# Cigarette smoking: an epidemiological overview 

Nicholas J Wald* and Allan K Hackshaw<br>Department of Environmental and Preventive Medicine, Wolfson Institute of Preventive Medicine, The Medical College of St Bartholomew's Hospital, London, UK


#### Abstract

The detailed mortality and morbidity statistics on smoking tend to conceal the overall impact of the habit on health. About 3 million people die each year from smoking in economically developed countries, half of them before the age of 70. Cancers of eight sites are recognized as being caused by smoking-lung cancer almost entirely and the others (upper respiratory, bladder, pancreas, oesophagus, stomach, kidney, leukaemia) to a substantial extent. Six other potentially fatal diseases are also judged to be caused by smoking: respiratory heart disease, chronic obstructive lung disease, stroke, pneumonia, aortic aneurysm and ischaemic heart disease, the most common cause of death in economically developed countries. Non-fatal diseases, such as peripheral vascular disease, cataracts, hip fracture, and periodontal disease, which cause appreciable disability, cost and inconvenience are also caused by smoking. In pregnancy, smoking increases the risk of limb reduction defects, spontaneous abortion, ectopic pregnancy, and low birth weight. While there are some diseases for which smoking shows a protective effect, the 'benefits' of these are negligible in relation to the illness and premature mortality caused by smoking. About $20 \%$ of all deaths in developed countries are caused by smoking; an enormous human cost which can be completely avoided.


Worldwide, about 3 million people currently die each year from smoking, half of them before the age of $70^{1}$ - an enormous human cost. What is so unusual is the social and political acceptability of this lethal habit. The tobacco industry is probably responsible for more premature deaths and illness than any other organized commercial enterprise, exceeding the destructive impact of the arms and illicit drugs industries.

There are about 1 billion smokers in the world today, one-third of whom live in China. Table 1 shows the average number of manufactured cigarettes consumed per day per adult for 22 developed countries ${ }^{2}$. Smoking increased between 1945 and 1965 in all the countries, and from 1965 to 1985 it did not decline substantially in any of the countries and continued to increase in many. In 1985, 1650 billion cigarettes were sold in the countries listed in Table 1 -double the figure in 1955. Since 1985, there has been a decline in consumption in a few countries. In the UK, for example, the total number of cigarettes sold declined from 98 billion in

Table 1 Number of manufactured cigarettes consumed per day per adult (age 15 years or over) in 22 oconomically devaloped countries

|  | 1945 | 1985 (relative to 1945) | 1985 (relative to 1985) |
| :---: | :---: | :---: | :---: |
| Australio | 1.6 | 7.3 (4.5) | 6.3 (0.9) |
| Austria | 1.3 | 5.3 (4.1) | 6.9 (1.3) |
| Belgivm | 1.1 | 5.4 (4.9) | 5.4(1.0) |
| Conoda | 4.5 | 9.0 (2.0) | 8.1 (0.9) |
| Denmark | 1.1 | 4.1 (3.7) | 5.1 (1.2) |
| Fintand | 2.1 | 5.4 (2.6) | 4.7 (0.9) |
| France | 1.2 | 4.1 (3.4) | 6.0 (1.5) |
| Gormany | $0.7{ }^{\dagger}$ | 5.8 (8.3) | 6.4(1.1) |
| Greece | 2.3 | 5.3 (2.3) | 9.7 (1.8) |
| Ireland | 4.3 | 7.4(1.7) | 6.8 (0.9) |
| larcol | - | 5.4\# ${ }^{\text {( }}$ ( ${ }^{\text {a }}$ | 6.4.1.2) |
| Haly | 1.8 | 4.2 (2.3) | 6.3 (1.5) |
| Japon | 0.9 | 6.4 (7.1) | 9.0 (1.4) |
| The Netherlands | $1.3{ }^{\ddagger}$ | 5.6 (4.3) | 3.8 (0.7) |
| Now Zoaland | 2.7 | 6.3 (2.3) | 6.3 (1.0) |
| Norwoy | 0.6 | 1.4 (2.3) | 1.9 (1.4) |
| Portugal | 1.2 | 3.2 (2.7) | 4.8 (1.5) |
| Spain | 1.3 | 4.8 (37) | 7.4 (1.5) |
| Sweden | 1.3 | 3.7 (2.8) | 4.5 (1.2) |
| Switzertand | 3.2 | 8.5 (2.7) | 8.1 (0.9) |
| UK | 7.1 | 7.4 (1.0) | 5.9 (0.8) |
| USA | 7.0 | 10.5(1.5) | 8.7 (0.8) |
| ${ }^{\dagger} 1948$ |  |  |  |
| : 1946 |  |  |  |
| \#1967 |  |  |  |
| Data taken from refarance 2. |  |  |  |

1985 to just over 93 billion in 1992/933. Consumption figures for economically developing countries are not readily available, but the increase in consumption of cigarettes in many of these countries has been substantial over the past 30 years. For example, in China about 700 cigarettes per adult were consumed in 1970. This increased dramatically to about 2000 per year in 1990/92 (A Lopez, personal communication).

This brief epidemiological overview covers the health effects of active cigarette smoking on the smoker and in pregnancy. In February 1985, the International Agency for Research on Cancer, part of the World Health Organization, convened a workshop which reported on tobacco smoking ${ }^{4}$. Since that report, new evidence has reinforced conclusions about diseases that were judged at that time to be caused by smoking. New evidence has also identified additional diseases caused by smoking (see Cancers weakly related to smoking in this issue).
In this chapter, we first examine fatal diseases that are positively associated with smoking, classifying them according to the extent to which the difference in incidence (or mortality) between smokers and non-smokers is a causal effect of smoking (Tables 2 and 3 ). We use three

Table 2 Fatal diseases positively associated with smoking - study of male British doctors ${ }^{5}$

| Disease | Standardised mortality par 100,000 men/year |  | Rolative risk (b/a) | Absolute excess risk per 100,000 men/yoor (b-a) | Attributable proportion ${ }^{\dagger}(\%)$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Life-long non-mmoker (a) | Current cigaretto amoker (b) |  |  |  |
| (i) Increased risk largoly or entiroly coused by amoking |  |  |  |  |  |
| Cancer of. |  |  |  |  |  |
| lung | 14 | 209 | 15.0 | 195 | 81 |
| Upper respiratory sites | 1 | 24 | 24.0 | 23 | 87 |
| Bladdor | 13 | 30 | 2.3 | 17 | 28 |
| Ралстеая | 16 | 35 | 2.2 | 19 | 26 |
| Ischaemic heart disoase | 572 | 892 | 1.6 | 320 | 15 |
| Respiratory hreart disease | 0 | 10 | - | 10 | 100 |
| Aortic anourym | 15 | 62 | 4.1 | 47 | 48 |
| Chronic obstructive lung disoaso | 10 | 127 | 12.7 | 117 | 78 |
| (ii) Increased risk portly coused by smotiong |  |  |  |  |  |
| Cancer of. |  |  |  |  |  |
| Ossophogus | 4 | 30 | 7.5 | 26 | 66 |
| Stomoch | 26 | 43 | 1.7 | 17 | 17 |
| Kidnay | 9 | 13 | 2.1 | 4 | 25 |
| Leukoemia | 4 | 7 | 1.8 | 3 | 19 |
| Stroke | 152 | 203 | 1.3 | 51 | 8 |
| Preumronia | 71 | 138 | 1.9 | 67 | 21 |
| (iii) Incrased risk due to confounding |  |  |  |  |  |
| Cirmosis of fiver | 6 | 32 | 5.3 | 26 | - |
| Cancer of livar | 7 | 11 | 1.6 | 4 | - |
| Suicide | 23 | 37 | 1.6 | 14 | - |
| Poisoning | 7 | 19 | 2.7 | 12 | - |
| All diseases excluding those in category (iii) | 907 | 1823 | 2.0 | 916 | 23 |
| All diseases exduding those in categories <br> (ii) $\mathbf{a}^{2}$ (iii) | 612 | 1324 | 2.2 | 712 | 26 |

Rosults taken from reference 5.
the proportion of all deaths from the specified disease attributable to smoking, assuming 30\% of the population are current mmokers and that all the excess risk in smokers is due to smoking. In Group (ii) the actual proportions will be somewhat less than those specified.
categories: (i) increased risk largely or entirely due to smoking; (ii) increased risk partly due to smoking; and (iii) increased risk due to confounding. We then consider non-fatal diseases under the first of these three categories (Table 4), disorders in pregnancy (Table 5), and finally diseases negatively associated with smoking (Table 6).

The International Agency for Research on Cancer (IARC) Report assessed the evidence on confounding and assigned the smoking related diseases to one of these three categories. For some smoking related diseases, such as lung cancer and peripheral vascular disease, the excess incidence or mortality is almost entirely caused by smoking. For most diseases, part of the association is likely to be attributable to confounding, as smoking is correlated with a number of dietary and other factors that also cause disease. In Table 2, for example, alcohol is

Table 3 Fatal diseases positively associated with smoking - American Cancer Society (CPSII). Men and women aged 35 years or

|  |  | Standardised mortality per 100,000/yoar\# |  | Rolativo risk | Absolute excess risk per 100,000 per yoar | Attributable proportion ${ }^{\dagger}$ (\%) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Life-long non-moker | Current digoretto amoker |  |  |  |
| (i) Incrocsed risk largely or entiraly coused by mmoting |  |  |  |  |  |  |
| Cancar of. |  |  |  |  |  |  |
| lung | M | 24 | 537 | 22.4 | 513 | 87 |
|  | F | 18 | 213 | 11.9 | 195 | 77 |
| Uppar respiratory sites | M | 1 | 27 | 24.5 | 26 | 89 |
|  | F | 2 | 10 | 5.6 | 8 | 58 |
| Btadder and other urinary organs | M | 18 | 53 | 2.9 | 35 | 36 |
|  | F | 8 | 21 | 2.6 | 13 | 32 |
| Pancreas | M | 18 | 38 | 2.1 | 20 | 25 |
|  | F | 16 | 37 | 2.3 | 21 | 29 |
| Ischasmic heort diseaso | M | 500 | 970 | 1.9 | 470 | 22 |
|  | F | 386 | 688 | 1.8 | 302 | 19 |
| Aortic aneuryum ${ }^{\text { }}$ | M | 24 | 98 | 4.1 | 74 | 48 |
|  | F | 11 | 52 | 4.6 | 41 | 52 |
| Chronic obstructive pulmonary diseaso | M | 39 | 378 | 9.7 | 339 | 72 |
|  | F | 21 | 216 | 10.5 | 195 | 74 |
| (ii) Increasid risk party coused by smoting |  |  |  |  |  |  |
| Cancer of. |  |  |  |  |  |  |
| Oesophogus | M | 9 | 68 | 7.6 | 59 | 66 |
|  | F | 4 | 41 | 10.3 | 37 | . 74 |
| Kidney | M | 8 | 23 | 3.0 | 15 | 37 |
|  | F | 6 | 8 | 1.4 | 2 | 11 |
| Corobrovascular losions | M | 147 | 328 | 2.2 | 181 | 27 |
|  | F | 236 | 434 | 1.8 | 198 | 20 |
| (iii) Increosed risk due to confounding |  |  |  |  |  |  |
| Cancer of cervix | F | 8 | 18 | 2.1 | 10 | - |
| All diseases exduding those in cotegory (iii) | M | 788 | 2520 | 3.2 | 1732 | 40 |
|  | F | 708 | 1720 | 2.4 | 1012 | 30 |
| All diseases exduding those in categories (ii) or (iii) | M | 588 | 2010 | 3.4 | 1422 | 42 |
|  | F | 438 | 1179 | 2.7 | 741 | 34 |

Relative risks taken from the American Cancer Study (CPSII).
"Calculated using the publishod relative risk, the mortality in the population aged $\geqslant 35$ years' and assuming that $30 \%$ of the population are current emokers.
${ }^{\dagger}$ The proportion of all deaths from the specified disease attributable to moking, assuming $30 \%$ of the pepulation are current mmokers and that all the excess risk in smokers is duv to smoking. In Group (ii) the actual proportions will be somewhat less than those specified.
${ }^{\text {tTaken }}$ from American Cancor Socioty (CPSII)'
also a cause of stroke and oesophageal cancer, and smokers, on average, drink more alcohol than non-smokers. Alcohol also predisposes to falls and hip fracture (Table 4), as does lack of exercise, and smokers may on average exercise less. For diseases in which confounding plays a role, the effect of smoking and a confounding factor, such as alcohol, often tends to act synergistically so that those who do not smoke avoid most of the excess risk.

Table 4 Non-fatal diseases positively associated with smoking

| Disorder | Incidenca per 100,000/year ${ }^{\dagger}$ |  | Relative risk | Absolute excoss risk por 100,000/ yoar | Altributable proporition ${ }^{\dagger}(\%)$ | Refarence |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Lifo-tong non-mmoker | Curront mmoker |  |  |  |  |
| (i) Increased risk lergely or entirely coured by mmoking |  |  |  |  |  |  |
| Peripheral vascular disocse (age 45-74 years) | 150 | 300 | 2.0 | 150 | 23 | 11 |
| (ii) Increased risk partly coused by smoting |  |  |  |  |  |  |
| Cataracts (men oged 40-84 years) | 247 | 543 | 2.2 | 296 | 26 | 12 |
| Crohn's disase | 5 | 15 | 2.1 | 10 | 25 | 13 |
| Gastric ulcer (aged 20-61 yeans, Norway) | 60 | 201 | 3.4 | 141 | 42 | 14 |
| Duodend uker (oged 20-61 years, Norwry) | 61 | 250 | 4.1 | 189 | 48 | 14 |
| Hip fracture (aged $\geqslant 65$ yeors) | 453 | 587 | 1.3 | 134 | 8 | 15 |
| Periodontitis (agod 19-40 yeors)[Provalenco] | 22,500 | 67,000 | 3.0 | 44,500 | 38 | 16 |

the proportion of all deaths attributable to smoking, assuming $30 \%$ of the population are current smokers and thet all the axcess risk in smokers is dus to smoking. In Group (ii) the actual proportion will be somewhat less than those specified.

## Fatal diseases

Table 2, based on data on male British doctors ${ }^{5}$, shows the mortality in cigarette smokers and life-long non-smokers. The relative risk and the absolute excess risk in cigarette smokers is given for each disease, together with the attributable proportion - the proportion of all deaths for each specified disease that is due to smoking. Cancers of eight sites (considering upper respiratory cancers [lip, tongue, mouth, pharynx and larynx] as one site) are recognized as being caused by smoking. The increased risks of cancer of the bladder and cancer of the pancreas are now considered to be largely due to smoking ${ }^{6}$. Six other diseases are judged to be caused by smoking, including ischaemic heart disease, the most common cause of death in economically developed countries. Smoking is responsible for much of the disease specified in categories (i) and (ii), for example, over $75 \%$ of deaths from lung cancer and chronic obstructive lung disease. Smoking causes more deaths from ischaemic heart disease than any other disease; about $35 \%$ of all the excess deaths for the diseases specified in Table 2 (320/916) per 100,000. Overall, the death rate in cigarette smokers from all the specified diseases is double that in life-long non-smokers.
Table 3 is similar to Table 2 but based on the American Cancer Society study of over 1 million men and women aged 35 years and over ${ }^{7}$. The results are similar to those from the British Doctors' study, although the relative risk for stroke is larger ( 2.2 compared with 1.3 ), probably because the men in the Doctors' study were older and the relative risk of stroke decreases in older men. The table shows that, for most diseases,

Table 5 Disorders in pregnancy positivoly associated with smoking

| Disordor | Incidence per 100,000/year ${ }^{\dagger}$ |  | Rolative risk | Absolute axcess risk per 100,000/ year | Altributable proportion ${ }^{\dagger}$ [ $\%$ ] | Reference |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Lifo-long non-smoker | Current smoker |  |  |  |  |
| Congenital limb reduction defects (births) | 41 | 87 | 2.10 | 46 | 25 | 17 |
| Spontaneous abortion | 13,838 | 17,712 | 1.28 | 3874 | 8 | 18 |
| Ectopic prognancy ${ }^{\#}$ | 44 | 971 | 2.20 | 530 | 26 | 19 |

tThe proportion of all deaths attributable to moking, assuming $30 \%$ of the population are current mokers and that all the excess risk in minokers is due to smoking. The actual proportion will be somowhat less than thoso ppecified if not all oxcess is duo to smoking.
\#it is uncertain how much of the association is cousal; at least part of it is likely to be due to confounding.
the relative risk in women is similar to that in men. The relative risk for cervical cancer is 2.1 but the increase in risk may be largely due to confounding; number of sexual partners is associated with the risk of cervical cancer and there is a strong relationship between the number of partners and current smoking ${ }^{10}$ (see also the chapter Cancers weakly related to smoking by R Doll in this issue).

## Non-fatal diseases

Table 4, based on various sources, is similar to Tables 2 and 3 but relates to diseases associated with smoking that are not usually fatal. Some diseases, such as peripheral vascular disease, are recognised to be caused by smoking, but others, such as cataracts, which cause appreciable disability, are less recognised. The relative risk of hip fracture in smokers compared with non-smokers is modest (1.3) but the frequency of the disorder means that smoking accounts for many cases. Periodontal disease is the major cause of teeth loss in adults, affecting nearly a quarter of non-smokers. The risk in smokers is substantial (relative risk of 3) and smoking accounts for about $40 \%$ of all periodontitis in communities in which about one-third of adults smoke. Some of this increase in risk may be due to confounding, for example, smokers brushing their teeth infrequently, but it is likely that a major part of the association is causal.

## Disorders in pregnancy

Table 5 shows three disorders positively associated with smoking. A rare but serious hazard is congenital limb reduction defects in which part or all of a limb can fail to develop; the risk with maternal smoking is double

Table 6 Diseases negatively associated with smoking

| Disease | Incidence (or deaths) par 100,000/year |  | Rolative risk | Reforence |
| :---: | :---: | :---: | :---: | :---: |
|  | Non-smoker | Current (or over) smoker |  |  |
| Porkinson's (decths) | 8 | 4 | 0.50 | 21 |
| Ulcerative cotatis | 16 | 13 | 0.70 | 13 |
| Alzheimer's (aged over 65 years) | 8286 | 5667 | 0.70 | 22 |
| Endometrial cancar (women over 60 years) | 230 | 110 | 0.50 | 23 |
| Pro-eclampsio (births) | 507 | 331 | 0.65 | 24 |
| Down's sydrome (biths) | 147 | 90 | 0.60 | 25 |
| Unerine fibroids (women aged 25-39) | 3473 | 2430 | 0.70 | 26 |
| Vomiting during pregnancy (typeramesis gravidarum) | 864 | 517 | 0.60 | 26 |

that in non-smokers. Spontaneous abortion occurs in about $15-20 \%$ of all pregnancies and although the proportion attributable to smoking is modest ( $28 \%$ increase) it accounts for almost 4000 cases per 100,000 women who smoke. The risk of having an ectopic pregnancy is double that in smokers - as many as a quarter of cases may be caused by smoking if all the excess is causal.

It has also been demonstrated that babies of smoking mothers weigh, on average, $150-250 \mathrm{~g}$ less at birth ${ }^{18}$. The association has been shown to be causal since randomised trials of smoking cessation in pregnancy have shown that birth weight can be increased ${ }^{18}$. Smoking is an important hazard in pregnancy.

## Diseases less common in smokers

Table 6 summarises diseases that show a negative association with smoking. Much of the evidence is summarised in Wald and Baron ${ }^{20}$ (see also the chapter Protective effects of tobacco by J Baron in this issue). There is a remarkable consistency in the data on smoking and Parkinsonism ${ }^{21}$ - smokers have about half the risk of non-smokers. Most of the reduction is probably causal; there are no grounds for concluding that bias or confounding explains the association and there is a plausible pharmacological explanation for the association; nicotine stimulates dopamine release, which can ameliorate the disease. Smoking also reduces the risk of endometrial cancer - probably because of the anti-oestrogenic effect of smoking ${ }^{23}$, smokers again having about half the risk of non-smokers. The position on Alzheimer's disease is uncertain. The summary relative risk from eight case-control studies (0.78) and one
cohort study ( 0.70 ) are not very different from unity, so bias or confounding could be an explanation, and even chance cannot be totally excluded.

Smoking probably has a protective effect on ulcerative colitis ${ }^{13}$, which contrasts with the increased risk of Crohn's disease (Table 4). The effect is consistent, though modest in size; the relative risk in case-control studies is about 0.5 and in two cohort studies it is about 0.7 . The latter estimate is cited in Table 6. It is not widely recognised that the birth prevalence of Down's syndrome is lower in women who smoke than in non-smokers; relative risk $0.60,95 \% \mathrm{CI} 0.44-0.81$ (based on a review of five studies ${ }^{25}$ and supplemented by a further unpublished study provided as a personal communication by $G$ Palomaki). The most likely explanation is that smoking increases the risk of miscarriage and this has a disproportionate effect in Down's syndrome pregnancies compared with unaffected pregnancies.

Taken as a whole, the 'benefits' arising from the protective biological effects of smoking are quantitatively much smaller and considerably less serious than illness and premature mortality caused by smoking.

## Conclusion

The detailed mortality and morbidity statistics on smoking tend to conceal the overall impact of the habit on health. In Britain, for example, about one-third of adults smoke and half of these smokers will die of the habit, over one-third before the age of 65 years. In 1995, the total number of deaths attributed to smoking is estimated as 150,000 in the UK, over half a million in the USA, and in all developed countries about 2 million ${ }^{27}$. About $20 \%$ of all deaths in these countries are smokinginduced. The overall morbidity is more difficult to quantify but many millions of people will suffer illness and disability due to smoking. While the trend in cigarette consumption in some countries such as the UK is downward, this is not so in many countries. In every continent of the world, the public health impact of cigarette smoking is immense - a pandemic that is completely avoidable.

## References

[^0]4 International Agency for Research on Cancer. Tobacco Smoking. (IARC Monographs on the evaluation of the carcinogenic risk of chemicals to humans, Lyons, IARC 1986 No 38)
5 Doll R, Peto R, Wheatley K, Gray R, Sutherland I. Mortality in relation to smoking: 40 years' observation on male British doctors. BMJ 1994; 309: 901-11
6 International Agency for Research on Cancer. Cancer, Causes, Occurrence and Control. Tomatis L. ed. Lyon: IARC Scientific Publications No 100, 1990
7 Surgeon General Report. Reducing the Health Consequences of Smoking: 25 Years of Progress. US Deparment of Health and Human Services, 1989. Publication No CDC 89-8411
8 Office of Population Censuses and Surveys. Mortality Statistics: Cause, 1992. (Series DH2, no 19). London: HMSO, 1993

9 Phillips AN, Smith GD. Cigarette smoking as a potential cause of cervical cancer: has confounding been controlled for? Int J Epidemiol 1994; 23: 42-9
10 Wellings K, Field J, Johnson AM, Wadsworth J. Sexual behaviour in Brtain. The national survey of sexual attitudes and lifestyles. London: Penguin, 1994
11 Surgeon General Report. Consequences of Smoking: Cardiovascular Disease. US Department of Health and Human Services, 1983 Publication no PHS 84-50204
12 Christen WG, Manson JE, Seddon JM, et al. A prospective study of cigarette smoking and risk of cataract in men. JAMA 1992; 268: 989-93
13 Logan RFA. Smoking and inflammatory bowel disease. In: Wald NJ, Baron J. eds. Smoking and Hormone Related Disorders. Oxford: Oxford University Press, 1990: 122-34
14 Johnsen R, Forde OH, Straume B, Burhol PG. Aetiology of peptic ulcer: a prospective population study in Norway. J Epidemiol Community Health 1994; 48: 156-60
15 Law MR, Wald NJ, Meade TW. Strategies for the prevention of osteoporosis and hip fracture. BMJ 1991; 303: 453-9
16 Haber J. Smoking is a major risk factor for periodontitis. Curr Opin Periodontol 1994; 12-18
17 Czeizel AE, Kodaj I, Lenz W. Smoking during pregnancy and congenital limb deficiency. BMJ 1994; 308:1473-6
18 Department of Health and Social Security. Fourth report of the Independent Scientific Committee on Smoking and Health. London: HMSO, 1988
19 Campbell O. Ectopic pregnancy and smoking: confounding or causality. In: Poswillo D, Alberman E. eds. Effects of Smoking on the Fetus, Neonate and Child. Oxford, Oxford University Press, 1992: 23-44
20 Wald NJ, Baron J. eds. Smoking and Hormone Related Disorders. Oxford, Oxford University Press, 1990
21 Marmot M. Smoking and Parkinson's disease. In: Wald NJ, Baron J. eds. Smoking and Homone Related Disorders. Oxford, Oxford University Press, 1990: 135-41
22 Hebert LE, Scherr PA, Beckett LA et al. Relation of smoking and alcohol consumption to incident Alzheimer's disease. Am J Epidemiol 1992; 135: 347-55 [Incidence of Alzheimer's taken as $7.5 \%$ in people aged 65 years and over. Weatherall D. Ed. Oxford Textbook of Medicine 2nd edn 1987, pp 21-43]
23 Ross RK, Bernstein L, Paganini-Hill A, Henderson BE. Effects of cigarette smoking on 'hormone related' disease in a Southern California retirement community. In: Wald NJ, Baron J. eds. Smoking and Hormone Related Disorders. Oxford, Oxford University Press, 1990: 32-54
24 Hall MH, Harper PV. Smoking and pre-eclampsia. In: Poswillo D, Alberman E. eds. Effects of Smoking on the Fetus, Neonate and Child. Oxford, Oxford University Press, 1992: 81-8
25 Cuckle HS, Alberman E, Wald NJ, Royston P, Knight G. Maternal smoking habits and Down's syndrome. Prenat Diagn 1990; 10: 561-7
26 Ross RK, Bernstein L, Vessey MP, Henderson BE. Hyperemesis gravidarum, uterine fibroids, and endometriosis: effects of cigarette smoking on risk. In: Wald NJ, Baron J, eds. Smoking and Hormone Related Disorders. Oxford, Oxford University Press, 1990: 64-71
27 Peto R, Lopez AD, Boreham J, Thun M, Heath C. Mortality from tobacco in developed countries:indirect estimation from national vital statistics. Lancet 1992; 329:1268-78


[^0]:    1 Peto R, Lopez AD, Boreham J, Thun M, Heath C. Mortality from Smoking in Developed Countries: 1950-2000. Oxford: Oxford University Press, 1994
    2 Nicolaides-Bouman A, Wald NJ, Forey B, Lee P. eds. International Smoking Statistics. Oxford: Oxford University Press, 1993
    3 UK Customs and Excise Annual Report 1992/93. London: HMSO, 1994

