

• SMOKING AND CANCER

What is cancer? It is a group of many different diseases that have some important things in common. They all affect cells, the body's basic unit of life. To understand cancer, it is helpful to know about normal cells and about what happens when cells become cancerous.

The body is made up of many types of cells. Normally, cells grow and divide to produce more cells only when the body needs them. This orderly process helps keep the body healthy. Sometimes cells keep dividing when new cells are not needed. A mass of extra tissue forms, and this mass is called a growth or tumour. Tumours can be benign or malignant.

- Benign tumours are not cancer. They often can be removed and, in most cases, they do not come back. Cells in benign tumours do not spread to other parts of the body. Most important, benign tumours are rarely a threat to life.
- Malignant tumours are cancer. Cells in malignant tumours are abnormal and divide without control or order. These cancer cells can invade and destroy the tissue around them. Also, cancer cells can break away from a malignant tumour and enter the bloodstream or lymphatic system. This process is how cancer spreads from the original (primary) tumour to form new tumours in other parts of the body. The spread of cancer is called metastasis.

Is it greater the risk of getting cancer if one smokes? Despite many years of intensive study, aimed at seeing if there is a relationship between smoking and cancer, most of the more recently published scientific papers on the subject still

conclude that more research will be needed before firm conclusions can be reached.

The literature on smoking during the last two decades has been voluminous, but we have now reached a point where not only the environment is an issue but its consequences in the health of smokers and non-smokers.

The long latent period for tumour expression following tobacco smoke exposure, estimated to be in the order of two decades (Horton, 1988), renders current ETS exposure only indirectly correlated to tumour incidence. Furthermore, extrapolation of exposure data gained in one nation to epidemiological studies in another is a further source of difficulty in evaluating multiple studies.

It is noteworthy that, with the exception of lung cancer, tumour types reported to be associated with active smoking, carcinoma of the oral cavity, pharynx, larynx, oesophagus, bladder, pancreas and kidney (renal pelvis) have shown no evidence of increase over control incidence following ETS exposure. However, in this report we are going to study the evidence in order to support or reject this idea.

Lung cancer is the number one cause of cancer death in the United States for both men and women alike. Approximately 100,000 men and 60,000 women die of lung cancer each year. The number of women dying from lung cancer is on the rise due to the increased number of women smoking over the past 30 years.

Cigarette smoking is the main cause of lung cancer with about 90 percent in men and 70 percent in women who are diagnosed with lung cancer can trace the cause to cigarette smoke. We assume, as the correlation coefficient is quite high that the more a person smokes, the greater the risk of lung cancer. Lung cancer is relatively uncommon in non-smokers, but cancer that originated in other parts of the body can metastasise (spread) to the lungs. If you are a smoker who smokes a pack of cigarettes a day, you have a 20 percent greater chance of developing lung cancer than those who have never smoked. If you smoke two packs a day,

you have a 60 to 70 percent greater chance of developing lung cancer compared to a non-smoker.

The correlation coefficient is not a sub estimation and predictions could be done, as the regression line is a good representation of the population. There are no outliers.

Misclassification of disease:

It was found (Faccini, 1989) that some studies were based upon cases which had all been microscopically confirmed as being lung cancer and just half of them had a pathologist as a co-author who confirmed the microscopic diagnoses. The other studies were based upon hospital records, death certificates, censuses or cancer registries. The possibility of misclassification of metastatic lung cancers from other tissues being wrongly classified as primary lung cancers was not seriously taken into consideration by authors of most studies. This study could also have been affected, as readings could be wrong.

Kidney cancer is often associated with active smoking but there is no evidence of any relationship between them. However, there is a form of kidney cancer called Transitional cell cancer (carcinoma), which affects the renal pelvis and because of its similarity to cancer that occurs in the bladder, it is thought that smoking is one of its main causes.

The correlation coefficient shows that there is a weak relationship between the two variables. It can be due to the statement above. Moreover, Carcinoma is not a very common form of kidney cancer so as the percentage of other forms of cancer is bigger, the correlation is smaller.

The regression line is not as a good representation of the population as the lung cancer's. There are no outliers.

Misclassification of disease:

Because Carcinoma is so similar to cancer that occurs in the bladder and it is often treated like bladder cancer, sometimes doctors diagnosticate bladder cancer when it is actually kidney cancer and as the results of the treatment are similar they do not realise the mistake.

Furthermore, kidney cancer symptoms could be taken as other, less serious problems such as an infection. This can lead to a wrong diagnostic and recorded in hospital's files, The National Research Council and The National Cancer Institute where the data study in this report was taken from, altering in this way results and conclusions.

Leukaemia is a disease of the white blood cells, which are the cells in the blood which help to fight disease and infection. White blood cells are produced in the bone marrow. Bone marrow is a substance in the bones which makes white blood cells, red blood cells (which are responsible for delivering oxygen and other substances throughout the body), and platelets (which help the blood to clot). The long bones and the sternum are the bones in the body that are responsible for blood production.

In a person with leukaemia, the white blood cells become too numerous and do not fully mature. They can become so numerous that they crowd out the other substances being created in the marrow. If the body does not produce enough red blood cells, anaemia may develop. If there are not enough platelets, the blood will not clot as efficiently and bruising and bleeding will occur more easily. These under developed white blood cells can also build up in various organs in the body causing them to swell.

What causes these white blood cells to become irregular is still a mystery. Radiation, some toxins such as benzene, and some chemotherapy agents are thought to be a possible factor in the cause of these irregularities, according to the Healthy Answers' health information.

Adult exposure to ETS has not yield any evidence for increased tumour risk for leukaemia. On the other hand, childhood exposure indicated a 1.5 fold rise in children of smoking mothers and a 2.6 fold rise in children of smoking fathers. The period of possible exposure to the constituents of ETS or its metabolites may begin in uterus or in early neonatal period where breast-fed babies of ETS exposed non-smoking and smoking mothers have been shown to have urinary cotinine excretion related both to intake of breast milk as well as ETS.

Even though there is no relationship between leukaemia as a consequence of smoking, it can be seen in the correlation coefficient. Therefore, the regression line is not a good representation of the population and should not be used to predict.

About 25,000 people are diagnosed with leukaemia each year. It is often thought of as a children's disease, but according to the Leukaemia Society of America, leukaemia strikes 10 times as many adults as children and more than half of all people diagnosed with leukaemia are age 65 and older. As what causes leukaemia is not known, and only children have risk (very small) of getting it from a parent smoker, the correlation is extremely small and therefore not taken into account.

Misclassification of disease:

There is no problem with leukaemia diagnostics so it is not a fact that could alter the readings.

The correlation between the two variables is very high, therefore it can be said that smoking is the number one risk factor and underlying cause of about half of all new cases of bladder cancer.

The regression line is a very good representation of the population so predictions may be made. There are no outliers.

Misclassification of disease:

Bladder cancer is often first detected through blood that shows up in the urine. Later symptoms include pelvic pain, burning during urination, a frequent, urgent need to urinate, or even a difficulty in voiding urine. These symptoms are similar to those of a bladder infection, but if the symptoms do not disappear when treated for an infection, bladder cancer may be suspected.

As problems with diagnostics have been made during the past years and still go on, this could have altered the data.

3. CONCLUSION

We have analysed different types of cancers related to the habit of smoking. After analysing the data, correlation coefficients and regression lines, it can be seen whether there is a relationship or not. On the other hand, it is not enough, therefore doing a one-tail test is very important in order to find out what percentage of the population lies on that results.

Bladder and lung cancer are mainly smoking consequences, as long as metastases is not involved. The more a person smokes, the bigger the risk is of getting these sorts of cancers. Kidney cancer, although is not as related with smoking as bladder and lung cancers, it is also a smoking consequence. However, all three results are very representative, as less than 0.5 percent of the population lies out of values found.

On the contrary, the result found for the relationship between leukaemia and smoking is not reliable for predictions, as more than 10 percent of the population lies out of the parameters; the correlation actually shows that this kind of cancer is not a smoking consequence.

Although the reported relationships between some tumour types unassociated with active smoking also suggest a false positive finding, some theoretical explanations, such as the different chemical composition of side-stream smoke and nasal rather than oral route of inhalation, may also be relevant.

Day by day more people are dying of cancer. There are many different opinions about whether smoking should be banned on public places or not, as they are

also affecting non-smokers. Studies should continue, and the problem is not to find which illnesses are caused by smoking but if people would give up smoking for health sake.

It has been proven beyond any shadow of doubt that

smoking is a preferred cause of statistics.

Anonymous

Smoking and Common Sense

4. CHECKING VALUES

The graphs and regression lines were done in Microsoft Excel. Following the next 7 steps:

- The data was entered.
- The Chart Wizard icon was selected (tool bars).
- The XY (scatter) option and the graph without lines on it were selected.
- The data range is entered.
- Give names to the x and y axes.
- Click with the right button of the mouse on the data dots and select add trendline.
- Select on type: Linear type of graph and on options: display equation on chart and display R-squared value on chart.

The values given by the computer were as follows:

◆ Relationship between smoking and bladder cancer:

$$R^2 = 0.4951 \quad R = 0.7036$$

$$y = 0.1218x + 1.0861$$

◆ Relationship between smoking and lung cancer:

$$R^2 = 0.4864 \quad R = 0.6974$$

$$y = 0.5291x + 6.4717$$

- ◆ Relationship between smoking and kidney cancer:

$$R^2 = 0.2375 \quad R = 0.4873$$

$$y = 0.0454x + 1.6636$$

- ◆ Relationship between smoking and leukaemia:

$$R^2 = 0.0047 \quad R = 0.0685$$

$$y = -0.0078x + 7.0252$$

2. ANALYSIS

- HYPOTHESIS:

Leukaemia, kidney, bladder and lung cancer are mainly caused because of smoking

- SAMPLE:

The data are per capital numbers of cigarettes smoked (sold) by 43 states and the District of Columbia in 1960 in the United States of America together with death rates per thousand population from various forms of cancer.

- QUALITY OF DATA:

The data could have been affected by different factors:

- ◆ Misclassification of disease (Chapters: 2.2.Lung Cancer, 2.3.Kidney Cancer, 2.4.Leukaemia, 2.5.Bladder Cancer)
- ◆ Misclassification of smoking status: In a series of papers, it has been examined the evidence that a small proportion of those who have been ascribed non-smoker status are in fact active smokers. This leads to discrepancy in results.
- ◆ Choice of controls: Many of the cases control studies have been criticised on the basis of their selection of controls. In most studies the controls were other hospital cases, sometimes from other specialist hospitals or the controls were patients suffering from other cancers. The often poor choice of controls weakens several of the studies. However, since they (The National Cancer Institute) did not introduce any consistent bias they are probably insufficient to account generally for the discrepancy that it could be between the overall trend of the cancer studies and the expectations of risk based on smoking.

2.1. DATA

- CIG = Number of cigarettes smoked (hds per capital)
- BLAD = Deaths per 100K population from bladder cancer
- LUNG = Deaths per 100K population from lung cancer
- KID = Deaths per 100K population from kidney cancer
- LEUK = Deaths per 100K population from leukaemia

STATE	CIG	BLAD	LUNG	KID	LEUK
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AL	18.20	2.90	17.05	1.59	6.15
AZ	25.82	3.52	19.80	2.75	6.61
AR	18.24	2.99	15.98	2.02	6.94
CA	28.60	4.46	22.07	2.66	7.06
CT	31.10	5.11	22.83	3.35	7.20
DE	33.60	4.78	24.55	3.36	6.45
DC	40.46	5.60	27.27	3.13	7.08
FL	28.27	4.46	23.57	2.41	6.07
ID	20.10	3.08	13.58	2.46	6.62
IL	27.91	4.75	22.80	2.95	7.27
IN	26.18	4.09	20.30	2.81	7.00
IO	22.12	4.23	16.59	2.90	7.69
KS	21.84	2.91	16.84	2.88	7.42
KY	23.44	2.86	17.71	2.13	6.41
LA	21.58	4.65	25.45	2.30	6.71
ME	28.92	4.79	20.94	3.22	6.24
MD	25.91	5.21	26.48	2.85	6.81
MA	26.92	4.69	22.04	3.03	6.89
MI	24.96	5.27	22.72	2.97	6.91
MN	22.06	3.72	14.20	3.54	8.28
MS	16.08	3.06	15.60	1.77	6.08
MO	27.56	4.04	20.98	2.55	6.82
MT	23.75	3.95	19.50	3.43	6.90
NB	23.32	3.72	16.70	2.92	7.80
NE	42.40	6.54	23.03	2.85	6.67
NJ	28.64	5.98	25.95	3.12	7.12
NM	21.16	2.90	14.59	2.52	5.95
NY	29.14	5.30	25.02	3.10	7.23
ND	19.96	2.89	12.12	3.62	6.99
OH	26.38	4.47	21.89	2.95	7.38
OK	23.44	2.93	19.45	2.45	7.46
PE	23.78	4.89	12.11	2.75	6.83
RI	29.18	4.99	23.68	2.84	6.35
SC	18.06	3.25	17.45	2.05	5.82
SD	20.94	3.64	14.11	3.11	8.15
TE	20.08	2.94	17.60	2.18	6.59
TX	22.57	3.21	20.74	2.69	7.02
UT	14.00	3.31	12.01	2.20	6.71
VT	25.89	4.63	21.22	3.17	6.56
WA	21.17	4.04	20.34	2.78	7.48
WI	21.25	5.14	20.55	2.34	6.73
WV	22.86	4.78	15.53	3.28	7.38
WY	28.04	3.20	15.92	2.66	5.78

AK	30.34	3.46	25.88	4.32	4.90
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FORMULAS

Correlation coefficient:

$$R = \frac{\sum xy - (\sum x \sum y / n)}{\sqrt{(\sum x^2 - (\sum x)^2 / n)(\sum y^2 - (\sum y)^2 / n)}}$$

$$\sum x^2 - (\sum x)^2 / n$$

n

Gradient of a Regression Line: Regression Line:

$$\frac{\sum xy - (\sum x \sum y / n)}{\sum x^2 - (\sum x)^2 / n} (x - \bar{x})$$

$$\sum x^2 - (\sum x)^2 / n$$

IMPORTANT NUMBERS

				CIG-BLAD	CIG-LUNG	CIG-KID	CIG-LEUK
$\sum x$	1096.22		$\sum y$	181.33	864.74	122.96	300.51
$\sum x^2$	28646.97		$\sum y^2$	787.32	17763.60	355.20	2069.93
$(\sum x)^2$	1201698		$(\sum y)^2$	32880.57	747775.27	15119.16	90306.26
n	44		$\sum xy$	4680.38	22250.87	3124.07	7476.46
$\bar{x}$	24.91		$\bar{y}$	4.12	19.65	2.79	6.83

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