung cancer**

In most people, lung cancer is related to cigarette smoking. Although some people who have never smoked get lung cancer, smoking causes 9 out of 10 cases.

The more you smoke, the more likely you are to get lung cancer but it is the length of time you have been a smoker that is most important.

Filtered and low tar cigarettes might not increase your risk quite so much, but most smokers cancel this out by taking more, deeper puffs or smoking more cigarettes

As soon as you stop smoking, your risk of lung cancer starts to go down

Passive smoking (breathing in other people's cigarette smoke) increases the risk of lung cancer, but it is still much less than if you smoke yourself

It is almost impossible to work out the risk of occasional smoke exposure to second hand smoke for non smokers (passive smoking). The risk of lung cancer for passive smokers goes up the more cigarette smoke they are exposed to.

Overall, people exposed to environmental tobacco smoke at work or at home have their risk of lung cancer increased by about a quarter compared to people who are not exposed to environmental tobacco smoke. Heavy exposure to environmental tobacco smoke at work has been shown to double the risk of lung cancer.

Cigarette smoking is the main cause of lung cancer. But pipe and cigar smokers are still much more likely to get lung cancer than non smokers. (They are also

much more likely to get cancer of the mouth or lip (  
<http://www.cancerhelp.org.uk>)

## Other risk factors

### Exposure to radon gas

The second most important risk factor for lung cancer is exposure to radon gas. Radon is a naturally occurring radioactive gas that can seep out of the soil.

The risk from radon increases the risk from smoking. Smokers with high indoor levels of radon have a particularly high risk of getting lung cancer.

### Exposure to certain chemicals

A number of substances may cause lung cancer, including asbestos, metal dust and fumes, polycyclic aromatic hydrocarbons, diesel exhaust and silica. These are rare causes of lung cancer because you would normally only come across these chemicals in large amounts if you worked with them.

### Air pollution

Air pollution may cause lung cancer. People exposed to large amounts of diesel exhaust fumes at work for many years. This type of long term occupational exposure may increase lung cancer risk by up to 47% (that is the average risk of lung cancer, plus half again). One study has shown that people living in areas with high levels of nitrogen oxides (mainly from cars and other vehicles) have their lung cancer risk increased by about a third.

Based on a large European study, researchers think that 5 to 7% of lung cancers in non smokers are due to outdoor air pollution.

## Previous lung disease

Having had a disease that caused scarring in the lungs may be a risk factor for a type of lung cancer called adenocarcinoma of the lung. Tuberculosis (TB) can make scar tissue form in the lungs. A recent study in China showed that people who have had TB have a higher risk of lung cancer.

## A family history of lung cancer

Researchers are looking into the impact of family history on lung cancer. It is likely that there is at least one faulty lung cancer gene that can be passed down in families . If you have a first degree relative with lung cancer, your risk of lung cancer is doubled. It is very hard to sort out the facts here, because of the major role of smoking. Families of smokers will all be exposed to cigarette smoke and so have an increased risk of lung cancer whether they have inherited a faulty gene or not.

## Past cancer treatment

There is some evidence that particular cancer treatments might increase your risk of lung cancer. Researchers in Sweden looked at the medical records of 140,000 breast cancer patients. They found that there seemed to be an increased risk of lung cancer between 5 and 20 years after breast cancer treatment. They think this may be due to smoking after having had radiotherapy to the chest. This is backed up by the results of two studies showing particularly high risks of lung cancer in women who smoked and had radiotherapy for a previous breast cancer. The studies found no increase in risk in non smokers treated with radiotherapy for breast cancer.

Treatment for other types of cancer has also been linked to a slightly increased risk of lung cancer years later. People who have had treatment for Hodgkin's

lymphoma, some types of non Hodgkin's lymphoma, or testicular cancer may have an increased risk of lung cancer

### Previous smoking related cancers

People with a previous head and neck cancer, oesophageal or cervical cancer have an increased risk of lung cancer. But this may be explained by the fact that the risk of these cancers is higher in smokers.

### Lowered immunity

HIV and AIDs lower immunity and so do drugs that people take after organ transplants. An overview of research studies shows that people with HIV or AIDS have a risk of lung cancer that is 3 times higher than people who do not have HIV or AIDS. People who take drugs to suppress their immunity after an organ transplant have double the usual risk of lung cancer.

(<http://www.cancerhelp.org.uk/type/lung-cancer>)

## **Chapter 5**

### **Smoking statistics**

#### Prevalence

Data from the World Health Organization's "Health for All" database show that in all European countries (excluding Sweden) the prevalence of smoking is higher in men than it is in women. The difference in the prevalence of smoking between men and women is more marked in Eastern Europe than in Western Europe. For example, in Uzbekistan 24% of men smoke compared to only 1% of women, and in the Ukraine 62% of men smoke compared to only 17% of women.

The prevalence of smoking in men is generally higher in Eastern and former Soviet countries – of the six European countries where more than half of men smoke, five were part of the Soviet Union; the sixth is Albania. In contrast, the male smoking rate in Western and Northern Europe is in general less than 35%, with the exception of Germany (37%) and the Netherlands (35%). This pattern is reversed for women, where smoking rates are very low in former Soviet states (6% in Georgia, 2% in Kyrgyzstan, 1% in Uzbekistan), low in Eastern and Central European countries but higher in Western and Northern European countries.

Data from the Health Behaviour in School-aged Children survey on smoking among 15 year olds suggest that the traditional gender smoking patterns may be beginning to change. In more than half of the countries included in the survey in 2001/02, a greater proportion of 15 year old girls smoked than did boys. This was particularly the case for Western European countries (e.g. Portugal, 18% boys smoked at least once a week vs. 26% of girls). Smoking is more prevalent among 15 year old boys in Eastern European and former Soviet countries, but the gap

between the sexes is less marked than is seen for adults (e.g. Russian Federation, 27% boys vs. 19% girls). (Www.heartstats.org-smoking in europe)

I have included some statistics from WHO smoking database to find out what the smoking prevalence is in some selected countries. I have included Norway, Czech Republic, United Kingdom, Hungary and Ireland.

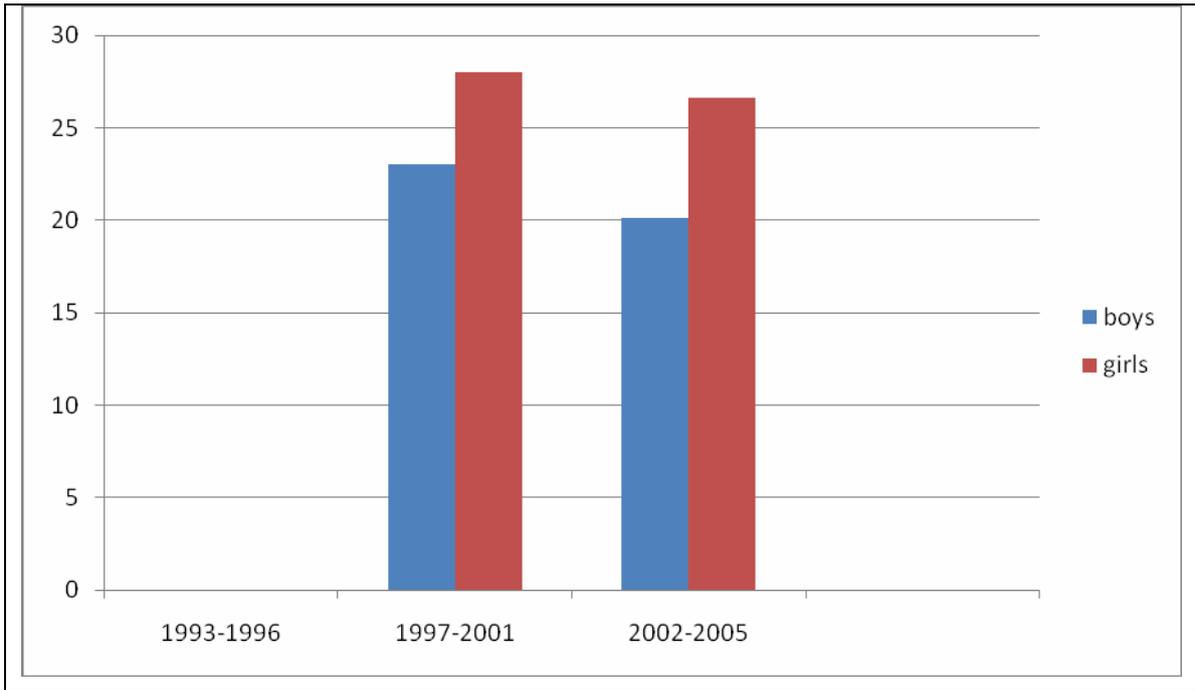
Their reason for including UK is that I am using other data in this thesis based on research in the UK, and it was therefore important to include their smoking statistics.

I included Hungary because they have the highest rate of lung cancer in Europe, and hence I will take a look at their smoking habits.

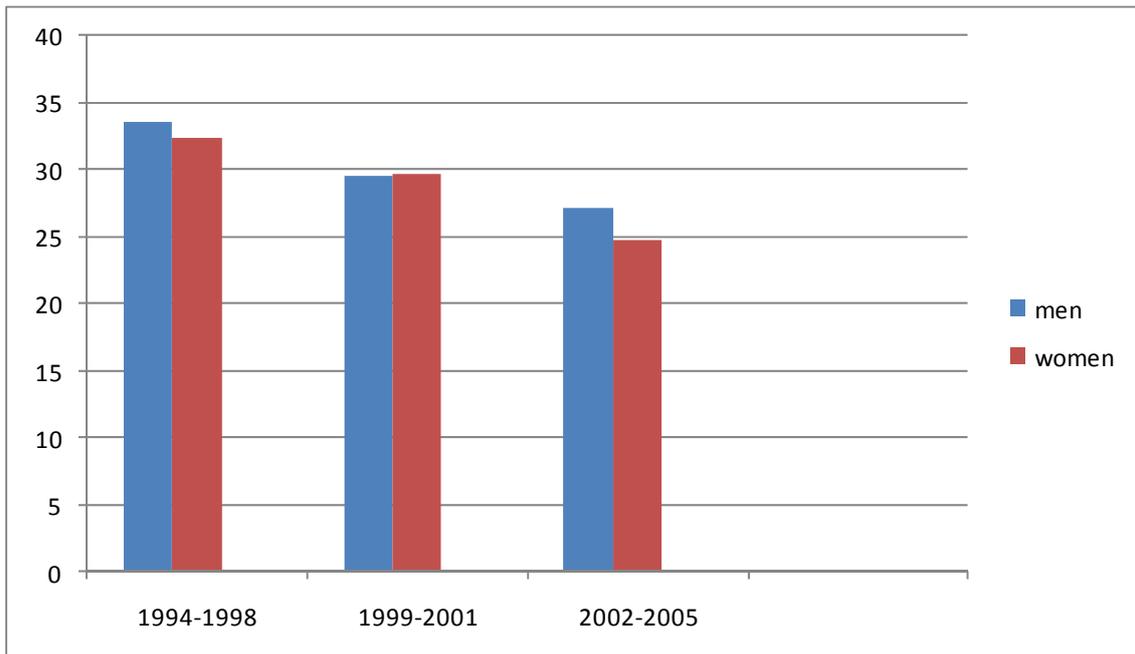
Ireland was the first country in Europe to introduce the smoking ban, and I will see if it had any effect on their smoking habits.

The prevalence will be shown in columns and expressed in percentage.

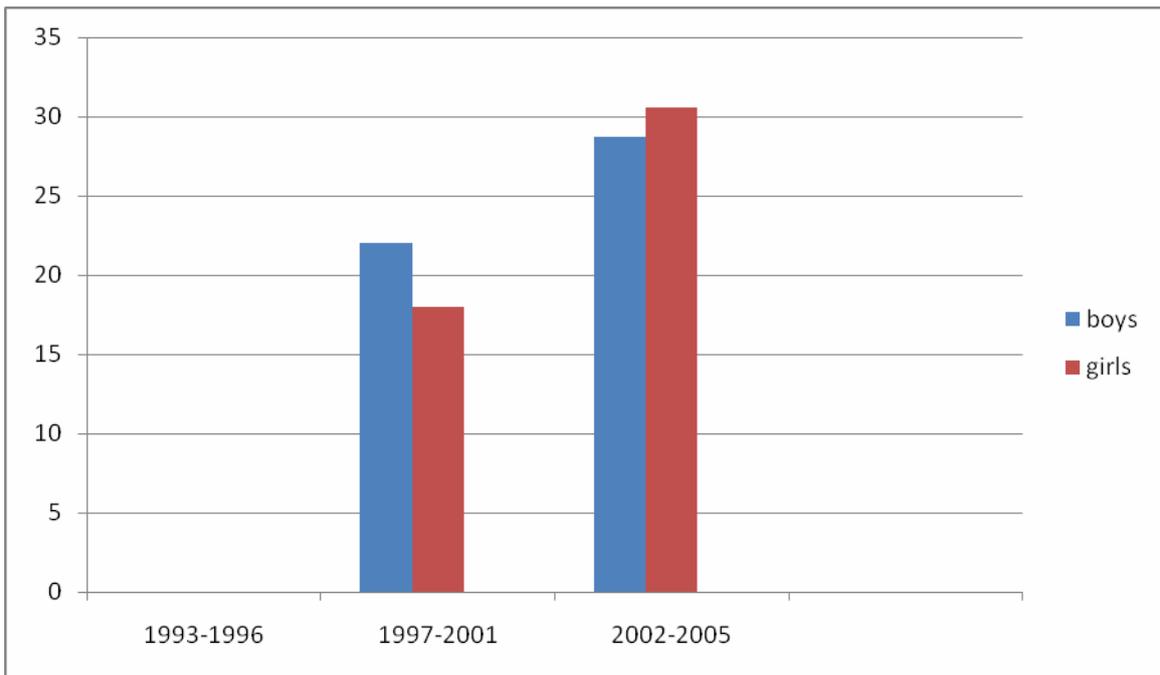
Prevalence of smoking in young people in Norway



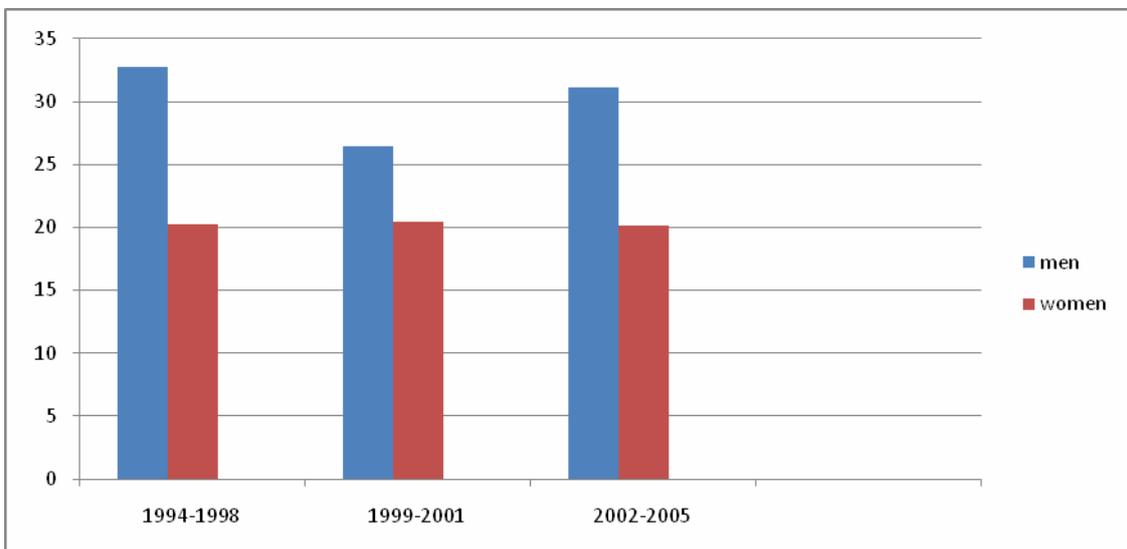
### Prevalence of smoking in adults in Norway



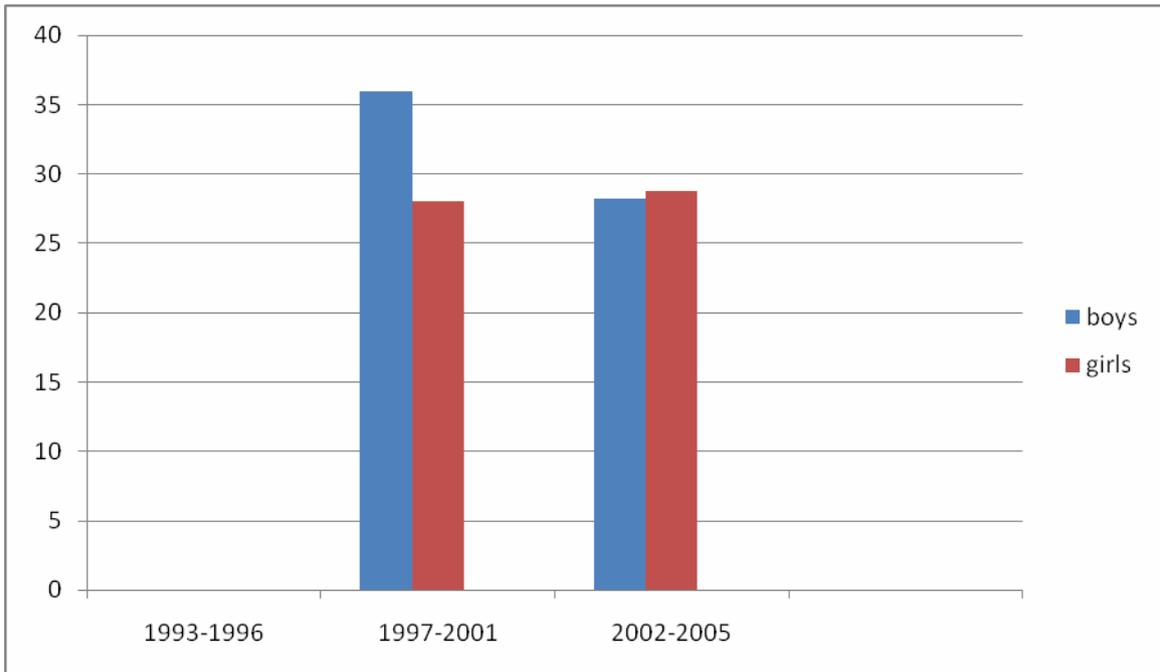
### Prevalence of smoking in young people in Czech Republic



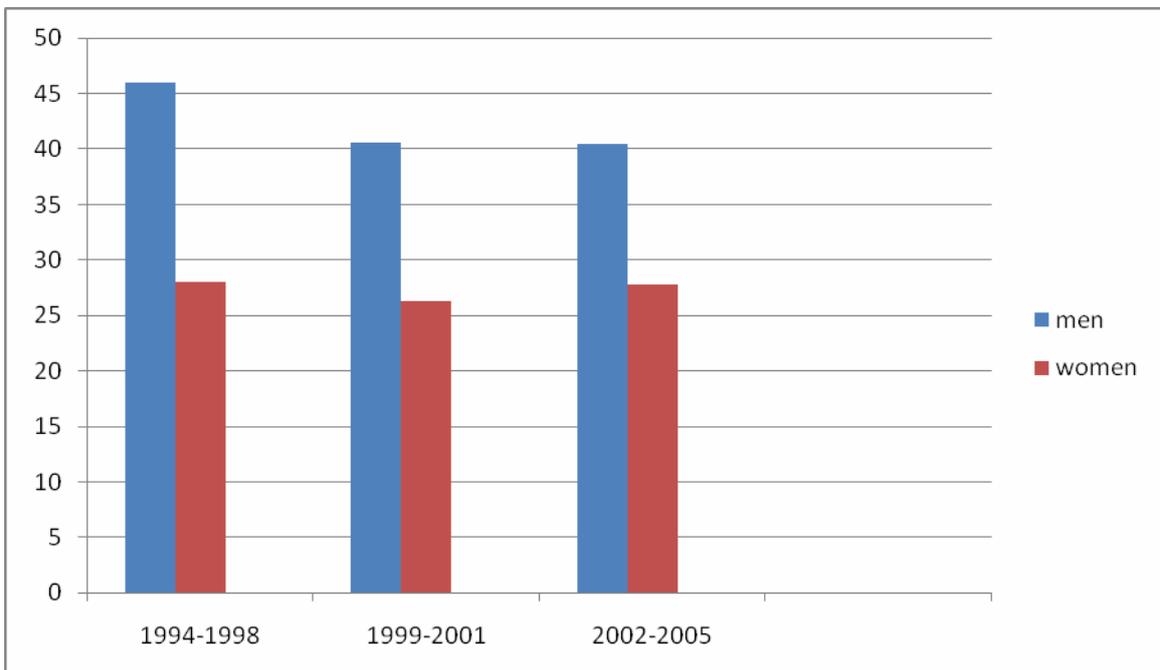
### Prevalence of smoking in adults in Czech republic



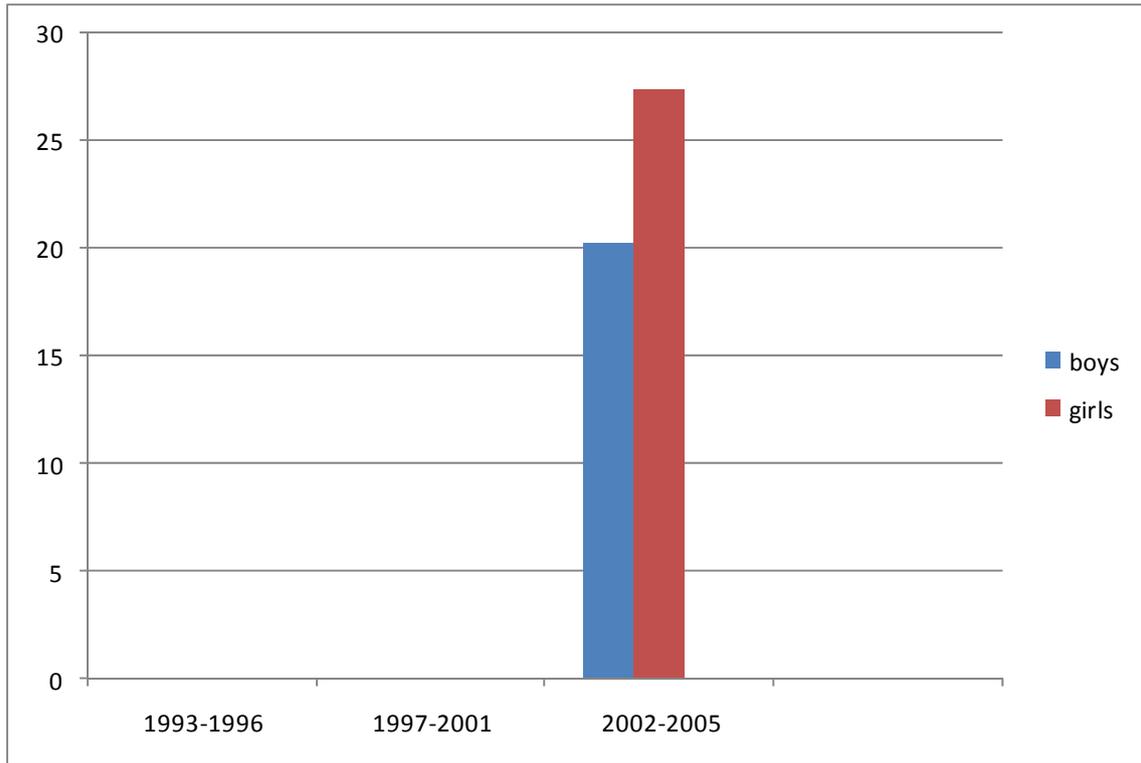
### Prevalence of smoking in young people in Hungary



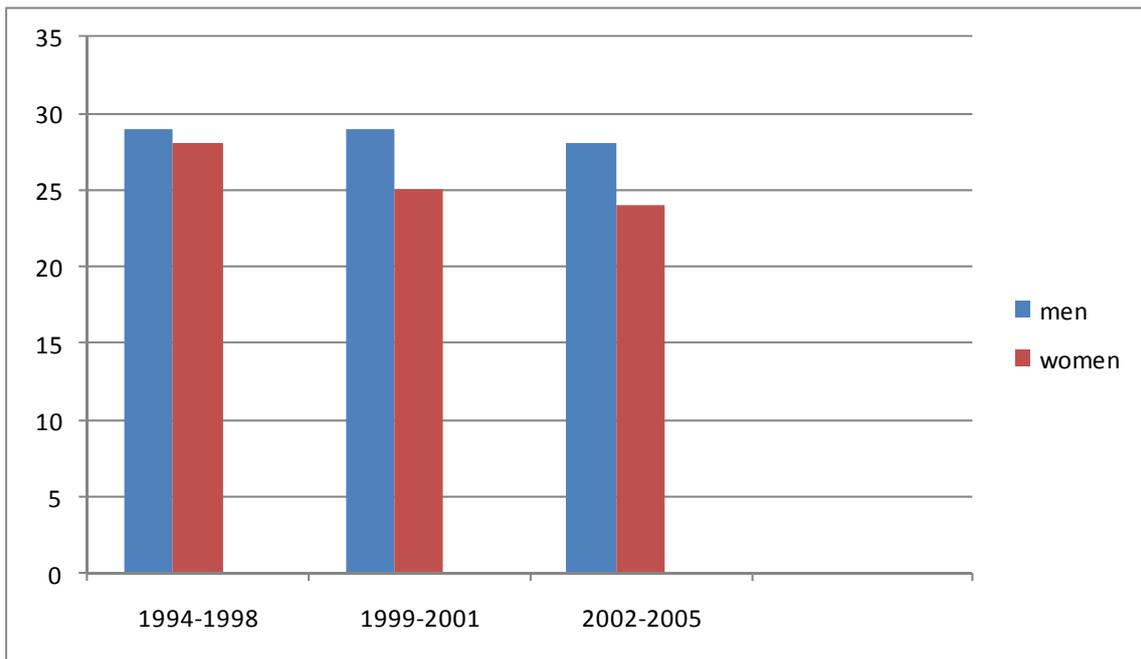
### Prevalence of smoking in adults in Hungary



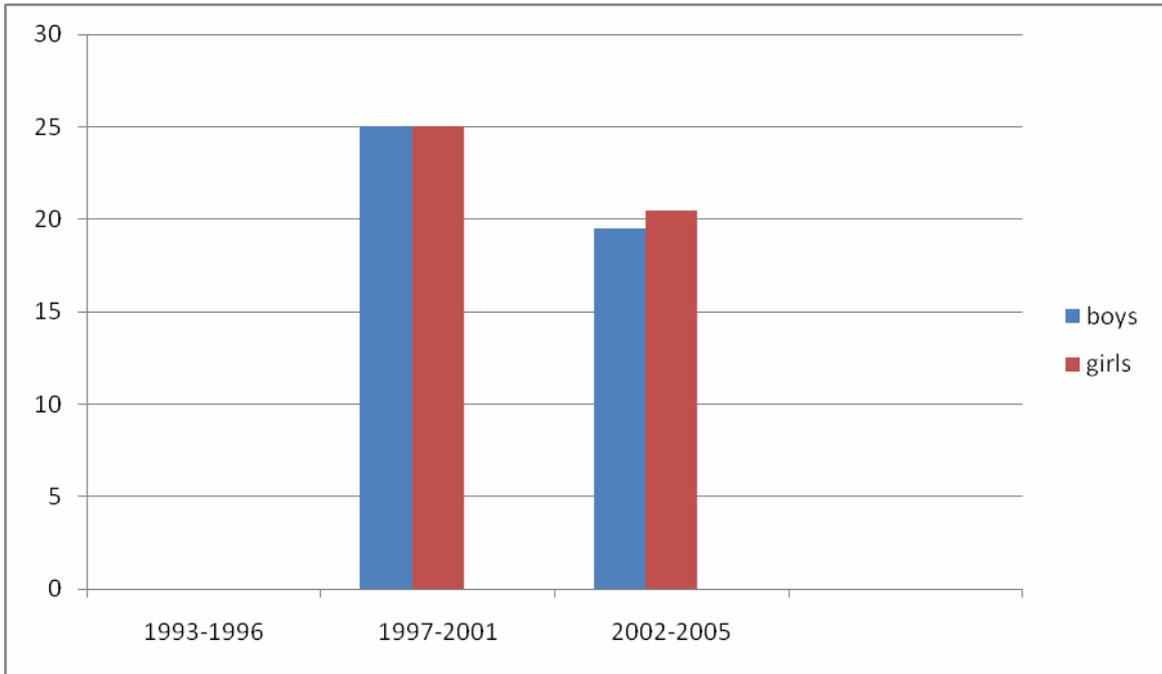
Prevalence of Smoking in young people in Northern Ireland and  
United Kingdom



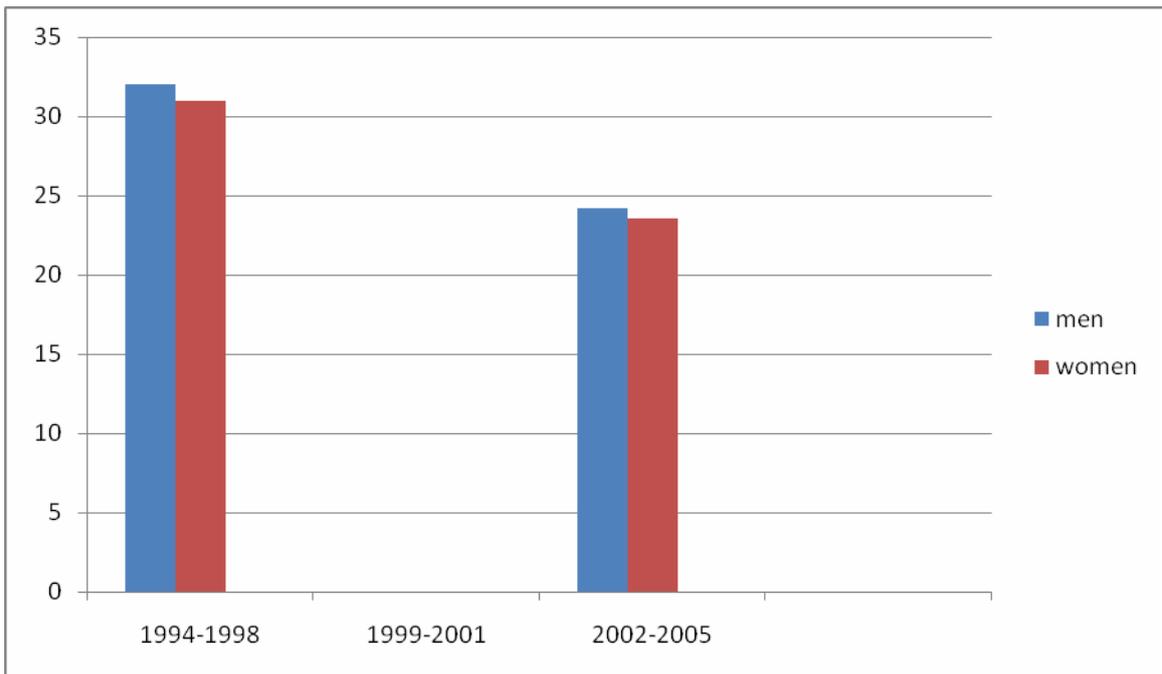
Prevalence of smoking in adults in Northern Ireland and United Kingdom



Prevalence of smoking in young people in Ireland



### Prevalence of smoking in adults in Ireland



## Chapter 6

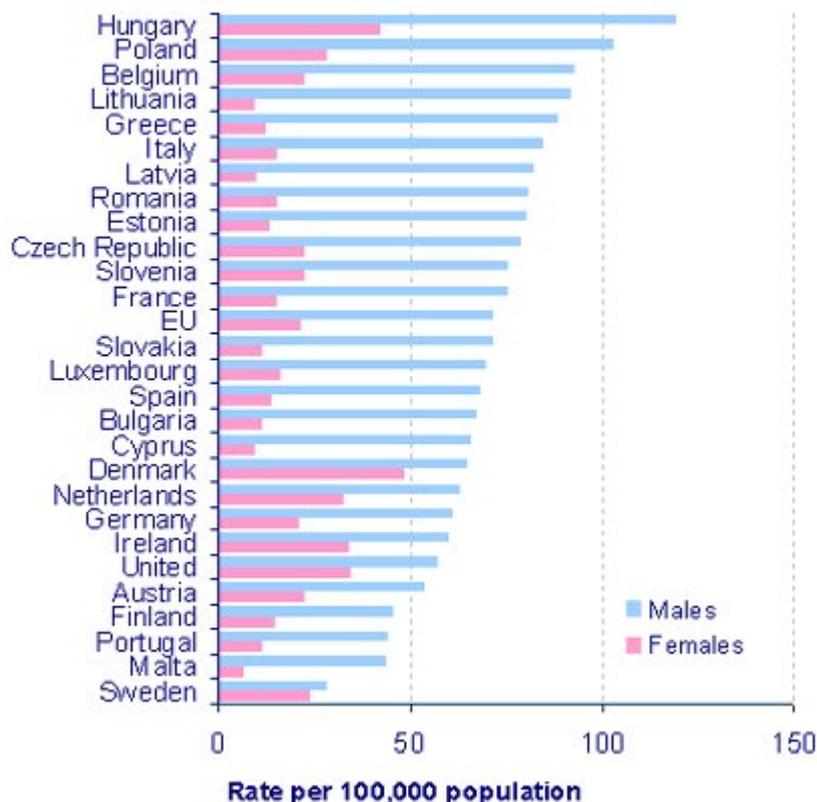
### Cancer statistics

Deaths from cancer of the trachea, bronchus and lung have declined nearly 25% among people aged 25–64 years in the European Region (standardized death rate (SDR)): 29.3 per 100 000 population) since 1990. This decline is particularly steep in commonwealth of independent states (CIS) countries (SDR: 27.7 per 100 000 population) and the central Asian republics and Kazakhstan (CARK) (SDR: 16.2 per 100 000 population), with rates falling by 40–50%. Lung cancer among women, however, has risen dramatically by 40–50% in EU countries (SDR: 18.2 per 100 000 population), particularly the 12 countries joining the EU since 1 May 2004 (SDR: 17.8 per 100 000 population).

Cancer death rates have improved somewhat in the Europe. For example, in the 27 countries with very low child and adult mortality, including Norway and Czech republic, average lung cancer mortality is relatively low in younger age groups and relatively high among the older population. The opposite tends to be true in the eastern part of the Region, while cancer mortality is high in both younger and older age groups in the central part of the Europe. Mortality from lung cancer is steadily rising among women in s75.

(( <http://www.euro.who.int>)

**Figure 1.2: Age-standardised incidence rates, lung cancer, by sex, EU, 2006**



( <http://info.cancerresearchuk.org>)

## UK

It has been estimated that the lifetime risk of developing lung cancer is 1 in 14 for men and 1 in 21 for women in the UK

Until the late 1990s, lung cancer was the most frequently occurring cancer in the UK; in 1997 it was overtaken by breast cancer , but still accounts for around 1 in 7 new cancer cases diagnosed in 2006

	England	Wales	Scotland	N.Ireland	UK
<b>Cases</b>					
<b>Males</b>	18,026	1,299	2,509	547	22,381
<b>Females</b>	13,141	984	2,177	344	16,646
<b>Persons</b>	31,167	2,283	4,686	891	39,027
<b>Crude rate per 100,000 population</b>					
<b>Males</b>	72.3	89.9	101.6	64.1	75.4
<b>Females</b>	50.9	64.7	82.2	38.7	53.9
<b>Persons</b>	61.4	77.0	91.6	51.2	64.4
<b>Age-standardised rate (European) per 100,000 population</b>					
<b>Males</b>	58.3	65.8	81.7	60.8	60.8
95% CI	57.5 59.2	62.2 69.4	78.5 84.9	55.7 65.9	60.0 61.5
<b>Females</b>	35.0	40.9	55.1	31.5	37.1
95% CI	34.4 35.6	38.3 43.4	52.8 57.4	28.2 34.9	36.5 37.6
<b>Persons</b>	45.2	51.9	66.2	44.3	47.4
95% CI	44.7 45.7	49.8 54.0	64.3 68.1	41.4 47.2	46.9 47.9

While there are more cases of lung cancer diagnosed in men, the numbers of women being diagnosed has increased. Lung cancer incidence and mortality rates were among the highest in the world but smoking cessation has lead to record falls, particularly among men.

Lung cancer is rarely diagnosed in people younger than 40, but incidence rises steeply thereafter peaking in people aged 75-84 years .Most cases (85%) occur in people over the age of 60.

In the 1950s the male/female ratio for lung cancer cases was 6:1 but with decreasing male rates and increasing female rates, the ratio is now 4:3 (22,381 male cases and 16,646 female cases in 2006). Overall, 13% of all new cases of cancer are lung cancers.( <http://info.cancerresearchuk.org>)

## Czech Republic

In Czech republic the incidence of lung cancer has increased slightly for the whole population from 1977 to 2007. For men the incidence has decreased slightly, but for women it has in fact increased. (( <http://www.svod.cz>)

## Norway

Lung cancer incidence has increased between 1978 and 2008, although drastically more in females (.[krefregisteret.no](http://krefregisteret.no))

## Ireland

While the number of cases is increasing for both sexes, by 5% annually for women and by 1% for men, the age-standardised incidence rates for men have been falling, while those for women are rising ((<http://ncri.ie>)

## **Chapter 7**

### **Smoking legislation**

#### The Importance of Legislation

Legislation is crucial of an effective tobacco control program. Any comprehensive tobacco control program requires the drafting and adoption of legislation and the introduction of regulations. When a government imposes a comprehensive ban on smoking in all public places it not only protects the public in general, but also declares the will of the society for a smoke free environment. (www.who.int)

#### Ireland goes as an example

Since 29 March 2004 the Irish Government has implemented a ban on smoking in the workplace in Ireland. This means that with effect from that date smoking is forbidden in enclosed places of work in Ireland. This includes office blocks, various buildings, public houses/bars, restaurants and company vehicles (cars and vans). The ban is being introduced as part of the (<http://www.citizensinformation.ie>.)Ireland was the first country in Europe to introduce this law, and since then several countries has followed ( Norway , UK, France, Germany, Sweden, Italy among several other countries).

So did this have any effect on smoking and lung cancer? A report by Ulster Medical journal did a recent lung cancer patterns in younger age-cohorts in Ireland in 2007, 3 years after the smoking ban. The following part will summarize it.

#### Background

Smoking causes 85% of all lung cancers in males and 70% in females. Therefore, birth cohort analysis and annual-percent-changes (APC) in age-specific lung

cancer mortality rates, particularly in the youngest age cohorts, can explain the beneficial impacts of both past and recent anti-smoking interventions.

## Methods

A long-term time-trend analysis (1958-2002) in lung cancer mortality rates focusing on the youngest age-cohorts (30-49 years of age) in particular was investigated in Ireland. The rates were standardised to the World Standard Population. Lung cancer mortality data were downloaded from the WHO Cancer Mortality Database

## Results

The youngest birth cohorts (born after 1965) have almost one-fourth lower lung cancer risk relative to those born around the First World War. A more than 50% relative decline in death rates among those between 35 and 39 years of age was observed in both sexes in recent years. The youngest age-cohorts (30-39 years of age) in males also showed a significant decrease in death rates in 1998-2002 by more than 3% every five years from 1958-1962 onwards. However, death rate declines in females are slower.

## Conclusions

The youngest birth cohorts had the lowest lung cancer risk and also showed a significant decreasing lung cancer death rate in the most recent years. Such temporal patterns indicate the beneficial impacts of both recent and past tobacco control efforts in Ireland. However, the decline in younger female cohorts is slower. This reflects the fact that females smoke less than earlier, but relatively more than men today. A comprehensive national tobacco control program enforced on evidence-based policies elsewhere can further accelerate a decline in death rates, especially among the younger generations.

However, in Ireland, it is premature to use age-specific lung cancer death rates to monitor the early consequences of the nationwide workplace smoking ban that was only introduced in March 2004, and so this will be the same for all the European countries

((<http://www.ncbi.nlm.nih.gov>))

In addition to the smoking ban, other factors that have to be considered is the price of tobacco, anti- smoking campains, education, country etc. Each country will differ a bit due to these differences.

## Hungary

The situation in Hungary is the most dramatic in Europe. Smoking is the most important public health issue in Hungary causing in excess of 28,000 deaths per year. About 3.5 million (out of a population of 10 million) Hungarians smoke. The Hungarian prevalence of lung cancer, index disease of smoking, is the highest in the world in both men and women. In addition, cardiovascular diseases, out of which 45% are directly caused by smoking alone, lead the mortality causes in both sexes.

Moreover, the tobacco epidemic is still spreading. Smoking prevalence among students aged 15-18 increased by 23.8% between 1995 and 1999, and the habit is increasingly taken up at an earlier age. Women's smoking also rose by about 40% between 1986 and 2001. These unfavourable trends predict further increase of burden related to tobacco consumption.

The magnitude of the problem resulted in some measures aimed at limiting the impact of the tobacco epidemic. These legislative measures are, however, to be enforced and further tobacco control regulation is needed if maximum impact is to be achieved. ((<http://www.policy.hu>))

Hungary planned to join the group of countries which have banned smoking in closed public places. However, In 2009, a proposal to ban smoking in most public places including restaurants, bars, etc. was placed on hold ((<http://index.hu>).)

## Czech Republic

*The situation in Czech republic* is that strong tobacco lobby prevents stricter legislative changes. Legislation in the Czech Republic is very tolerant towards smoking in public places, especially in pubs and bars. The country's strong tobacco lobby prevented the adoption of stricter legislative changes in 2008. The Czech Republic is the only EU country not to have ratified the World Health Organization's global tobacco control treaty, the Framework Convention for Tobacco Control (FCTC). Although this situation is not expected to change over the forecast period, tolerance of smoking in public places is gradually declining. This can be attributed both to campaigning by non-profit organisations and to the positive influence of public smoking bans in other countries.

Tobacco is expected to continue its growth in value terms over the forecast period, however volume sales is slightly dropping since 2008 and will experience only mild growth in volume terms over the forecast period. Increase of value sales is largely driven by increased taxation. Volume sales of Czech cigarettes are influenced by increasing illicit trade and the rapidly growing popularity of roll your own tobacco. (<http://www.euromonitor.com>)

## **Chapter 8**

### **Medical overview of lung cancer**

Lung cancer is not one disease but several diseases divided into two main categories:

Small

Cell Lung Cancer (SCLC) and Non Small Cell Lung Cancer (NSCLC). NSCLC account for 85 per cent of all cases of lung cancer. Lungcancer is a preventable disease and most cases are caused by smoking. There are few, if any, symptoms in the early stages and most patients are diagnosed with tumours which are already incurable.

#### **Lung cancer tumours**

There are three types of NSCLC:

- Adenocarcinomas are often found in an outer area of the lung.
- Squamous cell carcinomas are usually found in the centre of the lung by an air tube (bronchus).
- Large cell carcinomas can occur in any part of the lung. They tend to grow and spread faster than the other two types.

There are five defined stages of lung cancer:

Stage 0 - the cancer has not spread beyond the inner lining of the lung

Stage I - the cancer is small and has not spread to the lymph nodes

Stage II - the cancer has spread to some lymph nodes near the original tumour

Stage III - the cancer has spread to nearby tissue or spread to far away lymph nodes

Stage IV - the cancer has spread to other organs of the body such as the other lung, brain, or liver.

Stages I-III are often further divided into A and B to reflect differences within the stages.

## Aetiology

80 to 90 per cent of NSCLC cases are caused by smoking, and about 10 per cent of life long smokers develop lung cancer. There are at least 40 components of tobacco smoke that are highly carcinogenic (cancer inducing) and all forms of tobacco smoke, cigarette, cigar, pipe, are equally dangerous. Filtered cigarettes seem to have changed tumour location in the lungs, as filters let smaller particles through. Smoking filtered cigarettes is also associated with more vigorous inhalation. Passive smoking has been identified as the cause of about 25 per cent of NSCLC cases in non-smokers . Other environmental factors as asbestos, silica fibre and radon exposure have also been shown to increase the risk of developing NSCLC. In addition, there seem to be genetic factors that predispose for, as well as protect against, NSCLC.

## Screening programmes, clinical presentation & diagnostic tests

The early stages of NSCLC are often asymptomatic. These tumours are often found when a chest X-ray examination is carried out for other reasons. Patients with more advanced tumours often present with fatigue, cough, dyspnoea, pneumonia, pain and weight loss.

Diagnostic tests include bronchoscopy with biopsy, or fine needle biopsy, spirometry and Computerized Tomographic (CT) scans to establish operability and spread to local lymph glands or other organs. Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI) examinations are also being increasingly used. There are no reliable blood tumour markers presently available.

85 per cent of patients are currently diagnosed with tumours in advanced, incurable stages.

Screening programmes could therefore have a pivotal role in increasing cure rates. Most of the studies performed so far have not found any evidence of screening benefit. Although in one recent study the value of yearly CT-screening of people at risk for lung cancer was evaluated in a study of over 30,000 people. It showed that 85 per cent of the tumours detected were in a curable stage of the disease

## Prognosis

Prognosis depends mainly on the stage of the tumour at diagnosis. With the exception of a small number of early-stage localised cancers, which can be cured with surgery or sometimes loco-regional radiotherapy, there is no cure. Patients with small tumours, below 3 cm in diameter without metastasis, have a 5-year survival rate of 70 per cent. Patients with larger tumours, with local lymph gland involvement, have a 5-year survival rate as low as 10 per cent. Most patients with metastases to other organs die within 6 months and less than 5 per cent of these patients survive 5 years. Patients with smoking-related NSCLC also have an increased risk of developing second malignancies.

([http://www.comparatorreports.se/Lung\\_cancer\\_benchmarking](http://www.comparatorreports.se/Lung_cancer_benchmarking))

While cigarette smoking has been linked to all four types of lung cancer, adenocarcinoma, is the most common type in non-smokers and a rise in incidence has been reported in the USA and other countries.

In the USA, adenocarcinoma is now the most common type of lung cancer. In Europe the most common type of lung cancer is still squamous cell carcinoma despite increases in the incidence of adenocarcinoma . The increasing incidence of adenocarcinoma has been linked to low-tar cigarettes. Other factors such as poor diet, exposure to industrial carcinogens and air pollution may also contribute.

(<http://info.cancerresearchuk.org>)

Lung cancer incidence rates vary hugely between different regions of the world. The highest rates of lung cancer in men are found in Europe, especially central and Eastern Europe, and northern America. Within Europe the countries with the highest male rates are Hungary and Poland and the lowest in Sweden and Malta.

(<http://info.cancerresearchuk.org>)

## **Chapter 9**

### **Lung cancer mortality**

Cancer is the group of diseases causing the second highest number of deaths in Europe after cardiovascular diseases.

The survival rates for lung cancer patients in Europe are low. Almost 90 per cent of those diagnosed die within 5 years. Lung cancer is less common in women and the survival rate in women is slightly higher .

As with incidence, the mortality rates are generally higher in Eastern Europe compared to Western and Northern Europe . Because of the low survival rates the mortality figures follow incidence. The mortality rates are high in the Eastern European countries of the Czech Republic (48.2 deaths), Hungary (72.3 deaths) and Poland (56.9 deaths), but are also high in the Western European countries of Belgium (57.3 deaths), Denmark (49.8 deaths) and the Netherlands (48.8 lung cancer deaths per 100,000 inhabitants). The lowest mortality rates are found in Finland, Portugal and Sweden with less than 30 cases per 100,000 inhabitants.

The incidence, and hence the mortality, in lung cancer mirror smoking habits over several decades. In most countries, the mortality rates reached a peak in the late 1970s and 1980s and have since decreased . In the Eastern European countries the peak came in the 1990s . This trend has primarily followed mortality in males but is kept up by increasing mortality rates among women in all countries. In Norway, Portugal and Sweden the increasing mortality in females has led to a still increasing overall mortality rate.

(([http://www.comparatorreports.se/Lung\\_cancer\\_benchmarking](http://www.comparatorreports.se/Lung_cancer_benchmarking))

## Conclusion

Smoking is something that has negative health consequences for people who are active smokers and passive smokers. Smoking is a contributing factor to many diseases, and the most known is lung cancer. Lung cancer is maybe the most preventable disease we know of, and still people choose to smoke. There are complex reasons to explain this. Among others are the addictive nature of cigarettes and the lobbyism of the tobacco industry.

Lung cancer rates have gone up in Europe, but it is important to note that lung cancer affects the older age groups, and it is for the future to see what impact the smoking legislation and the decreasing smoking rates among young will have on the lung cancer statistics.

If the trend continues where women smoke more or the ratio of male to female smokers decrease we should see less or no decrease in lung cancer statistics for women.

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