ESTIMATING LUNG CANCER DEATHS BY SMOKING HABIT

AND ETS EXPOSURE IN THE UK

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EXECUTIVE SUMMARY

We estimate numbers of lung cancer deaths due to lung cancer by age, sex, smoking and ETS in England and Wales and in the whole of the UK for the years 1998 to 2002. The methodology assumes that increased risks of lung cancer observed in epidemiological studies associated with smoking and ETS can be attributed to these factors. No adjustment is made for possible biases due to such factors as misclassification of smoking habits or confounding by other lung cancer risk factors (other than any adjustment for confounding made in the source papers presenting the relative risk estimates).

The methodology used is described in detail. Data used to derive the estimates come from three sources – WHO (for lung cancer mortality and population size), the Health Survey for England (for the proportions of households containing partners, for proportions by smoking habit in households with and without partners, and for the association between partners' smoking habits) and two inhouse databases of epidemiological studies (to obtain relevant relative risk estimates for smoking and for ETS exposure by meta-analysis).

In the period 1998-2002, 104,195 men aged 35+ died of lung cancer in the United Kingdom, averaging 20,839 deaths a year. These can be subdivided as follows:

	Attributed to smoking	Attributed to ETS	Attributed to background	Total
Current cigarette smokers	7,772.9	49.6	381.3	8,203.8
Current pipe/cigar only smokers	1,261.4	17.5	132.9	1,411.8
Ex-smokers	8,737.4	210.1	1,520.0	10,467.5
Never smokers	0.0	94.2	661.7	755.9
Total	17,771.8	371.4	2,695.9	20,839.0

In the same period there were 65,699 deaths from lung cancer in women aged 35+, averaging 13,140 deaths a year. These can be subdivided as follows:

	Attributed to smoking	Attributed to ETS	Attributed to background	Total
Current cigarette smokers	5,029.0	111.9	508.2	5,649.1
Ex-smokers	3,713.5	239.0	1,106.4	5,058.9
Never smokers	0.0	434.2	1,997.6	2,431.8
Total	8,742.4	785.1	3,612.2	13,139.8

For the sexes combined, our analyses attribute 78% of the annual average of 33,979 deaths a year to smoking and 1.6% to ETS exposure in never smokers.

These conclusions depend on the estimates we have derived for various parameters, including the relative risks for active smoking and for ETS exposure, the relative dose of ETS according to partner's smoking and the assumed level of ETS exposure in those without partners. This report includes sensitivity analyses to illustrate how the calculated numbers of deaths would vary were different parameter values selected.

We note that though all our sensitivity analyses attribute some hundreds of deaths a year to ETS exposure in never smokers, these analyses do not adjust for potential bias due to confounding by other risk factors and to misclassification of active smoking. As we have demonstrated elsewhere,[1] it is possible that all or virtually all of the observed association of ETS exposure with lung cancer may be explained by such biasing factors. We also note that, though adjustment for misclassification of active smoking will tend to reduce numbers of deaths attributed to ETS exposure, it will increase numbers attributed to active smoking.

Males $R_C = 37.08$ $R_O = 17.78$ $R_X = 11.1$

Females $R_C = 17.22$ $R_X = 6.52$

Males $R_C = 10.02$ $R_O = 5.195$ $R_X = 3.525$

Females $R_C = 5.055$ $R_X = 2.38$

Males $E = 1.62$ Females $E = 1.48$

Males $E = 1.155$ Females $E = 1.12$

Males $Z = 10.5714$ Females $Z = 6.9048$

Males $Z = 3.39285$ Females $Z = 2.4762$

1.   <u>INTRODUCTION</u>

This report presents estimates of the numbers of lung cancer deaths occurring in England and Wales and in the United Kingdom by age, sex, smoking and ETS exposure. Men are divided into four groups – current cigarette smokers, current smokers of pipe/cigar only, ex-smokers and never smokers, while women are divided into current smokers, ex-smokers and never smokers based only on their cigarette smoking habits. For each smoking group we estimate, for both sexes and each five year age group, the total number of deaths, and the numbers attributed to smoking, ETS exposure and other causes (background rates).

The attributable risk methodology used is described in detail in section 2. Section 3 presents estimates of the various parameters required by the methodology and shows how they were derived. Section 4 uses these parameter estimates and the methodology to derive the estimates of lung cancer deaths, first in England and Wales and then in the UK. Section 5 presents the results of sensitivity analyses, showing how the all ages estimates of deaths by smoking habit and the attribution to smoking, ETS and background change as the different parameter estimates are varied. Section 6 provides some discussion of the results, and Section 7 summarizes the main findings.

2. METHODS

2.1 Definitions

Smoking groups

"Cigarette smokers"	Current smokers of cigarettes (manufactured or handrolled) regardless of whether or not they smoke pipes or cigars
"Pipe/cigar smokers"	Current smokers of pipes and/or cigars but not cigarettes
"Smokers"	All current smokers, i.e. the sum of the previous two groups
"Ex-smokers"	Former smokers of cigarettes, pipes or cigars who do not smoke any of these currently
"Never smokers"	Never smoked cigarettes, pipes or cigars
"Non-smokers"	Non-current smokers, i.e. the sum of the previous two groups
"Ever smokers"	Ever smoked cigarettes, pipes or cigar
Partner	A spouse or partner (of the opposite sex) living in the same household

For a given year, sex and age group, we also define the following:

Observable data from national statistics

P	Number in population
D	Number of deaths from lung cancer
N	Proportion of never smokers
C	Proportion of cigarette smokers
O	Proportion of pipe/cigar smokers (other products)
X	Proportion of ex-smokers
	(so that $N+C+O+X = 1$)
π	Proportion without partners
N_1, C_1, O_1, X_1	Proportions by smoking habit for those without partners
N_2, C_2, O_2, X_2	Proportions by smoking habit for those with partners

M	Proportion of never smokers with a partner where the partner has ever smoked

Data estimated from epidemiological studies

R_C, R_O, R_X	Risk of lung cancer for cigarette smokers, pipe/cigar smokers and ex-smokers relative to that in never smokers
E	Risk of never smokers partnered by an ever smoker relative to that in never smokers partnered by a never smoker

Data estimated from cotinine levels

Z	Dose of ETS exposure for never smokers living with an ever smoker relative to dose for never smokers living with a never smoker

Absolute risks of lung cancers to be estimated

Q	In never smokers unexposed to ETS
Q_U	In never smokers partnered by a never smoker
Q_M	In never smokers partnered by an ever smoker
Q_{N1}	In all never smokers without a partner
Q_{N2}	In all never smokers with a partner
Q_N	In all never smokers
Q_{C1}, Q_{C2}, Q_C	In cigarette smokers without a partner, with a partner and overall
Q_{O1}, Q_{O2}, Q_O	In pipe/cigar smokers without a partner, with a partner and overall
Q_{X1}, Q_{X2}, Q_X	In ex-smokers without a partner, with a partner and overall

2.2   <u>Assumptions</u>

- Excess risks are "attributable" to smoking or ETS exposure. No adjustment is made for misclassification of smoking habit or for potential confounding by other risk factors (other than the adjustment made in the

original papers which provided the estimates of relative risks from which R_C, R_O, R_X and E were derived)

- Excess risks in never smokers are linearly related to dose as estimated by Z

- The absolute risk in never smokers without partners is the same as that in never smokers with a non-smoking partner ($Q_{N1} = Q_U$)

- The smoking relative risks R_C, R_O, R_X apply uniformly, independent of ETS exposure

2.3 Estimating attributable deaths

2.3.1 Estimating risks in never smokers relative to a completely unexposed background

Based on the definition of E and Z, we can write down:

$$Q_M = EQ_U$$
$$(Q_M - Q) = Z(Q_U - Q)$$

These solve to give risks in never smokers by partner's smoking:

$$Q_U = (Z-1)Q/(Z-E)$$
$$Q_M = E(Z-1)Q/(Z-E)$$

For all never smokers living in households with partners:

$$Q_{N2} = (1-M)Q_U + MQ_M$$
$$= (1+(E-1)M)(Z-1)Q/(Z-E)$$

Defining $\alpha = (Z-1)/(Z-E)$

and $\beta = (1+(E-1)M)\alpha$

we can rewrite these formulae and noting that $Q_{N1} = Q_U$ we have

$$Q_{N1} = \alpha Q$$

$$Q_{N2} \quad = \quad \beta Q$$

and hence

$$Q_N \quad = \quad \pi Q_{N1} + (1-\pi)Q_{N2}$$

2.3.2 Estimating the absolute risk for the completely unexposed background

We can write down the following equation:

$$D = P\pi [N_1 Q_{N1} + C_1 Q_{N1} R_C + O_1 Q_{N1} R_O + X_1 Q_{N1} R_X] +$$
$$P(1-\pi)[N_2 Q_{N2} + C_2 Q_{N2} R_C + O_2 Q_{N2} R_O + X_2 Q_{N2} R_X]$$

Substituting for Q_{N1} and Q_{N2} for above, this gives:

$$D = PQ\{\alpha\pi [N_1 + C_1 R_C + O_1 R_O + X_1 R_X] +$$
$$\beta(1-\pi) [N_2 + C_2 R_C \ O_2 R_O + X_2 R_X]\}$$

This formula can be inverted to give Q in terms only of estimated parameters.

It is then straightforward to derive all the other parameters of interest.

2.3.3 Estimating the attributable deaths from smoking and ETS

For each of the smoking groups, we can now estimate the number of lung cancer deaths and the rates that actually occurred, and those that would have occurred at the background rate Q. The difference represents the numbers and rates attributable to smoking and ETS.

This is illustrated below for cigarette smokers. We first write down:

	Households with no partner	Households with a partner
Population	$P\pi C_1$	$P(1-\pi)C_2$
Rate	$Q_{N1}R_C$	$Q_{N2}R_C$
Deaths	$P\pi C_1 Q_{N1}R_C$	$P(1-\pi)C_2 Q_{N2}R_C$
Background rate	Q	Q
Deaths at background rate	$P\pi C_1 Q$	$P(1-\pi)C_2 Q$

The total population and total deaths are then calculated by summation over households with and without partners, and the total rate is then calculated by dividing the total deaths by the total population.

The calculations are essentially the same for pipe/cigar smokers and ex-smokers, with O and X, respectively, replacing C in the above formulae.

Never smokers are treated similarly with N replacing C and R_N defined as 1. Note that in never smokers the difference from the background is attributed only to ETS.

2.3.4 Estimating the "attributable" deaths from smoking only

The "attributable" differences in cigarette, pipe/cigar and ex-smokers that are due only to smoking can be calculated using the same formulae as above, but with Q replaced by Q_N.

2.3.5 Estimating "attributable" deaths for women

The methods were in fact only applied as described above for men. For women, pipe and cigar smoking is so rare that this has been ignored. Thus for women, ex-smokers refers to ex-smoking of cigarettes and similarly for never smoking. In practice, virtually all the women who did smoke pipes and cigars had previously smoked cigarettes, so the number of pure pipe and cigar smokers included in the never smokers would be trivial.

2.4   Data sources

Mortality and population data for UK and its constituent parts are readily available from WHO.[2] Successive years of the Health Survey of England (HSE)[3] provided information, on an individual person basis, concerning the smoking habits and cotinine level of the subject, whether they lived with a partner and, if so, the smoking habits of the partner. Relative risks for ETS were estimated from an inhouse database updated on a regular basis by PNLSC. Relative risks for cigarette smokers, pipe/cigar smokers and former smokers were estimated from PNLSC's inhouse IESLC database on which relative risks and 95% confidence intervals (CIs) are recorded relating to various aspects of the smoking habit for 296 epidemiological studies of ETS and lung cancer involving over 100 cases published by 1999 (updated to include later results published in 2001 in the large European multi-country study [4]).

2.5   Timing

As the latest available data on mortality on the WHO database are for 2002, attributable deaths were calculated for 1998 to 2002 and for the combined period. Data from HSE were available to us for years up to 2001 and our analyses are based on pooled data for the period 1998 to 2001 (core samples only), so as to provide adequately reliable estimates by age. They are assumed to apply to each year from 1998 to 2002. Estimates of relative risks for smoking and ETS were inevitably based on historic data; the actual periods covered are discussed in section 3.

2.6   Area covered

As HSE data apply to England, our first calculations were based on deaths occurring in England and Wales. However, additional calculations were based on deaths in the United Kingdom as a whole, assuming that the HSE-based estimates are reasonably valid for the larger area. Due to limited data for the United Kingdom, relative risk estimates were based on combined results from European studies.

2.7   <u>Age and sex</u>

The mortality data are specific for five-year age groups within sex and attention was restricted to ages 35-39 up to 80-84 and 85+. Lung cancers occurring before age 35 form less than 0.1% of the total. Except for the cotinine data, where the derived value of Z was sex-specific but not age-specific, estimates based on the HSE data were sex- and age-specific as for the mortality data. Relative risk estimates used were sex-specific, but not age-specific, as age-specific data are very rarely available.

3.   ESTIMATING THE REQUIRED PARAMETERS

3.1   Proportions of people smoking

The annual HSE surveys are of households in England sampled so as to be representative of the whole country. Data are available on files of individual households and of individuals within the households. Data on the individuals includes information on current and past smoking habits. By linking the individual data to the household data, it becomes possible to estimate directly:

- the proportion of households without partners (π),
- the proportions by smoking habits for those without and with partners ($N_1,C_1,O_1,X_1,N_2,C_2,O_2,X_2$), and
- the proportion of never smokers with a partner where the partner has ever smoked (M).

The questions in the HSE surveys give very good information on past smoking of cigarettes. In particular, there was a pre-derived variable dividing subjects (and their partners, if any) into four levels – never, ex-occasional smokers, ex-regular and current smokers. As a first step, the current smokers were classified as "cigarette smokers" (see section 2.1).

For women, the ex-regular smokers were classified as "ex-smokers" with the remainder, including ex-occasional smokers classified into the "never smokers" group.

For men, data were available on current regular pipe smoking and current regular cigar smoking, and those reporting either and who were not already classified as "cigarette smokers" were classified as "pipe/cigar smokers". Data on past smoking of pipes and cigars were limited, failing to distinguish current or regular smoking, and to derive the "ex-smokers" group an alternative question was used which asked about whether they had ever smoked cigarettes, pipes or cigars. Subjects who answered yes, but had not already been classified as "cigarette smokers" or "pipe/cigar smokers" and

were not ex-occasional smokers of cigarettes were classified into the "ex-smokers" group. Other subjects were classified as "never smokers".

For the purpose of estimating the proportions by smoking habit (N,C,O,X), the proportion of households without partners (π), the proportions by smoking habit for those without partners (N_1,C_1,O_1,X_1), the proportions by smoking habit for those with partners (N_2,C_2,O_2,X_2), and the proportion of never smokers with a partner whose partner had ever smoked (M), pooled data for the years 1998 to 2001 were used, with separate estimates made by 5-year age groups. Males were classified into their four smoking categories and females into their three smoking categories. Subjects were classified into whether or not they lived with a partner (of the opposite sex).

It was then straightforward to estimate π and the various proportions by smoking habits. To estimate M, attention was restricted to never smokers living with a partner and taking the percentage of those whose partner was an ever smoker. This was done separately according to the age of the never smoker.

Table 1M and Table 1F give the estimated values of the various parameters so derived for the two sexes, expressed as percentages rather than proportions.

3.2   Relative dose of ETS according to partner's smoking (Z)

The HSE files also include information on the cotinine levels for a sample of the individuals. As for estimation of M, attention was restricted to people living with a partner. As cotinine levels were not measured on all subjects, and in some years, particularly 1999, few cotinine values were available, it was decided to pool together all the data for all the years and all the age groups, ending up with just one estimate for each sex. For each sex, Z was estimated by restricting attention to never smokers and calculating the ratio of the geometric mean of cotinine values for all current smokers (including pipe/cigar smokers for men) to the geometric mean for all never smokers. The estimates obtained were as follows:

	Geometric means (ng/ml)		
	Partner never smoker	Partner currently smokes	Z
Males	0.28	1.62	5.7857
Females	0.21	0.83	3.9524

Separate calculations were in fact also carried out by year and gave quite similar estimates in each year (data not shown).

It should be noted that, as cotinine is only an indicator of current smoking, Z was only estimated with a numerator involving current smoking. It is applied in the calculations as if it applies also to ex-smokers, i.e. having a partner who has ever smoked is assumed to give an ETS dose Z times greater than having a partner who has never smoked (see also section 5).

3.3   Relative risks of lung cancer for smoking

Using our inhouse IESLC database, we investigated which relative risk estimates were most appropriate to use for applying to UK data for the period of interest. We defined a standard year for all the epidemiological studies as the mid-year over which the study was conducted for case-control studies and the final year of follow-up for prospective studies. Initial work indicated that for cigarette smoking, the estimates of relative risk increased markedly over the years, so it was decided to restrict attention to relative risks from the 1990s. However, when using just UK estimates, this gave us very few studies to use. In order to improve our estimate, therefore, we restricted attention to studies conducted in Western Europe (including Scandinavia).

In the IESLC database there are many different relative risk estimates to choose from each study, so a standardised technique was used to select individual estimates, which could then be meta-analysed using a weighted regression (weighting on the inverse of the variance of the estimates) to give overall estimates of relative risk.

To estimate relative risks for cigarette smokers, the following choices and preferences were used:

- Choose studies in Western Europe
- Choose relative risks from 1990s (as defined above)
- Choose relative risks for all lung cancers, i.e. not for specific histological types
- Choose relative risks for overall exposure, i.e. not for a specific number of cigarettes per day
- Choose all ages estimates
- Prefer estimates with "never smoked any product" as the denominator, and, if not available, preferring in turn "never smokes cigarettes," "non-smoker of any product" and "non-smoker of cigarettes"
- Prefer estimates for smoking cigarettes +/- other products, and, if not available, preferring in turn cigarettes and other products, cigarettes only and all/unspecified
- Prefer estimates for smoking manufactured cigarettes +/- handrolled, and, if not available, preferring in turn all/unspecified, manufactured cigarettes only, filter only and other.
- Choose estimates adjusted for age rather than non-adjusted for age
- Choose estimates adjusted for other risk factors rather than non-adjusted, and
- Choose estimates for the maximum follow-up period for prospective studies

finally selecting estimates for current smokers. For ex-smokers, the same choices and preferences were used, except for the final selection. For pipe/cigar smoking, similar choices and preferences were used except that the second preference was pipe and/or cigars (not cigarettes), pipe only, cigar only, with the third preference no longer relevant.

Tables 2, 3 and 4 show the relative risks (and 95% CI) included in the meta-analyses as well as the definitions of numerator and denominator for each relative risk. For each sex, the relative risks are given in ascending order. The

results of the meta-analyses, which show marked heterogeneity between studies for males, are summarised below:

		Number of studies	Relative risk (95% CI)	Heterogeneity Chisquared	p
Males					
Cigarette smoking	R_C	9	19.04 (16.44– 22.05)	16.98	<0.05
Pipe/cigar smoking	R_O	9	9.39 (7.18 – 12.29)	33.76	<0.001
Ex-smoking	R_X	8	6.05 (5.16 – 7.10)	24.12	<0.01
Females					
Cigarette smoking	R_C	5	9.11 (7.85 – 10.57)	6.23	N.S.
Ex-smoking	R_X	5	2.14 (1.78 – 2.57)	3.49	N.S.

3.4   Relative risks of lung cancer for ETS exposure

Using our inhouse database on ETS and lung cancer, meta-analyses have been derived for many years based on relative risk estimates included in Tables 1 and 2 of the annually updated summary of the epidemiological evidence prepared for TMA, the latest version of which was published in 2005. For our purposes, meta-analyses were conducted of those data based on estimates for studies conducted in Europe where the index of exposure was specifically based on spousal exposure. Table 5 presents the relative risks (and 95% CIs) used in the meta-analyses. The results of the meta-analyses are summarised below:

		Number of studies	Relative risk (95% CI)	Heterogeneity Chisquared	p
Males	E	4	1.31 (0.81 – 2.10)	2.06	N.S.
Females	E	9	1.24 (1.07 – 1.44)	12.21	N.S.

3.5   Mortality and population data

Data were obtained from WHO[2] for the years 1998 to 2002. Lung cancer mortality was classified based on combining codes C33 (malignant neoplasia of trachea) and C34 (malignant neoplasia of bronchus and lung).

Numbers of lung cancer deaths, death rates and populations for England and Wales for 1998 to 2002, by sex and the age groups of interest, are given in Table 6. Corresponding data for the United Kingdom are given in Table 7.

4.   MAIN ESTIMATES

The parameter estimates derived as described in section 3 were then entered into an Excel spreadsheet set up to calculate the attributable risks using the methodology presented in section 2. Tables 8a, 8b, 8c, 8d and 8e give, for each of the years 1998 to 2002, the estimated number of deaths that occurred in England and Wales by smoking habit, with the numbers divided into those that would have occurred at background rates and those that are attributed to smoking and ETS combined. Table 8f presents the same statistics but summed over the five year period.

Tables 9, 10 and 11 give further summary information for the five year period, with the estimated contributions of smoking and ETS separated. Table 9 gives numbers of lung cancer deaths (here the annual average), Table 10 gives percentages of lung cancer deaths and Table 11 gives rates per 100,000. For the 35+ age group, the rates are standardized to the European standard population.[5]

It can be seen from Table 8f that 90,333 men died of lung cancer in England and Wales in 1998 to 2002, equivalent to 18,067 a year. Based on the results in Table 9, one can divide these deaths as follows:

	Attributed to smoking	Attributed to ETS	Attributed to background	Total
Never smokers	0.0	81.7	574.4	656.1
Ex-smokers	7,597.7	182.5	1,322.0	9,102.2
Cigarette smokers	6,709.5	42.8	329.1	7081.4
Pipe/cigar smokers	1,096.1	15.1	115.6	1,226.8
Total	15,403.3	322.1	2,341.1	18,066.7

In women, over the same period, there were 55,799 deaths in England and Wales, equivalent to 11,160 a year. Again these can be divided as follows:

	Attributed to smoking	Attributed to ETS	Attributed to background	Total
Never smokers	0.0	368.9	1,703.2	2,072.1
Ex-smokers	3,160.9	202.9	942.3	4,306.1
Cigarette smokers	4,256.8	94.6	430.2	4,781.6
Total	7,417.7	666.4	3,075.78	11,159.8

Tables 12 and 13 correspond, respectively, to Tables 8f and 9, but giving results for the United Kingdom rather than England and Wales. This enables us to complete the following table of annual deaths averaged over the period 1998 to 2002:

	England and Wales			United Kingdom		
	Males	Females	Total	Males	Females	Total
Attributed to smoking	0	0	0.0	17,771.8	8,742.4	26,514.2
Attributed to ETS	0	0	0	371.4	785.1	1,1576.5
- in never smokers	81.7	368.9	450.6	94.2	434.2	528.4
- in ever smokers	-81.7	-368.9	-450.6	277.2	350.9	628.1
Attributed to background	2,341.1	0.08	2,341.189	2,695.9	3,612.2	6,308.1
Total	18,066.7	11,159.8	29,226.5	20,839.0	13,139.8	33,978.8

5.   SENSITIVITY ANALYSES

In order to give some insight into the effect that various parameter values have on the average numbers of lung cancer deaths per year in the United Kingdom over the period 1998-2002 by smoking habit and attributability to smoking and ETS, tables equivalent to Table 13 were run off using alternative estimates.

5.1   Varying relative risk estimates for active smoking

Tables 14 and 15 are based on varying the relative risk estimates (R_C, R_O and R_X) given in section 3.3, by respectively doubling and halving the excess risk. (For a given relative risk, R, the excess risk is R-1, so doubling the excess risk gives a relative risk of $1+2(R-1) = 2R-1$, and halving it gives a relative risk of $1+0.5(R-1) = 0.5(R+1)$. The results for all ages and both sexes combined for the United Kingdom are summarized below:

	Excess risk assumed		
	Half	As section 3.3	Twice
Attributed to smoking	22,082.5	**!H3 Is Not In Table**.2	29,662.4
Attributed to ETS	1,827.0	**!H4 Is Not In Table**6.5	672.1
- in never smokers	814.2	**!H5 Is Not In Table**	312.4
- in ever smokers	1,012.8	**!H6 Is Not In Table**	359.7
Attributed to background	10,069.3	**!H7 Is Not In Table**.1	3,644.3
Total	33,978.8	33,978.8	33,978.8

It can be seen that the stronger the assumed relationship with active smoking, the more deaths can be attributed to smoking and the fewer attributed to ETS and to background.

5.2   Varying relative risk estimates for ETS exposure

Tables 16 and 17 are based on varying the relative risk estimates (E) given in section 3.4 by respectively doubling and halving the excess risk E-1. The results for all ages and both sexes combined for the United Kingdom are summarized below:

	Excess risk assumed		
	Half	As section 3.4	Twice
Attributed to smoking	26,531.1	!H3 Is Not In Table.2	26,484.0
Attributed to ETS	601.1	!H4 Is Not In Table6.5	2,152.4
- in never smokers	274.8	!H5 Is Not In Table	982.0
- in ever smokers	326.3	!H6 Is Not In Table	1,170.3
Attributed to background	6,846.6	!H7 Is Not In Table8.1	5,342.4
Total	33,978.8	33,978.8	33,978.8

It can be seen that varying E has virtually no effect on the numbers of deaths attributed to smoking. In contrast, the numbers attributed to ETS increase approximately linearly with the excess risk, with the numbers attributed to background correspondingly decreasing.

5.3   Varying the relative dose of ETS according to partner's smoking

Tables 18 and 19 are based on varying the relative dose estimate (Z) given in section 3.2, by respectively doubling and halving the excess dose (Z-1). The results for all ages and both sexes combined for the United Kingdom are summarized below:

	Excess dose assumed		
	Half	As section 3.2	Twice
Attributed to smoking	26,514.2	!H3 Is Not In Table.2	26,514.2
Attributed to ETS	1,766.8	!H4 Is Not In Table6.5	851.4
- in never smokers	808.4	!H5 Is Not In Table	388.3
- in ever smokers	958.4	!H6 Is Not In Table	463.1
Attributed to background	5,697.8	!H7 Is Not In Table.1	6,613.2
Total	33,978.8	33,978.8	33,978.8

Varying Z has no effect on the number of deaths attributed to smoking. However, the number of deaths attributed to ETS decreases as Z increases. Note that the higher the value of Z the lower the relative importance of ETS from sources other than the partner.

5.4   Varying assumptions regarding ETS exposure in those without partners

The methodology described in section 2 implicitly assumes that the population can be divided into three groups according to ETS exposure: those without a partner, with a dose of 1 unit; those with a partner who has never smoked, also with a dose of 1 unit; and those with a partner who has ever smoked, with a dose of Z units. It may be unrealistic to assume that all those without a partner have an ETS exposure equivalent to those with a partner who has never smoked. An alternative, probably extreme, assumption is that the extent of ETS exposure in those without partners is the same as in those with partners. This can be achieved by setting $\pi = 0$, keeping M fixed at its estimated value, and applying the methodology with N_2, C_2, O_2 and X_2 replaced by N, C, O and X (see Table 20). This gives the following results for all ages and both sexes combined for the United Kingdom.

	Original assumption	Alternative assumption
Attributed to smoking	!H3 Is Not In Table.2	25,983.3
Attributed to ETS	!H4 Is Not In Table6.5	1,691.5
- in never smokers	!H5 Is Not In Table	837.9
- in ever smokers	!H6 Is Not In Table	853.6
Attributed to background	!H7 Is Not In Table.1	6,304.0
Total	33,978.8	33,978.8

The wider ETS exposure under the alternative assumption leads to a greater number of deaths attributed to ETS and a correspondingly smaller number attributed to smoking.

6.   <u>DISCUSSION</u>

In England and Wales, over the period 1998-2002, there were, on average, 29,227 lung cancer deaths per year. Based on the assumptions used in our main analyses, we estimate that 13,090 occurred in current smokers (1,227 in men who smoke pipes or cigars only, the rest in cigarette smokers), 13,408 in ex-smokers, and 2,728 in those who have never smoked. Of the 26,498 deaths in those who have ever smoked, 22,821 (86.1%) are attributed to their smoking and of the 2,728 in never smokers, 656 in men and 2,072 in women, 451 (16.5%) are attributed to ETS exposure. For the United Kingdom, lung cancer deaths averaged 33,979 per year over the period, 16.3% higher than the estimate for England and Wales, with numbers by smoking habit and by attribution to smoking and ETS similarly higher.

These estimates are subject to uncertainty for a number of reasons, which are discussed below.

Active smoking

Epidemiological studies have generally shown that adjustment for known risk factors for lung cancer other than smoking has little effect on the estimated relative risk for smoking. More important sources of uncertainty arise because of the difficulties of choosing appropriate relative risk estimates based on epidemiological studies and because of the possibility that they may be materially biased if a proportion of smokers deny smoking on interview.

Because studies from both the UK[6] and USA[7] have shown that relative risks from smoking have increased substantially over time, we have restricted attention to studies relating to the period from 1990. As evidence for this period that is specific to the UK is rather limited, we have used data from European studies.   Although the estimates for females were reasonably consistent, they were more variable for males, particularly for pipe/cigar smoking (see Table 3), possibly due to variation in the types of cigars smoked in different countries. Doubling the assumed excess risks would increase the proportion of total deaths attributed to smoking from about 78% to about 87%, but this seems a rather extreme alternative assumption, as judged by the

confidence limits for the relative risks given in section 3.3. It seems unlikely that the proportion should be much over 80% because of an inappropriate choice of relative risks estimates.

Misclassification of smoking habits is perhaps a more important issue. To illustrate this, consider a hypothetical situation where 70% of the population have ever smoked and where smoking has a true relative risk of 20. Suppose that 2% of typical smokers fail to report smoking on interview. The effect of this is that instead of observing 30% of never smokers, one observes a percentage of 30+0.02x70 = 31.4% and that their risk is higher by a factor (30+1.4x20)/31.4 = 1.85 than the risk in true never smokers. The relative risk observed therefore becomes 20/1.85 = 10.83. Whereas the proportion of deaths actually occurring in never smokers is 30/(30+(70x20)) = 2.1%, the observed proportion is almost doubled, by the inclusion of the misclassified smokers, to 4.1%.

While we do not attempt any formal correction for misclassification, partly because its extent may vary on the way the questions on smoking are asked, these calculations illustrate its potential importance. It should be noted that correction for misclassification will not only increase the estimated deaths in current and ex-smokers and the proportion attributable to smoking, but will also decrease the estimated number of deaths in never smokers and the number due to background causes.

ETS exposure

Mainly because of the greater frequency of never smokers in females, our estimates of total deaths in never smokers and those attributable to ETS are substantially higher in females than males. Our estimate of the relative risk associated with ETS exposure in females, of 1.24, is based only on European studies specifically reporting results for spousal exposure, but is quite similar to that of 1.17 calculated using estimates for all available studies for spouse smoking or nearest equivalent.[8] Noting also the lack of significant heterogeneity (see section 3.4), the estimate we used does not seem unreasonable.

However, as have shown in detail elsewhere,[1] it is in fact unclear whether the slight increase in risk associated with spousal smoking actually indicates any true effect of ETS exposure. It is not implausible that all, or virtually all, of this association can be explained by a combination of confounding by other risk factors and by misclassification of active smoking status.

Other sources of uncertainty in the ETS exposure estimates arise from uncertainty about the extent of the risk in those without partners and about the estimated relative ETS exposure of those with smoking and non-smoking partners, particularly as cotinine estimates only give information on very recent exposure. Considering also the fact that no causal effect of ETS exposure has been demonstrated, as noted above, it is clear that our estimates are far from precise, and merely serve to indicate that the number of deaths that might be regarded as attributable to ETS exposure is very much less than that attributable to smoking.

The Health Survey for England

The series of Health Surveys for England are designed to provide representative data of the population living in private households in England. The core sample was increased by a "minority ethnic boast" sample and by a sample of Chinese informants in 1999[9] and by a sample of other people resident in care homes in 2000,[10] but attention was restricted to the core samples in our analyses. Although of course not everyone lives in private households, data from the Health Surveys for England are widely taken to provide nationally representative data. They are also based on quite a large sample (totalling 33,459 people aged 35+ for the period of 1998-2001 where data were available to us), so should provide reasonably stable estimates. The proportions of cigarette smokers derived from the Health Surveys for England are not dissimilar to those reported in the General Household Surveys[11] (data not shown).

We consider that uncertainties in the reported frequency of smoking habits are likely to be considerably smaller than those related to estimation of relative risks due to smoking and ETS exposure and to bias due to misclassification of smoking habit.

7.   SUMMARY

We estimate numbers of lung cancer deaths due to lung cancer by age, sex, smoking and ETS in England and Wales and in the whole of the UK for the years 1998 to 2002. The methodology assumes that increased risks of lung cancer observed in epidemiological studies associated with smoking and ETS can be attributed to these factors. No adjustment is made for possible biases due to such factors as misclassification of smoking habits or confounding by other lung cancer risk factors (other than any adjustment for confounding made in the source papers presenting the relative risk estimates).

The methodology used is described in detail. Data used to derive the estimates come from three sources – WHO (for lung cancer mortality and population size), the Health Survey for England (for the proportions of households containing partners, for proportions by smoking habit in households with and without partners, and for the association between partners' smoking habits) and two inhouse databases of epidemiological studies (to obtain relevant relative risk estimates for smoking and for ETS exposure by meta-analysis).

In the period 1998-2002, 104,195 men aged 35+ died of lung cancer in the United Kingdom, averaging 20,839 deaths a year. These can be subdivided as follows:

	Attributed to smoking	Attributed to ETS	Attributed to background	Total
Current cigarette smokers	7,772.9	49.6	381.3	8,203.8
Current pipe/cigar only smokers	1,261.4	17.5	132.9	1,411.8
Ex-smokers	8,737.4	210.1	1,520.0	10,467.5
Never smokers	0.0	94.2	661.7	755.9
Total	17,771.8	371.4	2,695.9	20,839.0

In the same period there were 65,699 deaths from lung cancer in women aged 35+, averaging 13,140 deaths a year. These can be subdivided as follows:

	Attributed to smoking	Attributed to ETS	Attributed to background	Total
Current cigarette smokers	5,029.0	111.9	508.2	5,649.1
Ex-smokers	3,713.5	239.0	1,106.4	5,058.9
Never smokers	0.0	434.2	1,997.6	2,431.8
Total	8,742.4	785.1	3,612.2	13,139.8

For the sexes combined, our analyses attribute 78% of the annual average of 33,979 deaths a year to smoking and 1.6% to ETS exposure in never smokers.

These conclusions depend on the estimates we have derived for various parameters, including the relative risks for active smoking and for ETS exposure, the relative dose of ETS according to partner's smoking and the assumed level of ETS exposure in those without partners. This report includes sensitivity analyses to illustrate how the calculated numbers of deaths would vary were different parameter values selected.

We note that though all our sensitivity analyses attribute some hundreds of deaths a year to ETS exposure in never smokers, these analyses do not adjust for potential bias due to confounding by other risk factors and to misclassification of active smoking. As we have demonstrated elsewhere,[1] it is possible that all or virtually all of the observed association of ETS exposure with lung cancer may be explained by such biasing factors. We also note that, though adjustment for misclassification of active smoking will tend to reduce numbers of deaths attributed to ETS exposure, it will increase numbers attributed to active smoking.

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Table 1M

Estimates by age group of percentages by smoking habit and of M and π - Males

		Age 35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Percentages, of total population, who are												
never smokers	N	44.91	42.91	37.14	33.04	28.05	27.62	26.54	20.99	20.44	21.79	29.72
cigarette smokers	C	32.68	28.94	28.96	26.40	24.00	21.39	17.76	14.61	11.38	8.35	4.55
pipe/cigar smokers	O	2.48	3.52	4.71	4.60	5.47	5.15	4.39	4.59	5.30	4.48	5.94
ex-smokers	X	19.92	24.63	29.19	35.96	42.48	45.84	51.31	59.81	62.87	65.38	59.79
Percentages, of those without partners, who are												
never smokers	N_1	44.40	47.89	36.39	32.52	26.15	24.75	23.36	16.54	17.10	15.81	27.33
cigarette smokers	C_1	41.44	34.37	42.51	34.96	32.16	31.86	28.10	22.18	18.59	12.09	6.83
pipe/cigar smokers	O_1	1.90	2.82	3.06	4.07	8.48	4.07	4.74	4.89	6.69	6.05	6.83
ex-smokers	X_1	12.26	14.93	18.04	28.46	33.22	39.32	43.80	56.39	57.62	66.05	59.01
Percentages, of those with partners, who are												
never smokers	N_2	45.06	41.75	37.31	33.16	28.45	28.34	27.30	22.28	21.86	26.45	32.80
cigarette smokers	C_2	30.18	27.68	25.93	24.35	22.26	18.78	15.28	12.40	8.33	5.43	1.60
pipe/cigar smokers	O_2	2.65	3.68	5.08	4.73	4.83	5.41	4.30	4.50	4.72	3.26	4.80
ex-smokers	X_2	22.11	26.89	31.69	37.76	44.45	47.46	53.12	60.81	65.09	64.86	60.80
Percentages of people who are without partners	π	21.65	17.91	17.07	17.90	16.02	18.85	18.89	22.15	29.27	42.29	55.70
Percentages of never smokers with partners whose partner ever smoked	M	26.46	27.41	28.79	33.33	34.55	27.56	27.40	26.84	26.52	39.13	25.64

Table 1F

Estimates by age group of percentages by smoking habit
and of M and π - Females

	Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Percentages, of total population, who are												
never smokers	N	53.39	52.15	50.26	48.91	48.50	53.50	52.66	50.60	52.53	58.34	67.99
cigarette smokers	C	29.07	28.46	27.82	25.95	22.89	20.37	19.71	16.94	11.87	8.88	4.88
ex-smokers	X	17.53	19.39	21.92	25.14	28.61	26.13	27.63	32.47	35.61	32.78	27.12
Percentages, of those without partners, who are												
never smokers	N_1	44.76	44.85	43.62	38.31	43.14	50.00	49.48	49.41	48.92	58.02	67.27
cigarette smokers	C_1	40.87	37.60	38.68	37.33	30.67	24.79	25.17	19.38	13.94	9.15	4.99
ex-smokers	X_1	14.37	17.56	17.70	24.36	26.18	25.21	25.35	31.21	37.14	32.83	27.74
Percentages, of those with partners, who are												
never smokers	N_2	56.27	54.30	52.23	51.86	50.07	54.92	54.54	51.67	58.73	59.55	75.00
cigarette smokers	C_2	25.14	25.77	24.59	22.78	20.60	18.57	16.49	14.73	8.30	7.87	3.85
ex-smokers	X_2	18.59	19.93	23.18	25.36	29.33	26.51	28.97	33.60	32.97	32.58	21.15
Percentages of people who are without partners	π	25.18	22.51	22.58	21.66	22.34	28.38	36.61	47.24	62.59	78.72	89.83
Percentages of never smokers with partners whose partner ever smoked	M	44.40	49.19	53.01	57.80	63.30	64.55	68.47	70.46	70.36	76.00	57.89

Table 2

Relative risk estimates used in meta-analysis for cigarette smoking

Study	Country	Numerator[a]	RR[b]	RRL[c]	RRU[d]	Weight[e]	Year[f]
Males							
Engeland[12]	Norway	Current cigarettes ($\pm$ others)	9.70	4.49	20.94	6.48	93
Tulinius[13]	Iceland	Current cigarettes ($\pm$ others)	12.17	6.56	22.59	10.05	95
Doll 2[6]	UK	Current cigarettes ($\pm$ others)	12.20	5.77	25.82	6.84	91
Tang 2[14]	UK	Current filter cigarettes only	12.85	8.08	20.43	17.86	90
Droste[15]	Belgium	Current smoker (all/unspecified)	14.50	6.30	33.40	5.52	96
Axelsson[16]	Sweden	Current smoker (all/unspecified)	14.92	8.53	26.12	12.26	91
Knekt[17]	Finland	Current cigarettes ($\pm$ others)	18.14	11.16	29.49	16.27	91
Simonato[4]	Multi	Current smoker (all/unspecified)	23.90	19.70	29.00	102.77	91
Stucker[18]	France	Current smoker (all/unspecified)	104.50	6.32	1727.39	0.49	90
Females							
Engeland[12]	Norway	Current cigarettes ($\pm$ others)	5.80	2.69	12.51	6.50	93
Doll 2[6]	UK	Current cigarettes only	8.65	2.93	25.55	3.28	91
Simonato[4]	Multi	Current smoker (all/unspecified)	8.70	7.40	10.30	140.54	91
Axelsson[16]	Sweden	Current smoker (all/unspecified)	11.90	6.68	21.22	11.50	91
Tulinius[13]	Iceland	Current cigarettes ($\pm$ others)	16.34	9.07	29.47	11.07	95

[a] Denominator = never smoked any product for all estimates
[b] RR = relative risk
[c] RRL = lower 95% confidence limit of relative risk
[d] RRU = upper 95% confidence limit
[e] Weight = inverse of variance of the logarithm of the relative risk
[f] Year = mid-year for case-control studies or final year of follow-up for prospective studies

Table 3

Relative risk estimates used in meta-analysis for pipe/cigar smoking

Study	Country	Numerator[a]	RR[b]	RRL[c]	RRU[d]	Weight[e]	Year[f]
Males							
Kreuzer[19]	Germany	Current pipe and/or cigars (not cigarettes)	0.64	0.03	12.82	0.43	93
Engeland[12]	Norway	Current pipe and/or cigars (not cigarettes)	2.60	1.02	6.60	4.41	93
Wald[20]	UK	Current pipe and/or cigars (not cigarettes)	3.19	1.07	9.50	3.22	93
Doll 2[6]	UK	Current pipe and/or cigars (not cigarettes)	5.80	2.65	12.72	6.25	91
Knekt[17]	Finland	Current pipe and/or cigars (not cigarettes)	6.10	2.10	18.20	3.30	91
Tulinius[13]	Iceland	Current pipe and/or cigars (not cigarettes)	7.57	4.02	14.26	9.58	95
Boffetta[21]	Multi	Current pipe only[g]	12.50	7.70	20.20	16.52	91
Kreuzer[19]	Germany	Current pipe and/or cigars (not cigarettes)	30.37	14.18	65.06	6.62	93
Darby[22]	UK	Current pipe and/or cigars (not cigarettes)	44.22	13.65	143.22	2.78	90

a   Denominator = never smoked any product for all estimates
b   RR = relative risk
c   RRL = lower 95% confidence limit of relative risk
d   RRU = upper 95% confidence limit
e   Weight = inverse of variance of the logarithm of the relative risk
f   Year = mid-year for case-control studies or final year of follow-up for prospective studies
g   Boffetta did not report relative risks for current cigar only smokers, but risks were similar for ever cigar and ever pipe smokers

Table 4

Relative risk estimates used in meta-analysis for ex-smoking

Study	Country	Numerator[a]	RR[b]	RRL[c]	RRU[d]	Weight[e]	Year[f]
Males							
Engeland[12]	Norway	Ex smoker (all/unspecified)	2.80	1.08	7.20	4.27	93
Knekt[17]	Finland	Ex smoker (all/unspecified)	3.00	1.70	5.20	12.29	91
Tulinius[13]	Iceland	Ex smoker (all/unspecified)	3.03	1.54	5.98	8.35	95
Droste[15]	Belgium	Ex smoker (all/unspecified)	4.20	1.80	9.80	5.35	96
Doll 2[6]	UK	Ex cigarettes ($\pm$ others)	4.22	1.23	14.48	2.53	91
Axelsson[16]	Sweden	Ex smoker (all/unspecified)	4.58	2.60	8.07	11.96	91
Simonato[4]	Multi	Ex smoker (all/unspecified)	7.50	6.20	9.10	104.36	91
Stucker[18]	France	Ex smoker (all/unspecified)	135.69	8.30	2218.34	0.49	90
Females							
Simonato[4]	Multi	Ex smoker (all/unspecified)	2.00	1.60	2.40	93.47	91
Engeland[12]	Norway	Ex cigarettes ($\pm$ others)	2.00	0.80	4.90	4.68	93
Axelsson[16]	Sweden	Ex smoker (all/unspecified)	2.99	1.37	6.53	6.31	91
Doll 2[6]	UK	Ex smoker of cigarettes only	3.29	0.88	12.24	2.22	91
Tulinius[13]	Iceland	Ex smoker (all/unspecified)	3.69	1.71	7.99	6.47	95

[a] Denominator = never smoked any product except for Engeland (females) where it is never smoked cigarettes
[b] RR = relative risk
[c] RRL = lower 95% confidence limit of relative risk
[d] RRU = upper 95% confidence limit
[e] Weight = inverse of variance of the logarithm of the relative risk
[f] Year = mid-year for case-control studies or final year of follow-up for prospective studies

Table 5

Relative risk estimates used in meta-analysis for ETS exposure

Study	Country	RR[a]	RRL[b]	RRU[c]	Weight[d]	Year[e]
Males						
IARC: Kreuzer[23]	Germany	0.40	0.10	3.00	1.33	93
Lee[24]	UK	1.30	0.38	4.39	2.57	80
Boffetta[25]	Multi(W)[f]	1.47	0.81	2.66	10.87	91
Malats[26]	Multi(E&W)[g]	1.50	0.41	5.43	2.30	100
Females						
IARC: Kreuzer[23]	Germany	0.80	0.50	1.30	16.83	93
Boffetta 2[27]	Multi(E&W)[g]	1.00	0.50	1.90	8.62	95
Lee[24]	UK	1.00	0.37	2.71	3.88	80
Boffetta[25]	Multi(W)[f]	1.11	0.88	1.39	73.53	91
Pershagen[28]	Sweden	1.20	0.70	2.10	12.73	70
Malats[26]	Multi(E&W)[g]	1.50	0.77	2.91	8.69	100
Zaridze[29]	Russia	1.53	1.06	2.21	28.47	92
Trichopoulos[30]	Greece	2.08	1.20	3.59	12.80	80
Kalandidi[31]	Greece	2.11	1.09	4.08	8.82	88

[a] RR = relative risk
[b] RRL = lower 95% confidence limit of relative risk
[c] RRU = upper 95% confidence limit
[d] Weight = inverse of variance of the logarithm of the relative risk
[e] Year = mid-year for case-control studies or final year of follow-up for prospective studies
[f] Multi-country study in West Europe
[g] Multi-country study in East and West Europe

Table 6
England and Wales: Deaths from Lung Cancer
by Year and Age Group for 1998 to 2002

Number of deaths from Lung Cancer

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
1998	33	117	298	716	1,307	1,932	2,976	3,939	3,851	2,319	1,535	19,023
1999	41	103	265	689	1,147	1,868	2,781	3,802	3,959	2,142	1,535	18,332
2000	34	106	259	673	1,156	1,836	2,711	3,550	3,785	2,292	1,573	17,975
2001	29	82	274	669	1,168	1,782	2,532	3,349	3,641	2,429	1,608	17,563
2002	28	104	259	628	1,238	1,863	2,560	3,248	3,500	2,442	1,570	17,440
Females												
1998	31	87	250	458	647	947	1,587	2,337	2,301	1,423	1,081	11,149
1999	25	101	232	439	640	1,026	1,464	2,297	2,411	1,361	1,145	11,141
2000	22	99	211	453	707	978	1,483	2,180	2,247	1,438	1,210	11,028
2001	28	73	223	477	706	976	1,343	2,158	2,247	1,694	1,213	11,138
2002	30	80	197	471	771	984	1,327	2,043	2,360	1,763	1,317	11,343

Rates per 100,000 per year for Lung Cancer

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+*
Males												
1998	16.07	66.87	174.98	410.01	971.60	1,578.43	2,705.45	4,192.21	5,287.66	6,024.94	5,697.85	1,281.88
1999	19.26	57.41	157.29	387.06	825.83	1,502.69	2,537.41	4,055.47	5,234.00	5,747.25	5,511.67	1,217.17
2000	15.51	57.07	154.72	372.77	807.32	1,465.63	2,475.35	3,773.38	5,120.40	5,645.32	5,490.40	1,179.41
2001	14.25	44.75	166.63	378.29	784.05	1,425.60	2,295.14	3,542.42	4,967.26	5,511.69	5,686.00	1,140.00
2002	13.63	55.34	155.85	371.60	769.47	1,488.14	2,294.32	3,417.15	4,789.27	5,196.85	5,506.84	1,118.87
Females												
1998	15.64	50.29	147.00	261.15	474.27	748.08	1,306.50	2,039.09	2,185.39	2,019.30	1,446.54	581.69
1999	12.24	57.10	138.01	245.58	454.74	797.64	1,220.41	2,025.22	2,224.79	2,024.70	1,511.75	576.61
2000	10.49	54.33	126.42	249.79	486.45	753.41	1,247.69	1,927.50	2,154.98	2,024.50	1,575.11	569.12
2001	13.47	39.43	133.73	265.21	465.06	753.09	1,125.64	1,909.40	2,205.75	2,258.67	1,653.26	565.46
2002	14.32	42.09	116.76	273.36	470.01	757.16	1,106.29	1,815.19	2,362.60	2,243.86	1,809.81	567.62

* Standardised to European Standard Population

Table 6 (Cont.)
England and Wales: Deaths from Lung Cancer
by Year and Age Group for 1998 to 2002

Population (hundreds)

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
1998	20,532	17,497	17,031	17,463	13,452	12,240	11,000	9,396	7,283	3,849	2,694	132,437
1999	21,292	17,942	16,848	17,801	13,889	12,431	10,960	9,375	7,564	3,727	2,785	134,614
2000	21,926	18,573	16,740	18,054	14,319	12,527	10,952	9,408	7,392	4,060	2,865	136,816
2001	20,350	18,322	16,444	17,685	14,897	12,500	11,032	9,454	7,330	4,407	2,828	135,249
2002	20,546	18,793	16,619	16,900	16,089	12,519	11,158	9,505	7,308	4,699	2,851	136,987
Females												
1998	19,821	17,300	17,007	17,538	13,642	12,659	12,147	11,461	10,529	7,047	7,473	146,624
1999	20,419	17,688	16,810	17,876	14,074	12,863	11,996	11,342	10,837	6,722	7,574	148,201
2000	20,980	18,223	16,691	18,135	14,534	12,981	11,886	11,310	10,427	7,103	7,682	149,952
2001	20,787	18,516	16,676	17,986	15,181	12,960	11,931	11,302	10,187	7,500	7,337	150,363
2002	20,954	19,006	16,872	17,230	16,404	12,996	11,995	11,255	9,989	7,857	7,277	151,835

Table 7
United Kingdom: Deaths from Lung Cancer
by Year and Age Group for 1998 to 2002 combined

Number of deaths from Lung Cancer

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
1998	40	134	346	840	1,494	2,258	3,483	4,527	4,376	2,635	1,699	21,832
1999	44	114	314	801	1,339	2,185	3,254	4,394	4,533	2,415	1,720	21,113
2000	40	120	293	771	1,338	2,165	3,145	4,101	4,295	2,615	1,778	20,661
2001	36	98	321	772	1,371	2,109	2,973	3,946	4,183	2,747	1,789	20,345
2002	31	119	307	745	1,428	2,211	3,026	3,830	4,021	2,768	1,758	20,244
Females												
1998	32	111	286	515	760	1,147	1,892	2,764	2,708	1,642	1,239	13,096
1999	31	117	274	520	739	1,241	1,759	2,699	2,812	1,596	1,312	13,100
2000	30	116	255	539	820	1,172	1,796	2,608	2,646	1,708	1,384	13,074
2001	33	87	262	556	828	1,157	1,631	2,548	2,636	1,929	1,384	13,051
2002	32	95	232	547	893	1,202	1,634	2,449	2,737	2,051	1,506	13,378

Rates per 100,000 per year for Lung Cancer

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+*
Males												
1998	17.35	67.77	180.42	429.27	984.00	1,634.34	2,812.27	4,298.33	5,400.47	6,168.07	5,722.47	1,315.50
1999	18.45	56.26	165.37	401.46	855.04	1,557.82	2,636.31	4,179.59	5,386.17	5,830.52	5,609.92	1,254.14
2000	16.32	57.29	155.15	380.74	830.02	1,531.98	2,548.21	3,886.10	5,214.91	5,805.95	5,635.50	1,212.58
2001	15.70	47.24	172.27	387.78	818.21	1,495.64	2,389.87	3,720.18	5,114.32	5,618.74	5,730.30	1,180.92
2002	13.40	55.98	162.86	391.10	790.17	1,564.65	2,406.17	3,589.17	4,926.49	5,311.84	5,584.50	1,161.38
Females												
1998	14.24	56.50	149.08	261.55	490.89	796.64	1,370.12	2,133.37	2,293.17	2,082.70	1,496.20	606.88
1999	13.41	58.22	144.33	259.08	463.47	849.01	1,289.02	2,103.34	2,313.64	2,119.24	1,563.77	602.55
2000	12.65	56.04	135.10	264.58	499.15	795.06	1,327.91	2,036.39	2,259.61	2,148.70	1,626.51	599.28
2001	14.02	41.31	138.65	274.53	483.70	786.49	1,201.65	1,990.78	2,299.97	2,300.26	1,695.04	589.77
2002	13.50	43.98	121.15	281.64	483.62	814.75	1,198.04	1,919.28	2,432.46	2,335.19	1,860.18	596.15

* Standardised to European Standard Population

Table 7 (Cont.)
United Kingdom: Deaths from Lung Cancer
by Year and Age Group for 1998 to 2002 combined

Population (hundreds)

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
1998	23,059	19,774	19,178	19,568	15,183	13,816	12,385	10,532	8,103	4,272	2,969	148,839
1999	23,851	20,264	18,988	19,952	15,660	14,026	12,343	10,513	8,416	4,142	3,066	151,221
2000	24,511	20,946	18,885	20,250	16,120	14,132	12,342	10,553	8,236	4,504	3,155	153,634
2001	22,936	20,744	18,634	19,908	16,756	14,101	12,440	10,607	8,179	4,889	3,122	152,316
2002	23,132	21,257	18,851	19,049	18,072	14,131	12,576	10,671	8,162	5,211	3,148	154,260
Females												
1998	22,468	19,646	19,184	19,690	15,482	14,398	13,809	12,956	11,809	7,884	8,281	165,607
1999	23,111	20,097	18,984	20,071	15,945	14,617	13,646	12,832	12,154	7,531	8,390	167,378
2000	23,712	20,700	18,875	20,372	16,428	14,741	13,525	12,807	11,710	7,949	8,509	169,328
2001	23,535	21,061	18,897	20,253	17,118	14,711	13,573	12,799	11,461	8,386	8,165	169,959
2002	23,705	21,601	19,150	19,422	18,465	14,753	13,639	12,760	11,252	8,783	8,096	171,626

Table 8a

Numbers of Lung Cancer Deaths attributable to Smoking and ETS in England and Wales by Age and Sex, 1998 to 2002
Based on parameter estimates given in section 3

1998

Age:	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
Deaths occurred												
Never smokers	1.83	6.46	13.77	29.86	46.57	70.79	111.01	118.44	119.16	84.30	86.27	688.46
Ex smokers	4.97	22.73	66.17	197.99	428.95	711.40	1299.46	2035.22	2211.67	1497.77	1046.02	9522.35
Cigarette smokers	25.24	82.79	201.50	448.95	748.00	1025.70	1394.00	1543.72	1233.41	581.70	242.84	7527.85
Pipe/cigar smokers	0.96	5.01	16.56	39.20	83.48	124.12	171.53	241.62	286.76	155.24	159.87	1284.34
Total	33.00	117.00	298.00	716.00	1307.00	1932.00	2976.00	3939.00	3851.00	2319.00	1535.00	19023.00
Deaths that would have occurred at background rates												
Never smokers	1.61	5.66	11.99	25.74	39.92	61.81	96.95	103.65	104.93	72.70	77.67	602.61
Ex smokers	0.72	3.27	9.47	28.11	60.62	102.62	187.51	295.18	322.48	216.49	156.11	1382.58
Cigarette smokers	1.17	3.81	9.28	20.44	33.90	47.47	64.63	71.86	58.10	27.31	11.78	349.76
Pipe/cigar smokers	0.09	0.47	1.53	3.59	7.70	11.52	16.00	22.63	27.15	14.71	15.48	120.86
Total	3.59	13.20	32.26	77.88	142.13	223.42	365.10	493.31	512.66	331.21	261.04	2455.81
Attributable deaths												
Never smokers	0.22	0.80	1.78	4.13	6.65	8.98	14.06	14.79	14.24	11.59	8.60	85.84
Ex smokers	4.25	19.47	56.70	169.88	368.32	608.78	1111.94	1740.05	1889.19	1281.28	889.91	8139.77
Cigarette smokers	24.07	78.98	192.23	428.50	714.11	978.22	1329.37	1471.85	1175.31	554.38	231.06	7178.09
Pipe/cigar smokers	0.87	4.55	15.03	35.61	75.78	112.59	155.53	219.00	259.61	140.53	144.39	1163.48
Total	29.41	103.80	265.74	638.12	1164.87	1708.58	2610.90	3445.69	3338.34	1987.79	1273.96	16567.19
Females												
Deaths occurred												
Never smokers	4.35	11.93	32.94	59.93	87.05	151.62	252.01	364.24	418.87	317.15	344.73	2044.82
Ex smokers	5.37	16.66	54.16	115.09	192.91	278.01	497.92	880.06	1050.39	669.05	512.61	4272.23
Cigarette smokers	21.29	58.41	162.90	282.98	367.04	517.37	837.08	1092.70	831.74	436.80	223.66	4831.95
Total	31.00	87.00	250.00	458.00	647.00	947.00	1587.00	2337.00	2301.00	1423.00	1081.00	11149.00
Deaths that would have occurred at background rates												
Never smokers	3.68	9.51	26.04	46.69	67.32	118.30	197.97	291.67	343.58	270.03	302.45	1677.26
Ex smokers	1.21	3.54	11.36	24.00	39.72	57.78	103.87	187.16	232.45	151.70	120.30	933.09
Cigarette smokers	2.01	5.18	14.38	24.75	31.70	44.95	73.90	97.57	77.29	41.09	21.66	434.48
Total	6.90	18.23	51.79	95.44	138.74	221.03	375.75	576.40	653.32	462.81	444.41	3044.83
Attributable deaths												
Never smokers	0.66	2.42	6.90	13.24	19.73	33.32	54.03	72.57	75.29	47.12	42.28	367.56
Ex smokers	4.16	13.12	42.80	91.09	153.20	220.23	394.04	692.90	817.94	517.35	392.31	3339.14
Cigarette smokers	19.28	53.23	148.51	258.23	335.33	472.42	763.18	995.13	754.45	395.71	202.00	4397.47
Total	24.10	68.77	198.21	362.56	508.26	725.97	1211.25	1760.60	1647.68	960.19	636.59	8104.17

Numbers of Lung Cancer Deaths attributable to Smoking and ETS in England and Wales by Age and Sex, 1998 to 2002
Based on parameter estimates given in section 3

1999

Age:	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
Deaths occurred												
Never smokers	2.28	5.69	12.24	28.74	40.87	68.44	103.74	114.32	122.50	77.86	86.27	662.95
Ex smokers	6.17	20.01	58.84	190.53	376.44	687.83	1214.31	1964.44	2273.70	1383.45	1046.02	9221.74
Cigarette smokers	31.36	72.89	179.19	432.02	656.44	991.72	1302.66	1490.02	1268.00	537.30	242.84	7204.43
Pipe/cigar smokers	1.19	4.41	14.72	37.72	73.26	120.01	160.29	233.22	294.80	143.39	159.87	1242.88
Total	41.00	103.00	265.00	689.00	1147.00	1868.00	2781.00	3802.00	3959.00	2142.00	1535.00	18332.00
Deaths that would have occurred at background rates												
Never smokers	2.00	4.98	10.66	24.77	35.03	59.76	90.60	100.04	107.87	67.15	77.67	580.53
Ex smokers	0.89	2.88	8.42	27.05	53.20	99.22	175.23	284.91	331.53	199.97	156.11	1339.40
Cigarette smokers	1.45	3.36	8.25	19.67	29.75	45.90	60.39	69.36	59.73	25.23	11.78	334.87
Pipe/cigar smokers	0.11	0.41	1.36	3.46	6.75	11.14	14.95	21.84	27.92	13.58	15.48	117.01
Total	4.46	11.62	28.69	74.95	124.73	216.02	341.17	476.16	527.04	305.93	261.04	2371.81
Attributable deaths												
Never smokers	0.28	0.71	1.59	3.97	5.84	8.68	13.14	14.28	14.63	10.71	8.60	82.42
Ex smokers	5.28	17.14	50.42	163.47	323.23	588.61	1039.09	1679.53	1942.17	1183.48	889.91	7882.34
Cigarette smokers	29.91	69.53	170.94	412.35	626.69	945.82	1242.27	1420.66	1208.27	512.07	231.06	6869.56
Pipe/cigar smokers	1.08	4.00	13.36	34.27	66.50	108.86	145.34	211.38	266.89	129.81	144.39	1125.88
Total	36.54	91.38	236.31	614.05	1022.27	1651.98	2439.83	3325.84	3431.96	1836.07	1273.96	15960.19
Females												
Deaths occurred												
Never smokers	3.50	13.85	30.57	57.45	86.11	164.27	232.47	358.01	438.89	303.33	365.14	2053.60
Ex smokers	4.33	19.34	50.26	110.31	190.83	301.20	459.33	865.00	1100.61	639.90	542.96	4284.06
Cigarette smokers	17.17	67.81	151.17	271.24	363.06	560.53	772.20	1073.99	871.50	417.77	236.90	4803.34
Total	25.00	101.00	232.00	439.00	640.00	1026.00	1464.00	2297.00	2411.00	1361.00	1145.00	11141.00
Deaths that would have occurred at background rates												
Never smokers	2.97	11.04	24.17	44.76	66.59	128.17	182.63	286.68	360.01	258.27	320.36	1685.64
Ex smokers	0.98	4.10	10.55	23.00	39.29	62.60	95.82	183.96	243.56	145.09	127.42	936.37
Cigarette smokers	1.62	6.02	13.35	23.72	31.36	48.70	68.17	95.90	80.98	39.30	22.94	432.06
Total	5.57	21.16	48.06	91.48	137.24	239.46	346.62	566.54	684.55	442.65	470.72	3054.07
Attributable deaths												
Never smokers	0.53	2.81	6.40	12.69	19.51	36.10	49.85	71.33	78.89	45.07	44.78	367.96
Ex smokers	3.35	15.23	39.71	87.31	151.54	238.61	363.50	681.04	857.04	494.81	415.53	3347.69
Cigarette smokers	15.55	61.79	137.82	247.52	331.70	511.83	704.03	978.10	790.51	378.47	213.96	4371.28
Total	19.43	79.84	183.94	347.52	502.76	786.54	1117.38	1730.46	1726.45	918.35	674.28	8086.93

Table 8c
Numbers of Lung Cancer Deaths attributable to Smoking and ETS in England and Wales by Age and Sex, 1998 to 2002
Based on parameter estimates given in section 3

2000

Age:	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
Deaths occurred												
Never smokers	1.89	5.85	11.97	28.07	41.19	67.27	101.13	106.74	117.12	83.31	88.41	652.94
Ex smokers	5.12	20.60	57.51	186.10	379.39	676.05	1183.75	1834.23	2173.77	1480.33	1071.92	9068.76
Cigarette smokers	26.01	75.01	175.13	421.99	661.59	974.73	1269.87	1391.26	1212.27	574.93	248.85	7031.63
Pipe/cigar smokers	0.99	4.54	14.39	36.85	73.83	117.95	156.26	217.76	281.85	153.43	163.83	1221.67
Total	34.00	106.00	259.00	673.00	1156.00	1836.00	2711.00	3550.00	3785.00	2292.00	1573.00	17975.00
Deaths that would have occurred at background rates												
Never smokers	1.66	5.12	10.42	24.19	35.30	58.74	88.32	93.41	103.13	71.86	79.59	571.74
Ex smokers	0.74	2.96	8.23	26.42	53.62	97.52	170.81	266.03	316.96	213.97	159.97	1317.23
Cigarette smokers	1.21	3.45	8.06	19.22	29.98	45.11	58.87	64.77	57.10	27.00	12.07	326.84
Pipe/cigar smokers	0.09	0.42	1.33	3.38	6.81	10.95	14.58	20.39	26.69	14.53	15.86	115.03
Total	3.70	11.96	28.04	73.21	125.71	212.32	332.59	444.60	503.87	327.35	267.50	2330.85
Attributable deaths												
Never smokers	0.23	0.73	1.55	3.88	5.89	8.53	12.81	13.33	13.99	11.46	8.82	81.20
Ex smokers	4.38	17.64	49.28	159.68	325.77	578.53	1012.93	1568.21	1856.81	1266.36	911.94	7751.53
Cigarette smokers	24.80	71.56	167.07	402.77	631.61	929.62	1211.00	1326.50	1155.16	547.93	236.78	6704.79
Pipe/cigar smokers	0.89	4.12	13.06	33.47	67.03	107.00	141.68	197.37	255.16	138.90	147.96	1106.63
Total	30.30	94.04	230.96	599.79	1030.29	1623.68	2378.41	3105.40	3281.13	1964.65	1305.50	15644.15
Females												
Deaths occurred												
Never smokers	3.08	13.58	27.81	59.28	95.12	156.58	235.49	339.77	409.04	320.49	385.87	2046.12
Ex smokers	3.81	18.96	45.71	113.83	210.80	287.11	465.29	820.94	1025.74	676.10	573.78	4242.08
Cigarette smokers	15.11	66.46	137.48	279.89	401.07	534.31	782.22	1019.29	812.22	441.41	250.35	4739.81
Total	22.00	99.00	211.00	453.00	707.00	978.00	1483.00	2180.00	2247.00	1438.00	1210.00	11028.00
Deaths that would have occurred at background rates												
Never smokers	2.61	10.82	21.98	46.18	73.57	122.17	185.00	272.08	335.52	272.88	338.54	1681.36
Ex smokers	0.86	4.02	9.59	23.73	43.40	59.67	97.07	174.59	227.00	153.29	134.66	927.89
Cigarette smokers	1.43	5.90	12.14	24.48	34.64	46.42	69.06	91.01	75.47	41.52	24.25	426.31
Total	4.90	20.74	43.71	94.40	151.61	228.26	351.12	537.68	637.99	467.69	497.45	3035.56
Attributable deaths												
Never smokers	0.47	2.76	5.82	13.10	21.56	34.41	50.49	67.69	73.52	47.61	47.33	364.76
Ex smokers	2.95	14.93	36.12	90.10	167.40	227.44	368.22	646.35	798.75	522.81	439.12	3314.19
Cigarette smokers	13.68	60.57	125.34	255.41	366.43	487.89	713.16	928.28	736.74	399.89	226.11	4313.49
Total	17.10	78.26	167.29	358.60	555.39	749.74	1131.88	1642.32	1609.01	970.31	712.55	7992.44

Table 8d
Numbers of Lung Cancer Deaths attributable to Smoking and ETS in England and Wales by Age and Sex, 1998 to 2002
Based on parameter estimates given in section 3

2001

Age:	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
Deaths occurred												
Never smokers	1.61	4.53	12.66	27.90	41.62	65.29	94.45	100.70	112.66	88.29	90.37	640.08
Ex smokers	4.36	15.93	60.84	184.99	383.33	656.17	1105.59	1730.38	2091.07	1568.82	1095.77	8897.24
Cigarette smokers	22.18	58.03	185.28	419.48	668.45	946.06	1186.02	1312.49	1166.15	609.29	254.39	6827.82
Pipe/cigar smokers	0.84	3.51	15.22	36.63	74.60	114.48	145.94	205.43	271.12	162.60	167.47	1197.85
Total	29.00	82.00	274.00	669.00	1168.00	1782.00	2532.00	3349.00	3641.00	2429.00	1608.00	17563.00
Deaths that would have occurred at background rates												
Never smokers	1.42	3.96	11.02	24.05	35.67	57.01	82.49	88.12	99.20	76.15	81.36	560.46
Ex smokers	0.63	2.29	8.71	26.27	54.18	94.65	159.54	250.96	304.90	226.76	163.53	1292.41
Cigarette smokers	1.03	2.67	8.53	19.10	30.29	43.79	54.99	61.10	54.93	28.61	12.34	317.38
Pipe/cigar smokers	0.08	0.33	1.40	3.36	6.88	10.63	13.62	19.24	25.67	15.40	16.22	112.82
Total	3.15	9.25	29.67	72.77	127.02	206.08	310.63	419.42	484.70	346.92	273.45	2283.06
Attributable deaths												
Never smokers	0.20	0.56	1.64	3.85	5.95	8.28	11.96	12.58	13.46	12.14	9.01	79.63
Ex smokers	3.73	13.64	52.13	158.73	329.15	561.52	946.05	1479.42	1786.17	1342.06	932.24	7604.83
Cigarette smokers	21.15	55.35	176.75	400.38	638.16	902.27	1131.04	1251.39	1111.22	580.68	242.05	6510.44
Pipe/cigar smokers	0.76	3.19	13.82	33.27	67.72	103.85	132.33	186.19	245.45	147.20	151.25	1085.03
Total	25.85	72.75	244.33	596.23	1040.98	1575.92	2221.37	2929.58	3156.30	2082.08	1334.55	15279.94
Females												
Deaths occurred												
Never smokers	3.93	10.01	29.39	62.42	94.99	156.26	213.26	336.34	409.04	377.55	386.83	2080.01
Ex smokers	4.85	13.98	48.31	119.86	210.51	286.53	421.36	812.66	1025.74	796.47	575.20	4315.46
Cigarette smokers	19.23	49.01	145.30	294.72	400.51	533.21	708.38	1009.00	812.22	519.99	250.97	4742.53
Total	28.00	73.00	223.00	477.00	706.00	976.00	1343.00	2158.00	2247.00	1694.00	1213.00	11138.00
Deaths that would have occurred at background rates												
Never smokers	3.33	7.98	23.23	48.63	73.46	121.92	167.53	269.33	335.52	321.46	339.38	1711.78
Ex smokers	1.09	2.97	10.14	24.99	43.34	59.55	87.90	172.83	227.00	180.58	134.99	945.38
Cigarette smokers	1.81	4.35	12.83	25.78	34.59	46.32	62.54	90.09	75.47	48.91	24.31	427.01
Total	6.23	15.30	46.20	99.40	151.40	227.79	317.98	532.26	637.99	550.95	498.68	3084.17
Attributable deaths												
Never smokers	0.60	2.03	6.16	13.79	21.53	34.34	45.73	67.01	73.52	56.09	47.44	368.23
Ex smokers	3.76	11.01	38.17	94.87	167.17	226.98	333.46	639.83	798.75	615.88	440.21	3370.08
Cigarette smokers	17.41	44.66	132.47	268.94	365.91	486.89	645.84	918.91	736.74	471.07	226.67	4315.52
Total	21.77	57.70	176.80	377.60	554.60	748.21	1025.02	1625.74	1609.01	1143.05	714.32	8053.83

Table 8e
Numbers of Lung Cancer Deaths attributable to Smoking and ETS in England and Wales by Age and Sex, 1998 to 2002
Based on parameter estimates given in section 3

2002

Age:	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
Deaths occurred												
Never smokers	1.56	5.74	11.97	26.19	44.11	68.26	95.49	97.66	108.30	88.77	88.24	636.28
Ex smokers	4.21	20.21	57.51	173.66	406.30	685.99	1117.81	1678.19	2010.09	1577.21	1069.87	8801.06
Cigarette smokers	21.42	73.59	175.13	393.77	708.52	989.06	1199.14	1272.91	1120.99	612.55	248.38	6815.46
Pipe/cigar smokers	0.81	4.46	14.39	34.38	79.07	119.69	147.55	199.24	260.62	163.47	163.51	1187.19
Total	28.00	104.00	259.00	628.00	1238.00	1863.00	2560.00	3248.00	3500.00	2442.00	1570.00	17440.00
Deaths that would have occurred at background rates												
Never smokers	1.37	5.03	10.42	22.57	37.81	59.60	83.40	85.46	95.36	76.56	79.44	557.02
Ex smokers	0.61	2.90	8.23	24.66	57.42	98.95	161.30	243.40	293.09	227.97	159.67	1278.20
Cigarette smokers	0.99	3.39	8.06	17.93	32.11	45.78	55.59	59.26	52.80	28.76	12.05	316.73
Pipe/cigar smokers	0.08	0.41	1.33	3.15	7.29	11.11	13.77	18.66	24.68	15.49	15.83	111.79
Total	3.04	11.73	28.04	68.31	134.63	215.45	314.06	406.77	465.93	348.78	266.99	2263.74
Attributable deaths												
Never smokers	0.19	0.71	1.55	3.62	6.30	8.66	12.09	12.20	12.94	12.21	8.80	79.26
Ex smokers	3.61	17.30	49.28	149.00	348.88	587.04	956.51	1434.80	1717.00	1349.24	910.21	7522.86
Cigarette smokers	20.42	70.21	167.07	375.84	676.41	943.29	1143.55	1213.65	1068.18	583.79	236.33	6498.73
Pipe/cigar smokers	0.74	4.04	13.06	31.23	71.78	108.57	133.79	180.58	235.95	147.99	147.68	1075.40
Total	24.96	92.27	230.96	559.69	1103.37	1647.55	2245.94	2841.23	3034.07	2093.22	1303.01	15176.26
Females												
Deaths occurred												
Never smokers	4.21	10.97	25.96	61.64	103.73	157.54	210.72	318.42	429.61	392.93	419.99	2135.72
Ex smokers	5.20	15.32	42.68	118.35	229.89	288.87	416.34	769.35	1077.33	828.91	624.52	4416.75
Cigarette smokers	20.60	53.71	128.36	291.01	437.38	537.58	699.94	955.23	853.06	541.17	272.49	4790.53
Total	30.00	80.00	197.00	471.00	771.00	984.00	1327.00	2043.00	2360.00	1763.00	1317.00	11343.00
Deaths that would have occurred at background rates												
Never smokers	3.56	8.75	20.52	48.02	80.23	122.92	165.54	254.98	352.39	334.55	368.48	1759.94
Ex smokers	1.17	3.25	8.96	24.68	47.33	60.04	86.86	163.62	238.41	187.94	146.57	968.81
Cigarette smokers	1.94	4.77	11.33	25.45	37.78	46.70	61.79	85.29	79.27	50.90	26.39	431.63
Total	6.68	16.76	40.81	98.15	165.34	229.66	314.19	503.89	670.07	573.39	541.44	3160.38
Attributable deaths												
Never smokers	0.64	2.23	5.44	13.62	23.51	34.62	45.18	63.44	77.22	58.38	51.51	375.78
Ex smokers	4.03	12.07	33.72	93.68	182.56	228.84	329.49	605.73	838.91	640.97	477.95	3447.94
Cigarette smokers	18.66	48.94	117.03	265.56	399.60	490.88	638.14	869.94	773.79	490.26	246.10	4358.91
Total	23.32	63.24	156.19	372.85	605.66	754.34	1012.81	1539.11	1689.93	1189.61	775.56	8182.62

Numbers of Lung Cancer Deaths attributable to Smoking and ETS in England and Wales by Age and Sex, 1998 to 2002
Based on parameter estimates given in section 3

Total 1998 - 2002

Age:	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
Deaths occurred												
Never smokers	9.17	28.26	62.61	140.76	214.36	340.05	505.82	537.86	579.74	422.53	439.56	3280.71
Ex smokers	24.83	99.49	300.87	933.27	1974.41	3417.44	5920.91	9242.47	10760.29	7507.58	5329.60	45511.16
Cigarette smokers	126.21	362.31	916.24	2116.20	3443.00	4927.27	6351.69	7010.40	6000.81	2915.77	1237.29	35407.18
Pipe/cigar smokers	4.79	21.94	75.28	184.78	384.24	596.25	781.58	1097.27	1395.16	778.13	814.55	6133.94
Total	165.00	512.00	1355.00	3375.00	6016.00	9281.00	13560.00	17888.00	18736.00	11624.00	7821.00	90333.00
Deaths that would have occurred at background rates												
Never smokers	8.06	24.75	54.50	121.31	183.73	296.93	441.77	470.68	510.48	364.42	395.72	2872.36
Ex smokers	3.58	14.30	43.07	132.51	279.05	492.96	854.39	1340.47	1568.95	1085.16	795.39	6609.82
Cigarette smokers	5.85	16.68	42.19	96.36	156.02	228.05	294.48	326.35	282.67	136.91	60.03	1645.58
Pipe/cigar smokers	0.45	2.04	6.95	16.93	35.43	55.36	72.92	102.76	132.11	73.71	78.88	577.51
Total	17.94	57.76	146.71	367.11	654.22	1073.29	1663.55	2240.26	2494.21	1660.20	1330.02	11705.27
Attributable deaths												
Never smokers	1.11	3.51	8.11	19.44	30.63	43.12	64.05	67.17	69.26	58.11	43.83	408.35
Ex smokers	21.25	85.19	257.80	800.76	1695.36	2924.48	5066.52	7902.00	9191.34	6422.42	4534.21	38901.34
Cigarette smokers	120.36	345.63	874.05	2019.84	3286.98	4699.22	6057.22	6684.05	5718.14	2778.86	1177.27	33761.61
Pipe/cigar smokers	4.34	19.90	68.33	167.85	348.81	540.89	708.66	994.51	1263.05	704.42	735.67	5556.43
Total	147.06	454.24	1208.29	3007.89	5361.78	8207.71	11896.45	15647.74	16241.79	9963.80	6490.98	78627.73
Females												
Deaths occurred												
Never smokers	19.07	60.35	146.67	300.72	467.00	786.27	1143.95	1716.78	2105.45	1711.45	1902.56	10360.27
Ex smokers	23.55	84.25	241.12	577.44	1034.94	1441.73	2260.24	4148.01	5279.81	3610.42	2829.07	21530.58
Cigarette smokers	93.38	295.40	725.21	1419.84	1969.06	2683.00	3799.81	5150.21	4180.73	2357.13	1234.38	23908.15
Total	136.00	440.00	1113.00	2298.00	3471.00	4911.00	7204.00	11015.00	11566.00	7679.00	5966.00	55799.00
Deaths that would have occurred at background rates												
Never smokers	16.16	48.10	115.95	234.29	361.17	613.49	898.67	1374.75	1727.01	1457.18	1669.21	8515.98
Ex smokers	5.31	17.88	50.59	120.40	213.08	299.63	471.52	882.16	1168.42	818.60	663.94	4711.54
Cigarette smokers	8.81	26.21	64.03	124.18	170.08	233.08	335.46	459.86	388.49	221.72	119.55	2151.48
Total	30.27	92.20	230.57	478.87	744.33	1146.21	1705.66	2716.77	3283.92	2497.50	2452.70	15379.01
Attributable deaths												
Never smokers	2.91	12.25	30.72	66.43	105.83	172.77	245.28	342.03	378.44	254.27	233.34	1844.28
Ex smokers	18.25	66.37	190.52	457.04	821.86	1142.10	1788.71	3265.84	4111.39	2791.82	2165.13	16819.04
Cigarette smokers	84.57	269.19	661.18	1295.66	1798.98	2449.92	3464.35	4690.35	3792.24	2135.41	1114.83	21756.67
Total	105.73	347.80	882.43	1819.13	2726.67	3764.79	5498.34	8298.23	8282.08	5181.50	3513.30	40419.99

Table 9

Annual Numbers of Lung Cancer Deaths separately attributable to Smoking and ETS in England and Wales by Age and Sex, Averaged over years 1998 to 2002

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Numbers of deaths												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.1	16.6	50.2	155.8	329.6	570.5	988.4	1543.0	1796.3	1253.3	889.7	7597.7
In cigarette smokers	23.9	68.7	173.6	401.0	652.4	933.7	1203.6	1328.4	1137.1	552.5	234.5	6709.5
In pipe/cigar smokers	0.9	3.9	13.5	33.0	68.7	106.5	139.7	196.1	249.3	139.1	145.6	1096.1
Extra "attributable" to ETS												
In never smokers	0.2	0.7	1.6	3.9	6.1	8.6	12.8	13.4	13.9	11.6	8.8	81.7
In ex-smokers	0.1	0.4	1.3	4.4	9.5	14.4	24.9	37.4	41.9	31.2	17.1	182.5
In cigarette smokers	0.2	0.5	1.2	3.0	5.0	6.1	7.8	8.4	6.5	3.2	1.0	42.8
In pipe/cigar smokers	0.0	0.1	0.2	0.5	1.1	1.6	2.1	2.8	3.3	1.8	1.6	15.1
Not "attributable" to ETS or smoking	3.6	11.6	29.3	73.4	130.8	214.7	332.7	448.1	498.8	332.0	266.0	2341.1
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	3.5	12.4	35.4	84.8	151.9	211.7	331.8	609.0	775.1	530.0	415.3	3160.9
In cigarette smokers	16.6	52.6	129.1	252.8	350.6	477.7	676.5	917.0	744.4	419.7	219.8	4256.8
Extra "attributable" to ETS												
In never smokers	0.6	2.5	6.1	13.3	21.2	34.6	49.1	68.4	75.7	50.9	46.7	368.9
In ex-smokers	0.2	0.9	2.7	6.6	12.4	16.8	25.9	44.2	47.2	28.3	17.7	202.9
In cigarette smokers	0.3	1.2	3.1	6.3	9.2	12.3	16.3	21.1	14.1	7.4	3.2	94.6
Not "attributable" to ETS or smoking	6.1	18.4	46.1	95.8	148.9	229.2	341.1	543.4	656.8	499.5	490.5	3075.8

Table 10

Percentage of Lung Cancer Deaths separately attributable to Smoking and ETS in England and Wales by Age and Sex,
Total over years 1998 to 2002

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Percentage of deaths												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	12.6	16.2	18.5	23.1	27.4	30.7	36.4	43.1	47.9	53.9	56.9	42.1
In cigarette smokers	72.5	67.0	64.1	59.4	54.2	50.3	44.4	37.1	30.3	23.8	15.0	37.1
In pipe/cigar smokers	2.6	3.8	5.0	4.9	5.7	5.7	5.2	5.5	6.7	6.0	9.3	6.1
Extra "attributable" to ETS												
In never smokers	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.5	0.6	0.5
In ex-smokers	0.3	0.4	0.5	0.6	0.8	0.8	0.9	1.0	1.1	1.3	1.1	1.0
In cigarette smokers	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.2
In pipe/cigar smokers	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Not "attributable" to ETS or smoking	10.9	11.3	10.8	10.9	10.9	11.6	12.3	12.5	13.3	14.3	17.0	13.0
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	12.7	14.1	15.9	18.4	21.9	21.5	23.0	27.6	33.5	34.5	34.8	28.3
In cigarette smokers	61.1	59.8	58.0	55.0	50.5	48.6	47.0	41.6	32.2	27.3	18.4	38.1
Extra "attributable" to ETS												
In never smokers	2.1	2.8	2.8	2.9	3.0	3.5	3.4	3.1	3.3	3.3	3.9	3.3
In ex-smokers	0.7	1.0	1.2	1.4	1.8	1.7	1.8	2.0	2.0	1.8	1.5	1.8
In cigarette smokers	1.1	1.4	1.4	1.4	1.3	1.3	1.1	1.0	0.6	0.5	0.3	0.8
Not "attributable" to ETS or smoking	22.3	21.0	20.7	20.8	21.4	23.3	23.7	24.7	28.4	32.5	41.1	27.6

Table 11

Rates of Lung Cancer Deaths separately attributable to Smoking and ETS in England and Wales by Age and Sex,
Averaged over years 1998 to 2002

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+*
Rates per 100,000 per Year												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	1.0	3.7	10.2	24.3	54.1	99.9	175.0	273.8	387.0	468.8	531.3	87.9
In cigarette smokers	3.5	13.1	36.1	86.1	191.5	353.3	618.4	968.4	1359.6	1638.2	1855.4	309.6
In pipe/cigar smokers	1.6	6.1	17.0	40.4	88.7	166.1	289.8	454.0	637.8	765.7	876.6	145.2
Extra "attributable" to ETS												
In never smokers	0.0	0.1	0.3	0.7	1.5	2.5	4.4	6.8	9.2	12.9	10.5	2.2
In ex-smokers	0.0	0.1	0.3	0.7	1.6	2.5	4.4	6.6	9.0	11.7	10.2	2.1
In cigarette smokers	0.0	0.1	0.2	0.6	1.5	2.3	4.0	6.1	7.8	9.6	7.8	1.9
In pipe/cigar smokers	0.0	0.1	0.3	0.7	1.4	2.5	4.3	6.5	8.4	10.1	9.5	2.0
Not "attributable" to ETS or smoking	0.2	0.6	1.8	4.1	9.2	17.3	30.3	47.6	67.6	81.2	95.0	15.3
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	1.0	3.5	9.6	19.0	35.9	62.8	100.1	165.5	209.6	223.2	205.4	50.1
In cigarette smokers	2.8	10.2	27.7	54.9	103.9	182.2	286.9	478.0	605.4	652.4	603.7	145.0
Extra "attributable" to ETS												
In never smokers	0.1	0.3	0.7	1.5	3.0	5.0	7.8	11.9	13.8	12.0	9.2	3.5
In ex-smokers	0.1	0.3	0.7	1.5	2.9	5.0	7.8	12.0	12.8	11.9	8.8	3.5
In cigarette smokers	0.0	0.2	0.7	1.4	2.7	4.7	6.9	11.0	11.5	11.5	8.8	3.2
Not "attributable" to ETS or smoking	0.3	1.0	2.7	5.4	10.1	17.8	28.4	47.9	63.2	68.9	65.7	14.7

*   Standardised to European Standard Population

Table 12
Numbers of Lung Cancer Deaths attributable to Smoking and ETS in United Kingdom by Age and Sex, 1998 to 2002
Based on parameter estimates given in section 3

Total 1998 - 2002

Age:	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Males												
Deaths occurred												
Never smokers	10.62	32.29	73.05	163.86	248.35	400.39	592.40	625.36	662.42	479.09	491.43	3779.26
Ex smokers	28.75	113.67	351.06	1086.46	2287.51	4023.89	6934.36	10746.03	12294.85	8512.55	5958.58	52337.71
Cigarette smokers	146.10	413.97	1069.06	2463.57	3988.98	5801.66	7438.88	8150.85	6856.61	3306.07	1383.31	41019.04
Pipe/cigar smokers	5.54	25.07	87.84	215.11	445.17	702.05	915.36	1275.77	1594.12	882.29	910.68	7058.99
Total	191.00	585.00	1581.00	3929.00	6970.00	10928.00	15881.00	20798.00	21408.00	13180.00	8744.00	104195.00
Deaths that would have occurred at background rates												
Never smokers	9.33	28.28	63.59	141.23	212.86	349.63	517.38	547.25	583.29	413.20	442.42	3308.46
Ex smokers	4.15	16.33	50.25	154.26	323.30	580.44	1000.63	1558.54	1792.70	1230.42	889.26	7600.28
Cigarette smokers	6.77	19.06	49.23	112.18	180.76	268.51	344.88	379.44	322.98	155.24	67.11	1906.16
Pipe/cigar smokers	0.52	2.33	8.10	19.71	41.04	65.18	85.40	119.47	150.95	83.58	88.19	664.47
Total	20.77	66.00	171.17	427.37	757.97	1263.76	1948.29	2604.70	2849.92	1882.43	1486.98	13479.37
Attributable deaths												
Never smokers	1.29	4.01	9.46	22.64	35.48	50.77	75.02	78.10	79.14	65.89	49.01	470.80
Ex smokers	24.60	97.34	300.80	932.20	1964.21	3443.46	5933.73	9187.49	10502.15	7282.13	5069.32	44737.42
Cigarette smokers	139.32	394.91	1019.83	2351.39	3808.22	5533.14	7094.00	7771.41	6533.62	3150.84	1316.20	39112.89
Pipe/cigar smokers	5.03	22.74	79.73	195.40	404.12	636.87	829.96	1156.30	1443.18	798.71	822.49	6394.52
Total	170.23	519.00	1409.83	3501.63	6212.03	9664.24	13932.71	18193.30	18558.08	11297.57	7257.02	90715.63
Females												
Deaths occurred												
Never smokers	22.15	72.15	172.50	350.32	543.56	947.65	1383.41	2036.76	2464.62	1989.37	2176.49	12158.97
Ex smokers	27.36	100.71	283.58	672.68	1204.60	1737.65	2733.37	4921.12	6180.48	4196.72	3236.41	25294.68
Cigarette smokers	108.49	353.14	852.92	1654.00	2291.85	3233.70	4595.22	6110.12	4893.91	2739.90	1412.10	28245.35
Total	158.00	526.00	1309.00	2677.00	4040.00	5919.00	8712.00	13068.00	13539.00	8926.00	6825.00	65699.00
Deaths that would have occurred at background rates												
Never smokers	18.77	57.50	136.36	272.93	420.38	739.41	1086.78	1630.98	2021.62	1693.82	1909.55	9988.11
Ex smokers	6.16	21.38	59.50	140.26	248.01	361.13	570.23	1046.58	1367.74	951.54	759.54	5532.06
Cigarette smokers	10.24	31.34	75.31	144.66	197.96	280.92	405.69	545.57	454.76	257.72	136.76	2540.93
Total	35.17	110.22	271.18	557.84	866.35	1381.47	2062.70	3223.13	3844.11	2903.08	2805.85	18061.10
Attributable deaths												
Never smokers	3.38	14.65	36.13	77.39	123.18	208.24	296.62	405.78	443.00	295.56	266.94	2170.87
Ex smokers	21.20	79.34	224.08	532.42	956.59	1376.52	2163.14	3874.54	4812.74	3245.19	2476.87	19762.61
Cigarette smokers	98.25	321.80	777.61	1509.35	2093.88	2952.78	4189.54	5564.55	4439.15	2482.18	1275.35	25704.42
Total	122.83	415.78	1037.82	2119.16	3173.65	4537.53	6649.30	9844.87	9694.89	6022.92	4019.15	47637.90

Table 13

Annual Numbers of Lung Cancer Deaths separately attributable to Smoking and ETS in United Kingdom by Age and Sex, Averaged over years 1998 to 2002

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Numbers of deaths												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.8	19.0	58.6	181.4	381.9	671.8	1157.6	1794.0	2052.5	1421.1	994.7	8737.4
In cigarette smokers	27.7	78.4	202.6	466.8	755.9	1099.4	1409.6	1544.6	1299.3	626.5	262.1	7772.9
In pipe/cigar smokers	1.0	4.5	15.7	38.4	79.6	125.5	163.6	228.0	284.9	157.7	162.7	1261.4
Extra "attributable" to ETS												
In never smokers	0.3	0.8	1.9	4.5	7.1	10.2	15.0	15.6	15.8	13.2	9.8	94.2
In ex-smokers	0.1	0.5	1.6	5.1	11.0	16.9	29.1	43.5	47.9	35.3	19.1	210.1
In cigarette smokers	0.2	0.5	1.4	3.4	5.7	7.2	9.2	9.7	7.4	3.7	1.1	49.6
In pipe/cigar smokers	0.0	0.1	0.2	0.6	1.3	1.9	2.4	3.3	3.8	2.1	1.8	17.5
Not "attributable" to ETS or smoking	4.2	13.2	34.2	85.5	151.6	252.8	389.7	520.9	570.0	376.5	297.4	2695.9
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.0	14.8	41.6	98.8	176.8	255.1	401.3	722.5	907.3	616.1	475.1	3713.5
In cigarette smokers	19.3	62.9	151.9	294.5	408.1	575.7	818.2	1087.9	871.3	487.8	251.4	5029.0
Extra "attributable" to ETS												
In never smokers	0.7	2.9	7.2	15.5	24.6	41.6	59.3	81.2	88.6	59.1	53.4	434.2
In ex-smokers	0.2	1.1	3.2	7.7	14.5	20.2	31.3	52.4	55.2	32.9	20.2	239.0
In cigarette smokers	0.3	1.5	3.7	7.4	10.7	14.8	19.7	25.0	16.5	8.6	3.6	111.9
Not "attributable" to ETS or smoking	7.0	22.0	54.2	111.6	173.3	276.3	412.5	644.6	768.8	580.6	561.2	3612.2

Table 14
Annual Numbers of Lung Cancer Deaths separately attributable to Smoking and ETS in United Kingdom by Age and Sex,
Averaged over years 1998 to 2002
Sensitivity Analysis: Doubling Excess Risk of Active Smoking

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Numbers of deaths												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	5.1	20.3	62.5	193.6	407.7	719.3	1244.9	1931.7	2219.7	1547.5	1098.1	9450.4
In cigarette smokers	29.5	83.9	216.0	498.3	807.0	1177.2	1515.9	1663.1	1405.1	682.2	289.4	8367.6
In pipe/cigar smokers	1.1	4.8	16.7	41.0	84.9	134.3	175.9	245.5	308.1	171.7	179.6	1363.7
Extra "attributable" to ETS												
In never smokers	0.1	0.4	1.0	2.4	3.8	5.4	8.1	8.4	8.6	7.2	5.4	50.8
In ex-smokers	0.1	0.3	0.8	2.7	5.9	9.1	15.7	23.4	25.9	19.2	10.6	113.6
In cigarette smokers	0.1	0.3	0.7	1.8	3.1	3.9	4.9	5.2	4.0	2.0	0.6	26.7
In pipe/cigar smokers	0.0	0.0	0.1	0.3	0.7	1.0	1.3	1.8	2.0	1.1	1.0	9.4
Not "attributable" to ETS or smoking	2.2	7.1	18.3	45.6	80.9	135.3	209.5	280.5	308.2	205.0	164.1	1456.7
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.6	17.0	47.9	113.9	205.2	299.8	472.1	853.6	1095.3	761.4	620.2	4490.9
In cigarette smokers	22.2	72.3	174.6	339.6	473.4	676.6	962.6	1285.4	1051.8	602.9	328.2	5989.6
Extra "attributable" to ETS												
In never smokers	0.4	1.7	4.2	8.9	14.3	24.5	34.9	47.9	53.5	36.5	34.8	261.6
In ex-smokers	0.1	0.6	1.8	4.5	8.4	11.9	18.4	31.0	33.3	20.3	13.2	143.6
In cigarette smokers	0.2	0.9	2.1	4.3	6.2	8.7	11.6	14.8	10.0	5.3	2.4	66.4
Not "attributable" to ETS or smoking	4.0	12.7	31.2	64.3	100.5	162.3	242.7	380.8	464.0	358.8	366.2	2187.6

Relative Risk of Active smoking	**Males**	RRc= 37.08		RRo= 17.78		RRx= 11.1	
	Females	RRc= 17.22		RRx= 6.52			

RRc = Current Cigarette ; RRo = Current Pipe/Cigar ; RRx = Ex-smokers

Table 15

Annual Numbers of Lung Cancer Deaths separately attributable to Smoking and ETS in United Kingdom by Age and Sex,
Averaged over years 1998 to 2002
Sensitivity Analysis: Halving Excess Risk of Active Smoking

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Numbers of deaths												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.3	16.8	52.1	161.1	338.9	593.3	1015.3	1570.1	1783.8	1221.5	837.2	7594.4
In cigarette smokers	24.6	69.5	180.2	414.5	670.9	971.0	1236.3	1351.8	1129.2	538.5	220.6	6807.1
In pipe/cigar smokers	0.9	4.0	14.0	34.1	70.6	110.8	143.5	199.5	247.6	135.5	137.0	1097.4
Extra "attributable" to ETS												
In never smokers	0.5	1.4	3.4	8.0	12.6	17.9	26.3	27.3	27.5	22.7	16.5	164.1
In ex-smokers	0.2	0.9	2.8	9.0	19.5	29.9	51.1	76.2	83.3	60.7	32.2	365.6
In cigarette smokers	0.3	1.0	2.5	6.1	10.2	12.8	16.1	17.0	12.9	6.3	1.9	87.0
In pipe/cigar smokers	0.0	0.1	0.4	1.1	2.3	3.4	4.2	5.7	6.5	3.6	3.0	30.4
Not "attributable" to ETS or smoking	7.4	23.4	60.9	151.8	269.1	446.5	683.5	911.9	990.7	647.2	500.6	4692.9
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	3.2	11.7	33.0	78.0	138.6	196.5	308.6	552.6	675.5	445.9	323.7	2767.5
In cigarette smokers	15.3	49.8	120.4	232.7	319.8	443.5	629.3	832.1	648.7	353.1	171.3	3816.1
Extra "attributable" to ETS												
In never smokers	1.1	4.6	11.5	24.5	38.6	64.2	91.3	124.2	131.9	85.6	72.7	650.1
In ex-smokers	0.4	1.7	5.0	12.2	22.7	31.1	48.2	80.2	82.2	47.7	27.6	359.0
In cigarette smokers	0.5	2.4	5.8	11.7	16.8	22.8	30.4	38.3	24.6	12.5	5.0	170.6
Not "attributable" to ETS or smoking	11.2	34.9	86.0	176.3	271.6	425.7	634.6	986.2	1144.8	840.5	764.7	5376.4

| **Relative Risk of Active smoking** | **Males** | RRc= 10.02 | | RRo= 5.195 | | RRx= 3.525 | | | | | | |
| | **Females** | RRc= 5.055 | | RRx= 2.38 | | | | | | | | |

RRc = Current Cigarette ; RRo = Current Pipe/Cigar ; RRx = Ex-smokers

Table 16

Annual Numbers of Lung Cancer Deaths separately attributable to Smoking and ETS in United Kingdom by Age and Sex,
Averaged over years 1998 to 2002
Sensitivity Analysis: Doubling Excess Risk for ETS Exposure

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Numbers of deaths												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.8	19.1	59.0	182.3	383.8	674.8	1163.2	1800.4	2063.4	1429.0	998.7	8778.4
In cigarette smokers	27.6	78.3	201.9	465.5	754.0	1094.9	1402.6	1536.2	1286.7	617.6	257.5	7722.9
In pipe/cigar smokers	1.0	4.5	15.8	38.6	79.1	126.1	163.9	228.4	284.3	156.1	162.3	1260.1
Extra "attributable" to ETS												
In never smokers	0.5	1.5	3.5	8.4	13.1	19.1	28.3	29.5	30.1	24.9	19.0	178.0
In ex-smokers	0.2	0.9	2.9	9.4	20.3	31.9	54.8	82.3	91.1	66.7	37.1	397.8
In cigarette smokers	0.3	1.0	2.6	6.4	10.6	13.6	17.3	18.4	14.1	7.0	2.2	93.5
In pipe/cigar smokers	0.0	0.1	0.5	1.2	2.4	3.6	4.6	6.2	7.2	3.9	3.4	33.0
Not "attributable" to ETS or smoking	3.7	11.5	29.9	73.9	130.6	221.5	341.7	458.3	504.7	330.9	268.6	2375.2
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.1	14.9	42.1	99.5	178.1	256.4	405.6	727.3	910.3	616.8	474.3	3729.3
In cigarette smokers	19.2	62.6	151.1	292.9	405.8	573.0	810.6	1080.0	861.0	486.1	251.0	4993.3
Extra "attributable" to ETS												
In never smokers	1.3	5.3	13.1	27.7	43.7	74.3	106.7	147.7	166.1	113.0	105.1	804.0
In ex-smokers	0.4	2.0	5.8	13.9	25.7	36.0	56.4	95.4	103.5	62.9	39.9	441.8
In cigarette smokers	0.6	2.7	6.6	13.2	19.0	26.4	35.5	45.5	30.9	16.5	7.2	204.2
Not "attributable" to ETS or smoking	6.0	17.7	43.2	88.2	135.7	217.6	327.6	517.7	636.1	489.9	487.6	2967.2

Relative Risk for ETS exposure   **Males:**   E= 1.62   **Females:**   E= 1.48

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Table 17
Annual Numbers of Lung Cancer Deaths separately attributable to Smoking and ETS in United Kingdom by Age and Sex,
Averaged over years 1998 to 2002
Sensitivity Analysis: Halving Excess Risk for ETS Exposure

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Numbers of deaths												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.8	18.9	58.4	180.9	380.8	670.1	1154.6	1790.5	2046.7	1416.8	992.7	8715.1
In cigarette smokers	27.7	78.5	202.9	467.6	757.0	1101.8	1413.5	1549.1	1306.1	631.3	264.5	7800.2
In pipe/cigar smokers	1.0	4.5	15.6	38.4	79.8	125.1	163.4	227.8	285.2	158.5	163.0	1262.1
Extra "attributable" to ETS												
In never smokers	0.1	0.4	1.0	2.4	3.7	5.2	7.7	8.0	8.1	6.8	5.0	48.5
In ex-smokers	0.1	0.3	0.8	2.6	5.7	8.7	15.0	22.4	24.6	18.2	9.7	108.1
In cigarette smokers	0.1	0.3	0.7	1.8	3.0	3.7	4.7	5.0	3.8	1.9	0.6	25.6
In pipe/cigar smokers	0.0	0.0	0.1	0.3	0.7	1.0	1.2	1.7	1.9	1.1	0.9	9.0
Not "attributable" to ETS or smoking	4.4	14.1	36.6	91.9	163.4	269.9	415.9	555.1	605.2	401.4	312.5	2870.4
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.0	14.7	41.4	98.3	176.1	254.3	398.7	719.7	905.7	615.7	475.6	3704.3
In cigarette smokers	19.4	63.0	152.3	295.5	409.4	577.4	822.6	1092.5	877.1	488.7	251.6	5049.5
Extra "attributable" to ETS												
In never smokers	0.3	1.5	3.8	8.2	13.2	22.2	31.4	42.7	45.8	30.3	26.9	226.3
In ex-smokers	0.1	0.6	1.7	4.1	7.7	10.8	16.6	27.6	28.6	16.9	10.2	124.7
In cigarette smokers	0.2	0.8	1.9	3.9	5.7	7.9	10.5	13.2	8.5	4.4	1.8	58.8
Not "attributable" to ETS or smoking	7.6	24.6	60.7	125.4	195.9	311.3	462.6	718.0	842.1	629.2	598.8	3976.2

Relative Risk for ETS exposure   **Males:**   E= 1.155   **Females:**   E= 1.12

Table 18

Annual Numbers of Lung Cancer Deaths separately attributable to Smoking and ETS in United Kingdom by Age and Sex,
Averaged over years 1998 to 2002

Sensitivity Analysis: Doubling Estimate of Excess Relative Dose of ETS according to Partner's Smoking

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Numbers of deaths												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.8	19.0	58.6	181.4	381.9	671.8	1157.6	1794.0	2052.5	1421.1	994.7	8737.4
In cigarette smokers	27.7	78.4	202.6	466.8	755.9	1099.4	1409.6	1544.6	1299.3	626.5	262.1	7772.9
In pipe/cigar smokers	1.0	4.5	15.7	38.4	79.6	125.5	163.6	228.0	284.9	157.7	162.7	1261.4
Extra "attributable" to ETS												
In never smokers	0.2	0.6	1.5	3.5	5.6	7.7	11.4	11.8	11.8	10.3	6.7	71.2
In ex-smokers	0.1	0.4	1.2	4.0	8.7	12.9	22.2	32.7	35.5	26.8	13.0	157.5
In cigarette smokers	0.1	0.4	1.0	2.7	4.5	5.4	6.8	7.1	5.2	2.6	0.6	36.4
In pipe/cigar smokers	0.0	0.1	0.2	0.5	1.0	1.5	1.8	2.5	2.7	1.5	1.1	12.9
Not "attributable" to ETS or smoking	4.3	13.7	35.4	88.4	156.8	261.5	403.2	539.0	589.7	389.5	307.7	2789.2
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.0	14.8	41.6	98.8	176.8	255.1	401.3	722.5	907.3	616.1	475.1	3713.5
In cigarette smokers	19.3	62.9	151.9	294.5	408.1	575.7	818.2	1087.9	871.3	487.8	251.4	5029.0
Extra "attributable" to ETS												
In never smokers	0.5	2.3	5.6	12.3	19.7	33.0	46.6	62.0	64.9	39.2	31.0	317.0
In ex-smokers	0.2	0.8	2.5	6.1	11.6	16.0	24.7	40.2	39.2	21.8	11.3	174.2
In cigarette smokers	0.2	1.1	2.8	5.7	8.4	11.5	15.0	18.6	11.2	5.6	2.0	82.1
Not "attributable" to ETS or smoking	7.3	23.3	57.4	118.1	183.4	292.5	436.7	682.4	813.9	614.7	594.1	3824.0

Relative Dose of ETS according to partner's **Males:** Z= 10.5714 **Females:** Z= 6.9048
smoking

Table 19

Annual Numbers of Lung Cancer Deaths separately attributable to Smoking and ETS in United Kingdom by Age and Sex,
Averaged over years 1998 to 2002
Sensitivity Analysis: Halving Estimate of Excess Relative Dose of ETS according to Partner's Smoking

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Numbers of deaths												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.8	19.0	58.6	181.4	381.9	671.8	1157.6	1794.0	2052.5	1421.1	994.7	8737.4
In cigarette smokers	27.7	78.4	202.6	466.8	755.9	1099.4	1409.6	1544.6	1299.3	626.5	262.1	7772.9
In pipe/cigar smokers	1.0	4.5	15.7	38.4	79.6	125.5	163.6	228.0	284.9	157.7	162.7	1261.4
Extra "attributable" to ETS												
In never smokers	0.4	1.2	2.8	6.5	10.0	15.0	22.2	23.2	23.9	18.9	15.9	140.0
In ex-smokers	0.2	0.7	2.3	7.2	15.4	25.0	43.0	65.1	72.7	52.4	31.4	315.4
In cigarette smokers	0.3	0.8	2.1	5.0	8.3	11.0	13.9	15.0	11.9	5.8	2.0	76.0
In pipe/cigar smokers	0.0	0.1	0.4	0.9	1.8	2.8	3.6	4.9	5.9	3.2	3.0	26.7
Not "attributable" to ETS or smoking	3.9	12.3	31.9	79.6	141.1	235.2	362.7	484.9	530.5	350.4	276.8	2509.1
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.0	14.8	41.6	98.8	176.8	255.1	401.3	722.5	907.3	616.1	475.1	3713.5
In cigarette smokers	19.3	62.9	151.9	294.5	408.1	575.7	818.2	1087.9	871.3	487.8	251.4	5029.0
Extra "attributable" to ETS												
In never smokers	1.0	4.3	10.4	21.9	34.5	59.0	84.8	119.4	136.0	98.9	98.2	668.4
In ex-smokers	0.3	1.6	4.6	11.0	20.3	28.7	44.7	77.0	87.3	55.2	38.1	368.8
In cigarette smokers	0.5	2.2	5.4	10.8	15.4	21.4	29.3	37.8	27.2	14.7	6.9	171.5
Not "attributable" to ETS or smoking	6.4	19.5	47.9	98.5	152.9	243.9	364.1	569.0	678.6	512.5	495.3	3188.6

Relative Dose of ETS according to partner's smoking   **Males:**   Z= 3.39285   **Females:**   Z= 2.4762

Table 20

Annual Numbers of Lung Cancer Deaths separately attributable to Smoking and ETS in United Kingdom by Age and Sex,
Averaged over years 1998 to 2002
Sensitivity Analysis: Using alternative assumption regarding ETS exposure of those without Partners

Age	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	35+
Numbers of deaths												
Males												
"Attributable" to smoking ignoring ETS												
In ex-smokers	5.5	20.7	65.7	194.7	408.2	723.7	1253.0	1910.7	2275.2	1561.7	1127.6	9546.8
In cigarette smokers	26.7	76.3	192.0	448.5	730.3	1023.0	1287.6	1391.8	1040.1	467.1	106.0	6789.3
In pipe/cigar smokers	1.1	4.7	17.5	40.5	73.7	137.1	168.5	234.9	274.1	130.4	147.9	1230.4
Extra "attributable" to ETS												
In never smokers	0.3	0.9	2.2	5.2	8.0	11.8	17.6	18.9	20.6	20.9	16.1	122.5
In ex-smokers	0.1	0.6	1.8	5.9	12.5	19.8	34.2	51.7	61.2	51.3	29.8	269.1
In cigarette smokers	0.2	0.6	1.5	3.8	6.3	7.8	9.8	10.5	7.8	4.3	0.8	53.5
In pipe/cigar smokers	0.0	0.1	0.3	0.7	1.4	2.3	2.8	3.8	4.4	2.6	2.4	20.7
Not "attributable" to ETS or smoking	4.2	13.2	35.2	86.5	153.6	260.1	402.6	537.1	598.2	397.7	318.2	2806.7
Females												
"Attributable" to smoking ignoring ETS												
In ex-smokers	4.6	15.9	46.1	105.6	187.9	267.5	444.1	776.4	953.9	632.6	420.3	3854.9
In cigarette smokers	18.1	60.4	143.7	278.8	387.9	550.6	742.8	1000.1	705.6	449.0	224.8	4561.9
Extra "attributable" to ETS												
In never smokers	0.8	3.5	8.7	18.9	29.3	51.1	79.3	114.8	163.3	115.5	130.2	715.4
In ex-smokers	0.3	1.3	3.9	9.2	17.1	24.6	42.1	74.7	91.7	63.2	36.7	364.8
In cigarette smokers	0.4	1.7	4.1	8.3	12.0	17.3	24.0	32.7	23.1	15.3	6.7	145.5
Not "attributable" to ETS or smoking	7.4	22.4	55.4	114.6	173.7	272.7	410.1	614.9	770.2	509.6	546.3	3497.3