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Smoking and cancer

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Introduction This factsheet reviews the risks of developing various types of cancer from smoking or other tobacco use. It is estimated that one in three people in the UK will develop cancer at some stage in their lives and that one in four will die from the disease.¹ Smoking is the biggest risk factor for and largest single cause of cancer² and approximately one third of all cancer deaths are attributable to smoking.³ Globally, one in five cancer deaths are caused by tobacco.⁴

In October 2009, scientists from 10 countries met at the International Agency for Research on Cancer (IARC) to reassess the carcinogenicity of several compounds, including tobacco. The review, published by The Lancet Oncology, concludes that there is sufficient evidence to confirm that smoking is a cause of 15 types of cancer: namely: cancer of the bladder, bone marrow (myeloid leukaemia, cervix, colorectum (large bowel), kidney, larynx (voice box), liver, lung, mouth (including lip and tongue), nose, oesophagus (gullet), ovaries, pancreas, pharynx (throat) and stomach.² The report also states that there is some evidence to suggest that smoking is a cause of breast cancer. The findings are due to be published as part E of Volume 100 of the IARC Monographs.

Lung cancer Lung cancer has been the most common form of cancer in the world for a number of decades, accounting for 1.61 million new cases and 1.38 million deaths every year.⁵ Until recently, lung cancer was also the most frequently occurring cancer in the UK but it has now been overtaken by breast cancer.⁶ In 2007, 39,470 people were diagnosed with lung cancer and around 35,260 died of the disease in 2008.

Lung cancer is the cancer most commonly associated with smoking: around 85-90% of all lung cancers are caused by smoking, or as a result of exposure to secondhand smoke. Because of its poor prognosis, lung cancer is still the most common cause of cancer death, responsible for around 1 in 5 of all cancer deaths in the UK. Fewer than ten percent of people with lung cancer will survive five years beyond diagnosis.⁷

One in two persistent smokers will die of a smoking-related illness: of these, nearly one in four will die of lung cancer. Current smokers are fifteen times more likely to die from lung cancer than life-long non-smokers.⁸ The risk of dying from lung cancer increases with the number of cigarettes smoked per day, although duration of smoking is the strongest determinant of lung cancer in smokers.⁹

-) Smokers who start when they are young are at an increased risk of developing lung cancer. Results of a study of ex-smokers with lung cancer found that those who started smoking before age 15 had twice as many cell mutations as those who started after age 20.¹⁰

A longitudinal study of British doctors by Doll and Peto examined the effects of prolonged cigarette smoking and prolonged cessation on mortality from lung cancer.¹¹ They found that if people who have been smoking for many years stop, even well into middle age, they avoid most of their subsequent risk of lung cancer. Also, stopping smoking before middle age avoids more than 90% of the risk attributable to smoking. However, many smokers diagnosed with lung cancer continue to smoke even after treatment, with estimates ranging from 13% to 60%.¹²

See also: [ASH Fact Sheet on: Smoking & Respiratory Disease](#).

Cancers of the mouth and throat

Cigarette, pipe and cigar smoking are all major risk factors for cancers associated with the larynx, oral cavity and oesophagus^{13 14} The risk for these cancers increases with the number of cigarettes smoked¹⁵ and those who smoke pipes or cigars experience a risk similar to that of cigarette smokers.¹⁶ It has been estimated that smoking is a cause of 85% of deaths from oral cancer (cancers of the lip, tongue, mouth and throat) amongst men in industrialised countries.¹⁷ In total, 5,410 new cases of oral cancer were recorded in the UK in 2007.¹⁸

Also see: [ASH Research Report Tobacco and Oral Health](#).

Heavy smokers have laryngeal cancer mortality risks 20 to 30 times greater than non-smokers.⁴⁰ People who combined alcohol and tobacco use have a much higher risk of oral and pharyngeal (throat) cancers than those using tobacco or alcohol individually.¹⁹

Smokeless tobacco, including chewing tobacco and snuff, has been associated with oral cancer for many decades.¹⁴ While the risk is considered small in comparison to smoking, a risk exists nevertheless.^{20 21 22 23} A US study comparing mortality rates among former smokers who switched to smokeless tobacco with those who stopped using tobacco altogether found that risks of dying from major tobacco-related diseases were higher among former cigarette smokers who switched to oral tobacco after they stopped smoking than among those who stopped using tobacco entirely.²⁴

Bladder cancer

Tobacco smoking is the principal preventable risk factor for bladder cancer in both men and women.²⁵ The European Network of Cancer Registries states that bladder cancer is the 7th most common form of cancer amongst men and 14th amongst women and cites cigarette smoking as the principle risk factor.²⁶ According to Cancer Research UK, the risk of developing bladder cancer is six times higher in current smokers than in people who have never smoked.²⁷ As with lung cancer, the risk is associated with both the dose and duration of smoking, while cessation of smoking reduces the risk, returning to that of a non-smoker after 15 years.^{28 29}

Breast cancer

Most older studies found no association between smoking and breast cancer, but new evidence suggests that there is a link between nicotine and breast cancer. Researchers found that nicotine enhances the growth of breast cancer cells which means that smoking could be causally related to breast carcinogenesis and also that nicotine could directly contribute to the molecular mechanism of carcinogenesis.^{30 31}
³² Other studies suggest that the increase in breast cancer risk mostly affects premenopausal women.^{33 34 35}

Colorectal/Colon cancer (large bowel)

The recent IARC update (2010) concludes that smoking is a cause of colon cancer.^{36 37} These findings are echoed by the World Health Organization³⁸ and the Journal of the National Cancer Institute.³⁹ There is some disagreement about the degree of risk and further research is needed to clarify the relative risk of smoking and colon cancer.

Kidney cancer

Kidney cancer accounts for just under 3% of all cancers in men and just under 2% in women living in the UK. Although comparatively rare, kidney cancer has consistently been found to be more common in smokers than in non-smokers and there is sufficient evidence to show that smoking is a risk factor for the two principal types of kidney cancer.⁴⁰

According to Cancer Research UK, smokers are twice as likely to develop kidney cancer than non-smokers. There is a dose-response relationship with an increase in the numbers of cigarettes smoked per day. Risk appears to drop after smoking cessation.^{41 42} Approximately 24% of kidney cancer cases in men and 9% in women can be attributed to smoking.⁴³

Leukaemia

Smoking has been found to be a cause of myeloid leukaemia but not lymphoid leukaemia in adults.⁴⁴ There is some evidence to suggest that parental smoking can increase the risk of Acute Lymphoblastic Leukaemia (ALL) in children (see below).

Researchers have estimated that smokers have between a two and three fold increased risk of developing Acute Myeloid Leukaemia and that smoking may account for up to 17% of cases in the UK. A possible reason for this is the presence of benzene in cigarette smoke.⁴⁵

A study in the US estimated that 17% of myeloid leukaemia cases are caused by cigarette smoking.⁴⁶ Estimates of increased risk due to cigarette smoking vary by leukaemia sub-type, with up to a two-fold increase in risk for chronic myeloid leukaemia.⁴⁷

Liver cancer

Large case-control studies have demonstrated an association between smoking and risk of liver cancer. In many studies, the risk increases with duration of smoking or number of cigarettes smoked daily. Confounding from alcohol can be ruled out in the best case-control studies by means of careful adjustment for drinking habits, as association with smoking has also been demonstrated among non-drinkers. The IARC review concludes that "there is now sufficient evidence to judge the association between tobacco smoking and liver cancer as causal".⁹

A large-scale study carried out in China which examined whether smoking was a co-factor in the development of liver cancer found there was a 36% excess risk of death amongst smokers and that one in seven of all liver cancer deaths in China could be attribute to smoking (around 50,000 per year).⁴⁸

People who have a Hepatitis B or C infection have a higher risk of liver cancer if they smoke. Some studies have estimated this risk to be one hundred times higher compared to non-smokers who are not infected with the virus.⁴⁹

Researchers investigating the relationship between liver cancer and cigar smoking reported a seven-fold increase in risk.⁵⁰ A separate study found a three-fold increase in risk for current cigar or pipe smokers.⁵¹

Nasal cancer Smoking has been found to increase the risk of cancer of the nose and sinuses, particularly for squamous-cell carcinoma.⁵² Cancer Research UK notes that even though nasal cancer is rare, smoking significantly increases the risk of developing the disease.⁵³

A case-controlled study carried out in the United States found that heavy smokers had a two-three fold increased risk of nasal cancer and that there was an increased risk associated with snuff use.⁵⁴

Oesophageal cancer (gullet) Tobacco smoking is a cause of cancer of the oesophagus (gullet).⁵⁵ Tobacco and alcohol, acting independently and together, are the main risk factors for squamous cell carcinoma of the oesophagus in Western countries.⁵⁶ The risk increases with the number of cigarettes smoked and duration of smoking and also remains elevated many years after smoking cessation.⁹

Ovarian cancer Ovarian cancer is the fifth most common cancer in women in the UK and the most common gynaecological cancer.⁵⁷ It has recently been included in the IARC list of cancers caused by smoking.²

Smoking doubles a woman's risk of a particular sub-type of the disease: mucinous ovarian cancer. Stopping smoking returns the risk to that of nonsmokers in the long term.^{57 58}

Pancreatic cancer Cancer of the pancreas is a rapidly fatal disease with a five-year survival rate of only 4%. The disease is caused by damage (mutations) to the DNA, with smoking a significant risk factor.⁵⁹ Cigarette smoking is estimated to cause 20% of cases of pancreatic cancer in the UK.⁶⁰

Risk of the disease is related to consumption and duration of smoking. People smoking up to 25 cigarettes per day have about twice as high a risk for this cancer as non-smokers whereas people smoking more than 25 cigarettes per day have three times the risk.⁶¹ The risk diminishes to that of a non-smoker ten years, on average, after cessation. Regular cigar smokers have a 60-80% increased risk^{62 60} and the use of smokeless tobacco also carries an increased risk.⁶³

Cigars, pipes and chewing tobacco are also known to increase the risk of developing pancreatic cancer. Researchers based in Scandinavia found that snus (a type of smokeless tobacco) increased the risk of pancreatic cancer. These researchers found that around 1 in 5 cases of pancreatic cancer in Swedish men may be due to smokeless tobacco.⁶¹

Stomach cancer Stomach cancer has been in decline in recent years but remains the fourth most common cancer in the world and the second most common form of cancer death.⁶⁴ Studies have shown a consistent association between cigarette smoking and cancer of the stomach in both men and women. Cancer Research UK estimates that around 20% of stomach cancers in Europe are caused by smoking.⁶⁵

Current smokers have around double the risk of stomach cancer compared to nonsmokers and risk remains higher for 10-20 years after quitting smoking.⁶⁵ Risk increases with duration of smoking and number of cigarettes smoked, and decreases with increasing duration of successful quitting.⁹

Vulva and vagina cancers There is an association between smoking and cancer of the vulva, with reported three- to six-fold increases in risk in women who smoke. Risk increases with the number of cigarettes smoked and duration of smoking, and remains elevated more than five years after quitting. There is some evidence that smoking raises the risk of cancer of the vagina although this association remains uncertain.⁶⁶

Passive smoking Non-smokers are at risk of contracting lung cancer from exposure to other people's smoke. The UK's Scientific Committee on Tobacco and Health (SCOTH) reported an increased risk of lung cancer in non-smokers of between 20% and 30%.⁶⁷ A subsequent review of the evidence by SCOTH in 2004 re-confirmed that the increased risk was in the order of 24%.⁶⁸ This means that passive smoking causes several hundred lung cancer deaths in non-smokers each year in the UK.

Adults

The 2004 IARC review confirmed that “the evidence is sufficient to conclude that involuntary smoking is a cause of lung cancer in never smokers.”⁹ The 2010 IARC update reports limited evidence showing an association between exposure to secondhand smoke and cancers of the larynx and pharynx.²

Exposure to secondhand smoke has been linked with bladder cancer.⁶⁹

Children

A report by the British Medical Association found suggestive evidence that exposure to secondhand smoke can cause childhood cancer (in particular brain cancer and lymphoma). It can also lead to cancer in adulthood.⁷⁰

Children who are exposed to tobacco smoke on a daily basis grow up with more than triple the risk of lung cancer later in life compared to those who grow up in smokefree environments.⁷¹

A study in Sweden released in 2006 has shown that parents who smoke are greatly increasing their child's risk of developing several types of cancer. Similar risks for exposure by mothers and fathers smoking were found for lung cancer (71%), and upper aerodigestive cancer (45%). There was an 8-fold increased risk of developing nasal cancer (nasal adenoid cystic carcinoma) by exposure to SHS from either parent during childhood.⁷²

A further study in the United States found a positive association between maternal smoking and the development of pancreatic cancer later in life amongst children exposed to maternal smoking.⁷³

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