INTERNATIONAL VARIATION IN MORTALITY FROM SMOKING-ASSOCIATED DISEASES. DOES USE OF FLUE-CURED RATHER THAN BLENDED CIGARETTES HAVE AN EFFECT?

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November 2006

EXECUTIVE SUMMARY

The objective of the study was to determine possible differences between flue-cured and blended cigarettes in their effect on the major smoking-related diseases (lung cancer, IHD and COPD) and on the likelihood of quitting.

Data were collected for 1971-2000 by sex, five-year age group and five-year period for three countries with virtually a 100% flue-cured market (Australia, Canada, UK) and for four with virtually a 100% blended market (Austria, Denmark, Germany, USA).

National mortality (and population) data were obtained from WHO,[1] and national estimates of current smoking prevalence and daily cigarette consumption per smoker were obtained from appropriate surveys, these data being an extension to the year 2000 of the data currently available on IMASS.[2] National estimates of ex-smoking prevalence were extracted from available surveys, using methods similar to those used in ISS2.[3] Relative risk estimates for current and ex-smoking were obtained from relevant epidemiological studies. These were already available for lung cancer from the IESLC project,[4,5] but for IHD and COPD had to be extracted. Summary relative risk estimates were derived by period, sex and age as appropriate.

Comparisons were made between the flue-cured and blended countries of current and ex-smoking prevalence, of daily cigarette consumption per smoker and of quit rates. Comparisons were also made of mortality rates from lung cancer, IHD and COPD, both unadjusted and adjusted for smoking habits. The results are summarized below.

Mortality rates unadjusted for smoking habits

Except for lung cancer for men aged 35-49 in 1996-2000, where rates were lower in flue-cured countries, no statistically significant ($p<0.05$) difference was seen between the flue-cured and blended countries in mortality rates from lung cancer, IHD and COPD in any sex, period or age-group combination. For all three diseases the general tendency was for the mean rate in the flue-cured countries to be somewhat higher than the mean rate for the blended countries in the 1970s, with the difference diminishing or reversing by the 1990s. However, differences between rates within

countries smoking the same type of cigarette were often large, so that little could be reliably inferred from the smaller differences between the means.

Prevalence of current smoking

The mean prevalence of current smoking was higher in the flue-cured than in the blended countries in 1971-1975 for all age groups and both sexes. Over time, the difference reduced (and usually reversed in direction), but was never statistically significant due to variation between countries, particularly those using blended cigarettes.

Prevalence of ex-smoking and quit rates

The mean prevalence of ex-smoking generally increased over time and was higher for flue-cured than blended countries. However, the difference was only significant for men aged 35-49 and aged 50-64 in 1996-2000.

Essentially the same conclusions could be drawn from an analysis of quit rates, based on changes in current smoking prevalence over a five-year period within a birth cohort.

Daily cigarette consumption per smoker

The tendency is for daily cigarette consumption per smoker for both sexes to be somewhat higher in the flue-cured countries, but the difference was not statistically significant at any time point.

Relative risks

Limitations of available epidemiological data meant that it was not possible to obtain reliable relative risk estimates for current or ex-smoking for some of the countries, with relevant studies being predominantly conducted in the US and UK. There was no clear evidence that the relative risk estimates differed markedly for studies conducted in the flue-cured and blended countries.

Combined relative risk estimates were derived based on data for all the countries. For lung cancer, estimates did not vary materially by sex, so combined sex estimates were obtained for each period. For the period 1990-1999, they were 11.47

for current smoking and 4.72 for ex-smoking. Variation by age in the relative risk was not considered specifically, but has previously been shown to be minor.

For IHD, sex, age and period were all found to be predictors of relative risk and separate estimates were derived by modelling for all 18 combinations of sex by 15-year age group by 10-year period. For current smoking for the final 10 year period, relative risks for males were 3.03, 2.37 and 1.56 for ages 35-49, 50-64 and 65-79 respectively. For ex-smoking the corresponding relative risks were 1.44, 1.17 and 0.91. For females, estimates were higher by a factor of about 1.1 for current smoking and 1.2 for ex-smoking.

For COPD, there were far fewer study-specific estimates available (e.g. 12 for current smoking vs. 80 for lung cancer and 60 for IHD). Overall estimates of 11.59 for current smoking and 7.05 for ex-smoking were derived.

Adjustment of mortality rates for smoking habits

Based on the relative risks derived, it was possible, assuming that rates in never smokers did not vary by country, to compare the observed smoking-related excess risk in a given country with that expected based on a common estimate of excess risk for all the countries combined. The ratio of observed to expected, the "F factor," was then compared over countries, as a means of comparing mortality rates, taking into account any differences in their prevalence of current and ex-smoking. For lung cancer and COPD there was no difference in the conclusions comparing F factors and comparing simple mortality rates, with the only significant difference between flue-cured and blended being the higher rates in blended countries for lung cancer in men aged 35-49 in 1996-2000. For IHD it became apparent that the assumption of similarity of never smoker rates by country did not hold. In any case it was clear that differences between flue-cured and blended cigarettes could not explain the differences in IHD rates between country, which seem too large to have arisen only from differences in smoking habits.

Analyses adjusting also for daily cigarette consumption (G factors) did not affect the situation materially.

Conclusions

The analyses provide little indication that there is any substantial difference between flue-cured and blended cigarettes in their propensity to cause the major smoking-related diseases or to affect the likelihood of quitting smoking. However the power to detect small or even moderate differences using this ecological approach is limited.

The extensive data collected for the project, particularly the data not previously available in a convenient format for ex-smoking prevalence and for IHD relative risk, may be valuable for other projects.

Acknowledgements

We thank Pauline Wassell and Diana Morris for their patient and accurate word-processing of the various drafts of this review. We are also grateful to Philip Morris International, who gave financial support. All opinions expressed in this report are our own.

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APPENDICES

ABBREVIATIONS

CPS	Cigarettes per smoker
COPD	Chronic obstructive pulmonary disease
CPS II	Cancer Prevention Study II
IESLC	International Estimates of Smoking and Lung Cancer
IHD	Ischaemic heart disease
IMASS	International Mortality and Smoking Statistics
ISS2	International Smoking Statistics Second Edition
MC	Manufactured cigarettes
TC	Total cigarettes

1. Background and objectives

The European Union is in the process of developing legislation dealing with cigarettes, one aspect of which deals with ingredients. The public health community seems to have convinced themselves that the tobacco companies add various noxious ingredients to cigarettes, the main goal of which is to increase the addictiveness of the products.

One approach to looking at this problem is to compare the risk from cigarettes according to their use of additives. Cigarettes that are manufactured with 100% flue-cured tobaccos (all Virginia) do not actually use added ingredients, with the exception of a very small number of substances, mainly glycerine, that are added as humectants to maintain the correct level of moisture in the cigarettes. Such cigarettes dominate the market in the UK, Australia and Canada. Cigarettes that contain blended tobacco do use some additives, including casings (materials such as sugars that replace sugars lost during the curing), preservatives and flavours (used to give a brand a unique taste) as well as humectants. These are widely used in the US, Austria, Denmark, Germany and the Netherlands. Although the additives used in US and European blended cigarettes are not exactly identical, the differences are very minor. Moreover, there have been no major changes in these cigarettes for close to 40 years (Dr. E. Sanders, personal communication).

The main objective of this work is to compare mortality rates from the major smoking-related illnesses in countries predominantly using the flue-cured cigarettes and in those predominantly using blended cigarettes, taking into account any major differences in the distribution of smoking habits between the two groups of countries. A secondary objective is to compare smoking cessation rates in the countries.

2. General approach

2.1 Data collected

Data specific for country, sex, age group and time period on mortality from major smoking-related diseases and on certain smoking statistics were collected onto an EXCEL database. Attention was limited to the following variables, as described below.

- Smoking-related diseases Lung cancer, ischaemic heart disease (IHD) and chronic obstructive pulmonary disease (COPD). These three diseases were chosen as they contribute very largely to smoking-related mortality.
- Smoking statistics Because of limitations of available data at national level, attention was restricted to prevalence of current smoking, prevalence of ex-smoking, and cigarette consumption per smoker.
- Time period 1971-2000 with the six five year periods considered separately (1971-1975, 1976-1980 … 1996-2000). National smoking data for earlier years are often not available and data for 2001-2005 were not fully available at the time the work was carried out.
- Countries The main countries considered were Australia, Canada and UK (flue-cured) and Austria, Denmark, Germany and the US (blended), as virtually all smokers in these countries used only the one type of cigarette (see section 1). Some data were also collected for the Netherlands (blended) and are included on the EXCEL database. However, because this country includes a large proportion of smokers of products other than cigarettes, the analyses reported here exclude results for the Netherlands.
- Age groups Data for the five year age groups from 15-19 up to 80-84 and 85+ are included on the EXCEL database, but analyses generally restrict attention to the age range 35-79. Smoking-related mortality is rare at ages younger than 35. Mortality at ages 80+ is based on death certificate diagnoses which are less reliable, and it is also heavily dependent on smoking during the period before 1971, when national smoking data are, as noted above, often not available.

The data used on cigarette consumption per smoker were not by five year age-group but only for the age range 35+. This was thought to provide an adequate indication of variation by country, since variation by age is quite small and shows a similar pattern of decline with age in each country.[3]

Relative risk estimates for lung cancer, IHD and COPD for current smoking and for ex-smoking were also obtained from epidemiological studies conducted in the countries of interest. These were age specific in the case of IHD.

2.2 Outline of data sources

The sources of the data collected are outlined below. They are described in more detail in sections 3 to 8.

National mortality rates from smoking-related diseases Rates for the three diseases of interest were obtained from WHO,[1] and are equivalent to the data on the International Mortality and Smoking Statistics (IMASS) database,[2] extended to the period 1996-2000. Corresponding numbers of deaths were also extracted.

National estimates of current smoking prevalence Data up to 1995 were revised versions of those already published in and available on IMASS. The data for 1996-2000 were extracted as part of the ongoing updating of the second edition of International Smoking Statistics[3] (ISS2) and IMASS to web-based versions, which will become available shortly.

National estimates of ex-smoking prevalence Data on ex-smoking were not part of ISS2/IMASS and these had to be extracted from available surveys, mainly those that had provided data on current smoking prevalence.

Estimates of daily cigarette consumption per smoker As for current smoking, data up to 1995 were already available with data for 1996-2000 being extracted as part of the ISS/IMASS update.

Relative risk estimates These were derived from relevant epidemiological studies. For lung cancer, the required study estimates were already available on the International Estimates for Smoking and Lung Cancer (IESLC) database[4,5] and it was merely a question of selecting appropriate estimates for analysis. For IHD, the individual study estimates had to be extracted from relevant epidemiological studies identified by literature searches. For COPD the situation was similar to that for IHD, though some material was already available from work previously conducted for Philip Morris.[6,7]

2.3 Analysis of national mortality rates from smoking-related diseases and of national smoking statistics

Mortality rates from lung cancer, IHD and COPD and prevalence of current and of ex smoking were compared over the seven countries of interest and between the flue-cured and blended countries by sex, age and period. To reduce the size of the tables and make differences easier to understand, attention was restricted to the three fifteen year age groups 35-49, 50-64 and 65-79, the fifteen year data being derived from the five year data using the European standard population.[8]

The summary tables and figures shown in this report are given in a standard format. For lung cancer, for example, there is a table (Table 3/1L) giving the rates (per 100,000 per year) for the seven countries of major interest by sex, the six five year periods, and the three broad age groups. Also shown by sex, period and age group are the unweighted means for the flue-cured countries and for the blended countries, as well as the result of a simple t-test comparing the two sets of rates. The mean rates are plotted in Figure 3/1L and the individual country rates in Figure 3/2L. The plots show the rates for males on the left and females on the right, with the rates for the 35-49 year olds at the top, 50-64 year olds in the middle and 65-79 year olds at the bottom.

For IHD and COPD the tables and figures are in the same format, as is the case for prevalence of current smoking and of ex-smoking. For cigarette

consumption per smoker, where the data are for a single age range, 35+, the layout is simpler.

2.4 Analysis of relative risk estimates for current and ex-smoking

For each of lung cancer, IHD and COPD the relative risks from individual epidemiological studies for current smoking and for ex-smoking were separately analyzed by inverse-variance weighted regression analysis with two objectives.

One objective was to test whether relative risk varied significantly by whether the study was conducted in a flue-cured country or a blended country. The analyses were adjusted for relevant characteristics of the estimate. These relevant characteristics vary by disease and are presented in section 3, where the analyses are described more fully, but include such things as age, sex, period, study design and the precise definition of current or ex-smoking (e.g. of cigarettes only or cigarettes $\pm$ pipes and cigars).

The other objective was to provide a set of useful overall relative risk estimates for current smoking and ex-smoking that can be used when attempting to derive national mortality rates for current smokers and ex-smokers using the methods described in section 2.5 below. As will be seen in section 3, and for reasons described there, the overall relative estimates derived were specific for sex, age (35-49, 50-64, 65-79) and period (1970-1979, 1980-1989, 1990+) for IHD, but were specific only for period for lung cancer, and were not specific at all for COPD.

2.5 Comparing national mortality rates after adjustment for smoking

The analyses described in section 2.4 compare the countries of interest in terms of their mortality rates from lung cancer, IHD and COPD, and in terms of their prevalence of smoking and consumption per smoker, but they do not answer the main question of interest. This relates to how mortality rates in the different countries vary within smokers (or within smokers of a given cigarette consumption).

If, for a given population, data are available on the overall mortality rate, on the prevalence of never, ex- and current smoking and on the relative risk for ex-smokers and current smokers, it is straightforward to estimate mortality rates separately for never smokers, ex-smokers and current smokers. Given also data on consumption per smoker, mortality rates for current smokers can also be expressed as excess rates per cigarette smoked. Had good national data been available for mortality rates, for prevalence of never, ex- and current smoking, for cigarette consumption per smoker and for the relative risk for ex-smokers and current smokers, countries could then have been compared in terms of both current smoker mortality rates and excess current smoker mortality per cigarette smoked. In practice, though national data were available for the mortality rates and for the smoking statistics, good national estimates of relative risk were not available. As will be seen in section 7, where the epidemiological data are summarized, relevant epidemiological studies for a number of the countries were non-existent for some diseases and sparse for others.

The alternative approach used in this report involves only standard (non-country-specific) estimates of the ex-smoking and current smoking relative risk, and is based on the assumption that never smoking mortality rates do not vary by country. The basis of the method is described below.

Consider a particular sex, age group, time period and disease of interest. Define the following for those countries for which all relevant data are available:

P_X, P_C	Mean proportion of ex- and current smokers over country
M	Mean mortality rate over country
R_X, R_C	Relative risks for ex- and current smokers (compared to never smokers)

Based on these, estimate the mortality rate in never smokers, M_N, by the formula

$$M_N = M_T / (1 + P_X(R_X-1) + P_C(R_C-1)) \quad (1)$$

For a specific country, A, define

P_{XA}, P_{CA}	Proportion of ex- and current smokers
M_A	Mortality rate
F_A	Factor by which excess risks are multiplied

We can then write down the following equation:

$$M_A = M_N + P_{XA}M_NF_A(R_X-1) + P_{CA}M_NF_A(R_C-1) \quad (2)$$

and solve for F_A to give:

$$F_A = (M_A-M_N) / (M_N(P_{XA}(R_X-1) + P_{CA}(R_C-1))) \quad (3)$$

F_A is an index of relative cigarette effect in that country, with a value of 1 implying that the mortality rate in country A is about the average of the countries being compared, with a higher (or lower) F implying that relative risks for ex-smokers and current smokers are higher (or lower) in country A. F_A can also be understood as the ratio of the observed excess risk from smoking for country A to that expected based on its prevalences of current and ex-smoking.

The estimated F_A values can then be tabulated, plotted and analyzed in a manner identical to that described in section 2.4 as a test of between-country and flue-cured/blended differences in mortality rates adjusted for prevalence of ex- and current smoking.

To adjust additionally for consumption per smoker, a linear relationship with excess risk is assumed. This assumption is not critical given that variations between country in amount smoked per smoker are not large, as will be demonstrated later, in section 6.

Let us define

N Cigarette consumption per smoker for the combined countries being compared

N_A Cigarette consumption per smoker for country A

G_A Factor by which excess risks **per cigarette** are multiplied in country A

We then have:

$$M_A = M_N + (P_{XA}M_N G_A(R_X-1)N_A) / N + (P_{CA}M_N G_A(R_C-1)N_A) / N \quad (4)$$

so that

$$G_A = F_A N / N_A \quad (5)$$

Again G_A values can be tabulated, plotted and analyzed in a manner identical to that described in section 2.4. Here it is a test of between-country and flue-cured/blended differences in mortality rates adjusted for prevalence of current smoking and ex-smoking and for cigarette consumption per smoker.

It should be noted that the use of F and G statistics may be limited by failure to take into account variation between countries in other aspects of smoking, such as age started, tar level or butt length.

2.6 Quit rates

While data have been derived on the prevalence of ex-smoking during a given period, for a particular sex, age and country, this does not provide direct information on the rate of quitting. While such information cannot be directly obtained except from studies which follow a person's smoking history throughout life, approximate estimates can be derived by following the same birth cohort over successive periods. Consider, for example, the following data for UK males:

Period	Age	Prevalence of current smokers (%)	Prevalence of ex-smokers (%)	Total
1971-1975	45-49	53.7	20.3	74.0
1976-1980	50-54	49.0	27.1	76.1
1981-1985	55-59	37.1	35.0	72.1
1986-1990	60-64	35.5	41.9	77.4
1991-1995	65-69	25.9	51.6	77.5
1996-2000	70-74	15.8	57.4	73.2

These in principle all relate to the same birth cohort (though there may be some differences due to immigration, emigration and mortality and differences between surveys) and can be used to estimate quit rates, assuming that, over the ages of interest, starting to smoke is not a material issue. Thus, for example, the 5 year quit rate between 1976-1980 and 1981-1985 for this UK male cohort can be estimated by the decline in the prevalence of current smokers (49.0 - 37.1 = 11.9%) as a percentage of the current smoking prevalence at the start of the period (49.0%), yielding an estimate of 24.3%. Note that one can also estimate the quit rate as the increase in the prevalence of ex-smokers (35.0 - 27.1 = 7.9%) as a percentage of the starting current smoking prevalence, to give 7.9/49.0 = 16.1%. Were the total prevalence of ever smokers the same in the two periods these would in fact yield the same answers, but here they are not, due to sampling variation as well as to the cohorts not being exactly the same, for reasons noted above.

In practice, for the purposes of this report, attention has been limited to the former estimate, based only on current smoking prevalences. There are two reasons for this. Firstly, the current smoking data are more complete. Second, it seems preferable to use only the one statistic for the derivation, as this is likely to make the definition of smoking more consistent.

Attention has also been limited to five-year quit rates. This is partly because assessment of longer quit rates is likely to give similar findings, and partly because the estimates may involve ages where starting to smoke is occurring commonly. Thus, for example, a 15-year quit rate estimate for those aged 35-39 at the end of the period (say 1986-1990) would involve use of

current smoking prevalence estimates for 20-24 year olds 15 years earlier (in 1971-1975), and starting to smoke at age 20-24 is quite common.

Thus for each age group from 35-39 to 75-79 and for each period from 1976-1980 to 1996-2000 quit rate estimates were derived based on the current smoking prevalences for the given age and period, and the age and period shifted five years back. These were then combined into the broader age groups and tabulated and plotted as for the other statistics described in sections 2.3 and 2.5.

2.7 Databases

The EXCEL database contains all the national mortality and smoking statistics data, as well as the relative risk estimates based on the epidemiological estimates. These data were transferred to a ROELEE database to produce the tables and plots shown in this report. There are also ROELEE databases containing the individual study estimates of relative risk for lung cancer (IESLC), for IHD and for COPD.

The EXCEL database is made available with this report and is described more fully in section 8.

3. National mortality rates for lung cancer, IHD and COPD

3.1 Derivation

The IMASS database[2] includes mortality data for lung cancer, COPD and IHD and population data by sex, age and country up to the late 1990s. These data were obtained from WHO and fuller details are given in the documentation of the database. For the purposes of the work described here, mortality and population data were updated to the year 2000 from later WHO data. The update was straightforward for Australia, Austria, Canada, Denmark, Netherlands, UK and US but involved some complications for Germany.

The data on IMASS for Germany are for West Germany up to 1990, but for Unified Germany from 1991 onwards. It was decided to attempt to obtain data for the former West Germany for the whole period up to 2000. The German Federal Statistics office website (www.gbe-bund.de) provides mortality data for the former West Germany (Old Lander) up to 1997 (ICD 9), but unfortunately the Old Lander data from 1998 to 2000 (ICD 10) include East Berlin. However, population data were available up to 2000 both for West Germany excluding East Berlin and for West Germany including East Berlin. As East Berlin forms only slightly less than 2% of the total population of West Germany including East Berlin, it was decided to calculate the numbers of deaths in 1998 to 2000 by sex, age and cause of death for West Germany excluding East Berlin from the given numbers for West Germany including East Berlin, by applying a sex- and age-specific correction factor based on the corresponding populations.

It should be noted that the ICD 9 and ICD 10 codes used in IMASS and by the German Federal Statistics Office for the diseases of interest are the same (Lung cancer: ICD 9 162, ICD 10 C33 and C34; IHD: ICD 9 410-414, ICD 10 I20-I25; COPD: ICD 9 490-496, ICD 10 J40-J47 and J67).

3.2 Lung cancer

Table 3/1L tabulates the lung cancer death rates plotted in Figure 3/1L and Figure 3/2L. In males, mean rates (per 100,000 per year) in the three flue-cured countries were higher than in the four blended countries in all the three age groups in 1971-1975, this being mainly due to a high incidence in the UK. By the end of the period studied, in 1996-2000, the mean rates in all the age groups were lower in the flue-cured countries at ages 35-49 and 50-64 and similar to that in the blended countries at age 65-79. The decline over the period was also more marked in the flue-cured countries, and most evident in the UK. Because of the variability between countries, the flue-cured/blended difference was not significant at $p<0.05$ for any age or time point, with the single exception of the higher rates for blended countries in 1996-2000 for age group 35-49. Here the rates varied from 6.73 to 10.39 in the flue-cured countries and from 11.44 to 14.80 in the blended countries.

In females, mean rates tended to rise over the period studied in all age groups for both flue-cured and blended, and be somewhat higher for flue-cured, particularly at ages 50-64 and 65-79. However, none of these differences were statistically significant, there being a very large variation within countries. This is particularly evident for the blended countries, where rates were higher in Denmark and the US than in Austria and Germany. This is most clearly seen for age 65-79 for 1996-2000 where rates are 220.14 in Denmark, 215.77 in US, 70.47 in Germany and 64.31 in Austria.

3.3 IHD

Table 3/1H tabulates the IHD death rates plotted in Figure 3/1H and Figure 3/2H. In both sexes, and in all age groups, there has been a marked decline in the rate over the period studied in all seven countries studied, with the rates in 1996-2000 typically only about a third of those in 1971-1975. The mean for the flue-cured countries was always somewhat higher than for the blended countries at the beginning of the period studied, but over time this difference reduced and from 1991 mean rates were very similar. None of the flue-cured/blended differences were significant ($p<0.05$), due to the variation between countries. Thus in 1971-1975, when the flue-cured/blended

difference was largest, the high rates in the US were inconsistent with the general pattern. For example, in men aged 35-49, while rates in the flue-cured countries, which ranged from 101.06 to 115.67, were consistently higher than rates in Austria, Denmark and Germany, which ranged from 62.61 to 66.55, they were smaller than the rate of 128.46 in the US. Even by the end of the period, when mean rates are similar, this conceals quite marked differences between countries.

3.4 COPD

Table 3/1C tabulates the COPD death rates plotted in Figure 3/1C and Figure 3/2C. In males, the pattern is quite similar to that seen for IHD, with mean rates for the flue-cured countries higher initially (1971-75) and the difference then declining over time so that by the end of the period (1996-2000) flue-cured and blended rates are similar. None of the flue-cured/blended differences are statistically significant (at $p<0.05$), due to the between-country variation. Even for the largest apparent flue-cured/blended difference (1971-75, age 65-79) rates vary substantially, both within flue-cured countries from a low of 273.53 (Canada) to a high of 586.99 (UK), and within blended countries from a low of 224.99 (Austria) to a high of 421.58 (US).

Though trends in males in COPD have been downwards (except in Denmark for age 65-79), this is not so clearly evident in females. Downward trends are seen in females in all countries at age 35-49, more so in the flue-cured countries, but at age 50-64 the rates are rising slightly in the US and markedly in Denmark. At age 65-79 rates are rising in all countries except Austria and Germany, and particularly in Denmark and the US. Rates tended to be higher in flue-cured countries at the beginning of the period, with the difference declining or even reversing by the end of the period. However, the flue-cured/blended difference was never statistically significant.

Table 3/1L
Lung cancer rate (per 100,000 per year)

Males

	Country									
	Flue-cured				Blended					
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]	
Age 35 - 49										
1971-75	16.81	18.14	24.92	19.96	16.87	14.08	15.50	26.95	18.35	
1976-80	15.28	17.81	19.82	17.64	17.48	14.31	17.44	25.58	18.70	
1981-85	13.27	16.91	16.12	15.43	16.44	12.56	16.70	22.69	17.10	
1986-90	11.28	16.34	13.82	13.82	19.03	12.84	17.90	19.35	17.28	
1991-95	8.70	13.52	11.37	11.20	18.16	12.28	16.33	15.92	15.67	(+)
1996-2000	6.73	10.39	8.76	8.63	14.80	11.44	14.59	13.34	13.54	+
Age 50 - 64										
1971-75	128.38	132.53	209.95	156.95	126.20	134.47	124.35	156.06	135.27	
1976-80	128.50	148.13	195.74	157.46	128.37	141.90	126.73	166.59	140.90	
1981-85	130.57	157.00	171.06	152.88	134.53	154.36	133.04	169.22	147.78	
1986-90	114.20	155.58	142.90	137.56	129.20	142.40	135.44	166.95	143.50	
1991-95	96.46	134.54	115.41	115.47	117.47	124.60	127.33	151.94	130.33	
1996-2000	77.27	111.34	92.21	93.61	106.39	106.17	111.75	125.79	112.53	
Ages 65-79										
1971-75	382.40	350.04	619.05	450.50	472.50	388.43	407.13	363.12	407.80	
1976-80	401.98	404.04	625.14	477.05	438.95	434.81	420.75	405.16	424.92	
1981-85	399.40	443.91	583.46	475.59	379.40	469.62	404.64	434.35	422.00	
1986-90	373.48	463.20	534.80	457.16	343.28	467.12	382.32	443.97	409.17	
1991-95	346.89	443.21	470.02	420.04	337.72	439.55	371.09	447.38	398.93	
1996-2000	313.42	410.38	388.01	370.60	308.58	413.11	345.59	418.83	371.53	

[1] Significant differences are coded as follows: +++ $p<0.001$, ++ $p<0.01$, + $p<0.05$, (+) $p<0.1$ where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Table 3/1L (continued)
Lung cancer rate (per 100,000 per year)

Females

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	4.86	6.46	9.54	6.95	3.46	8.46	2.79	10.77	6.37
1976-80	5.50	8.33	8.51	7.45	3.54	11.33	3.04	12.31	7.56
1981-85	5.28	10.42	7.72	7.81	2.92	12.85	3.45	12.28	7.87
1986-90	6.29	11.33	7.49	8.37	3.51	11.78	5.06	11.42	7.94
1991-95	5.29	11.70	7.34	8.11	6.05	12.71	6.90	10.14	8.95
1996-2000	5.01	11.65	7.00	7.89	7.29	11.68	8.06	9.13	9.04
Age 50 - 64									
1971-75	22.99	28.55	48.56	33.37	18.32	30.55	13.60	40.61	25.77
1976-80	29.61	39.76	58.02	42.46	19.78	43.16	15.12	54.69	33.19
1981-85	34.57	53.60	61.13	49.77	17.41	66.34	18.40	68.19	42.58
1986-90	36.36	64.05	61.39	53.93	23.83	78.39	21.45	77.35	50.25
1991-95	37.45	69.58	53.69	53.58	24.25	88.27	25.06	79.56	54.28
1996-2000	36.43	70.63	49.10	52.06	24.37	82.57	30.53	73.33	52.70
Age 65 - 79									
1971-75	41.56	46.57	85.20	57.78	42.57	60.90	35.08	57.17	48.93
1976-80	58.81	69.71	108.19	78.90	47.96	81.47	39.44	84.82	63.42
1981-85	76.80	100.63	138.17	105.20	58.98	107.73	44.60	123.65	83.74
1986-90	91.28	137.54	163.31	130.71	60.13	149.12	54.27	165.04	107.14
1991-95	107.55	164.70	180.00	150.75	60.16	185.25	63.73	200.11	127.31
1996-2000	110.44	186.66	180.68	159.26	64.31	220.14	70.47	215.77	142.67

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Figure 3/1L
Lung Cancer rates (per 100,000 per year)
Flue-cured versus Blended Cigarettes

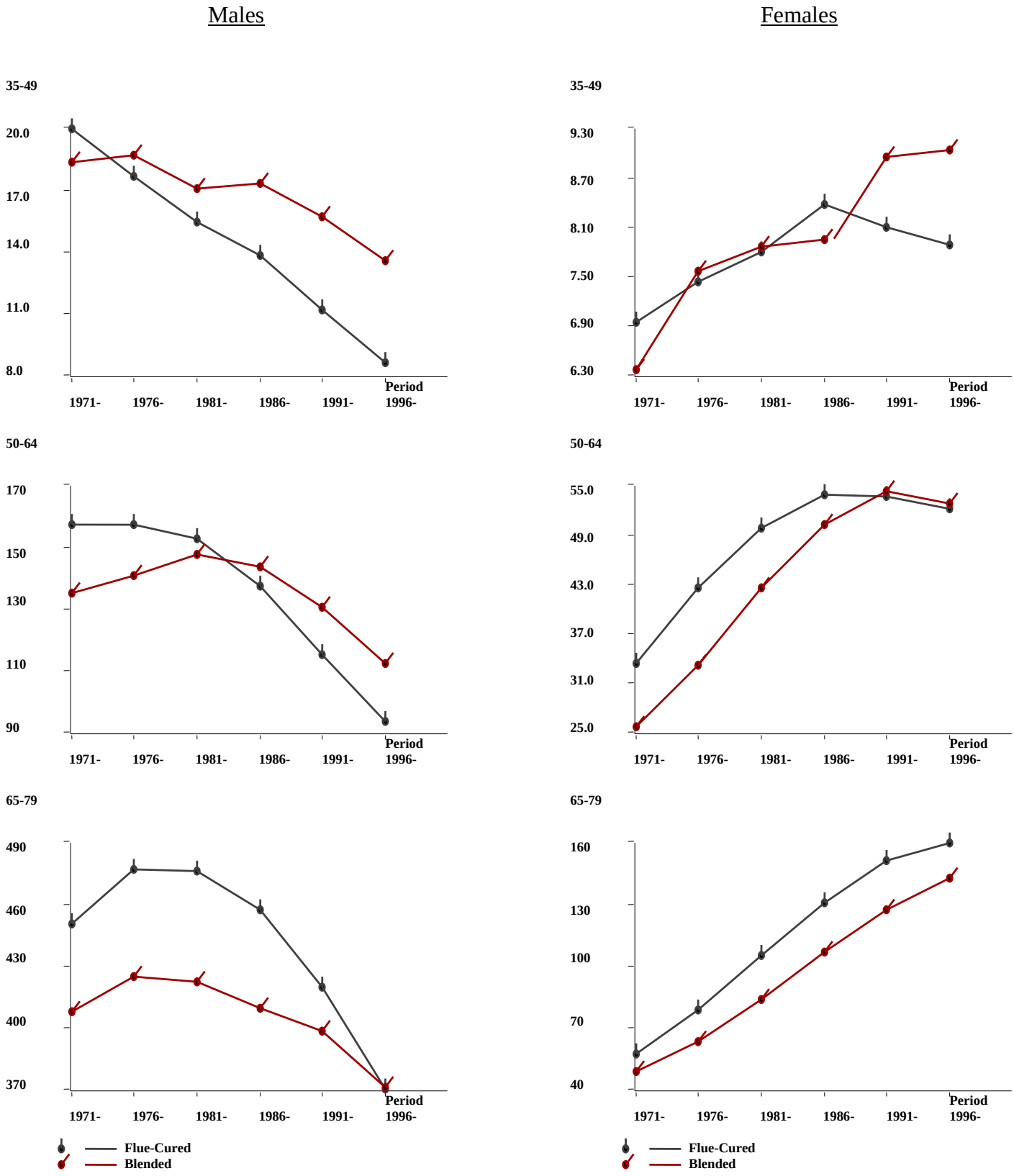


Figure 3/2L
Lung Cancer rates (per 100,000 per year)
Comparison of the seven countries

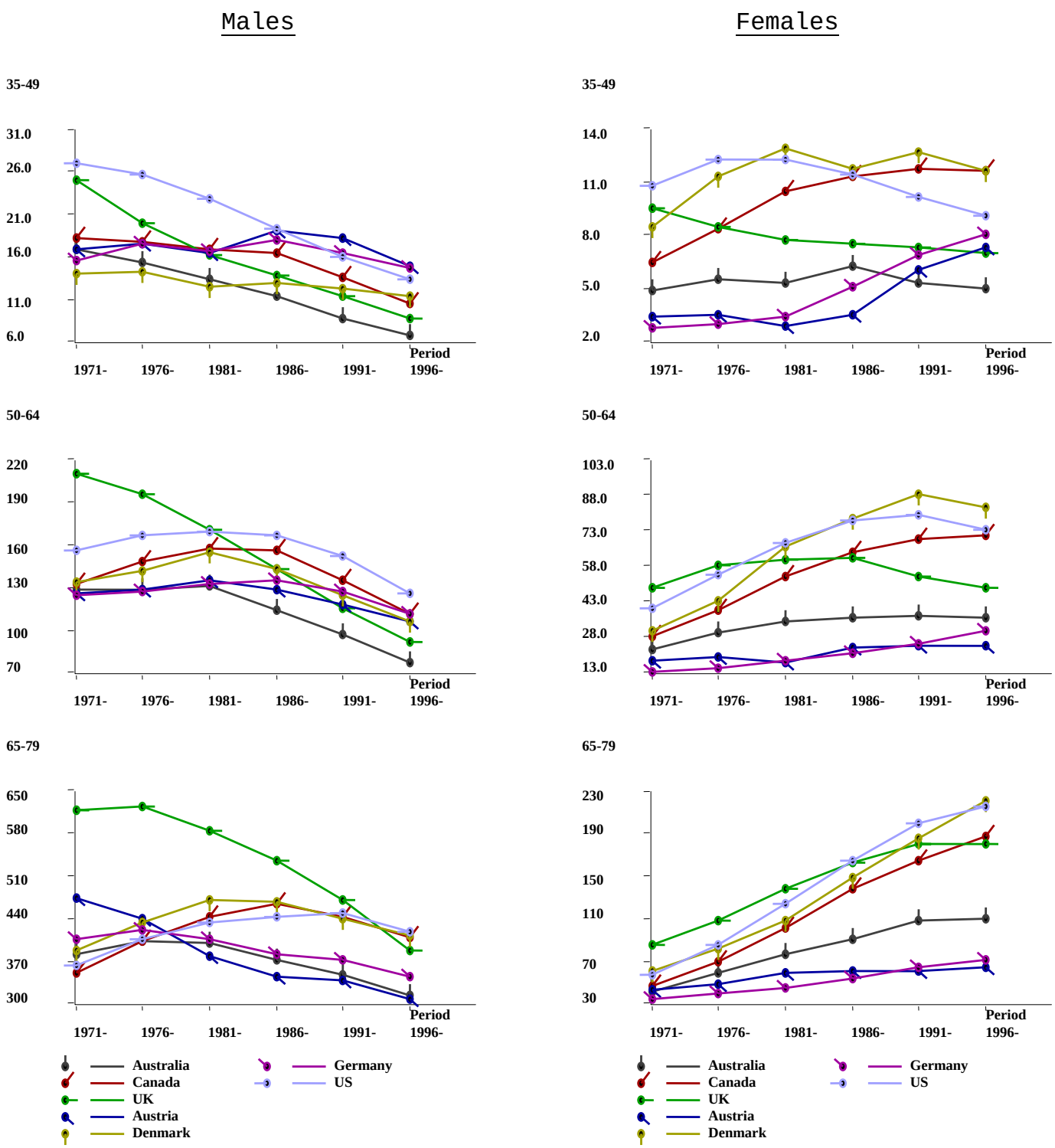


Table 3/1H
IHD rate (per 100,000 per year)

Males

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	114.21	101.06	115.67	110.31	62.61	66.55	62.78	128.46	80.10
1976-80	90.45	88.26	104.25	94.32	63.71	68.90	58.05	99.44	72.52
1981-85	65.41	66.64	86.79	72.95	53.34	58.72	48.41	74.41	58.72
1986-90	48.13	47.16	67.96	54.42	43.80	43.79	37.67	55.30	45.14
1991-95	33.63	34.62	50.23	39.49	41.26	29.83	32.03	45.46	37.14
1996-2000	28.57	28.25	39.13	31.98	36.67	22.66	27.61	40.96	31.97
Age 50 - 64									
1971-75	674.82	570.39	593.26	612.83	337.91	447.36	366.07	671.28	455.65
1976-80	542.91	505.96	596.91	548.59	353.05	463.31	365.99	532.28	428.66 (-)
1981-85	422.36	394.53	542.02	452.97	338.04	420.21	341.66	408.18	377.02
1986-90	314.96	302.95	458.62	358.84	280.65	351.71	272.21	314.73	304.82
1991-95	220.27	225.41	349.58	265.09	243.02	255.98	218.00	260.86	244.47
1996-2000	157.30	176.70	256.69	196.90	205.65	157.78	170.17	230.24	190.96
Age 65 - 79									
1971-75	2261.75	1916.75	1957.97	2045.49	1376.19	1905.51	1319.89	2237.66	1709.81
1976-80	1929.42	1711.04	1941.27	1860.58	1400.19	1852.73	1371.99	1798.11	1605.75
1981-85	1658.23	1449.21	1827.09	1644.84	1234.76	1695.98	1330.32	1443.84	1426.23
1986-90	1365.48	1208.03	1680.49	1418.00	1120.75	1493.29	1188.30	1158.84	1240.30
1991-95	1062.07	949.79	1450.05	1153.97	1042.88	1224.91	1032.46	978.32	1069.64
1996-2000	780.70	784.96	1129.36	898.34	940.80	850.96	866.79	858.59	879.28

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Table 3/1H (continued)
IHD rate (per 100,000 per year)

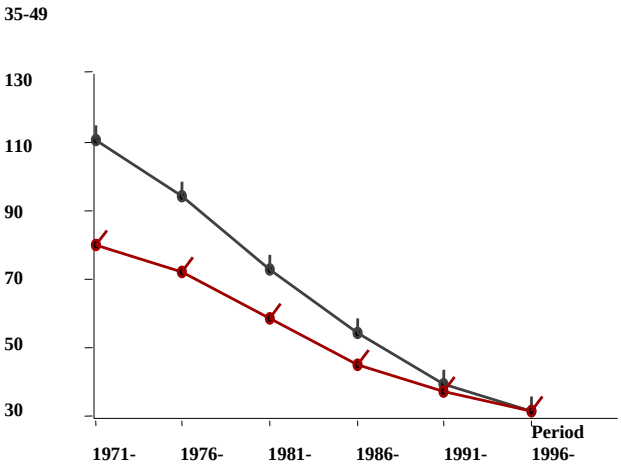
Females

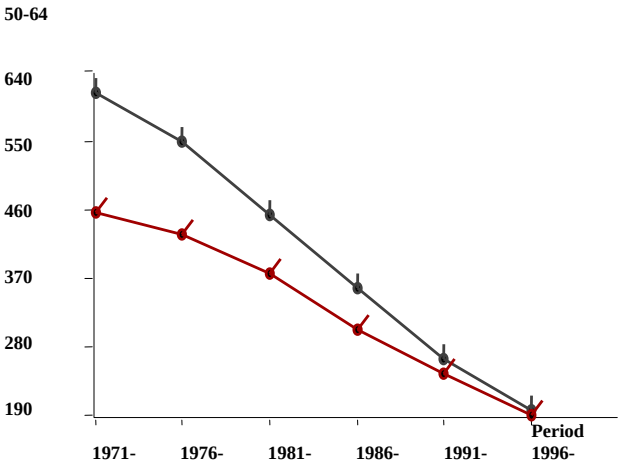
	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	28.40	17.72	19.26	21.79	10.54	14.80	9.87	30.13	16.33
1976-80	20.68	16.56	18.32	18.52	9.57	13.60	9.35	22.46	13.75
1981-85	15.30	11.87	14.16	13.77	9.50	11.76	7.72	16.82	11.45
1986-90	9.13	8.48	11.32	9.64	8.59	8.37	6.52	13.07	9.14
1991-95	6.51	6.61	9.14	7.42	8.72	6.07	5.92	11.61	8.08
1996-2000	5.94	5.78	8.19	6.64	7.90	5.28	6.30	11.33	7.70
Age 50 - 64									
1971-75	207.03	151.23	154.58	170.95	85.29	119.26	79.26	205.28	122.27
1976-80	161.18	130.23	158.30	149.90	83.58	115.89	78.01	160.98	109.62
1981-85	124.01	104.34	149.49	125.95	74.98	105.42	74.23	129.43	96.01
1986-90	91.98	81.91	132.66	102.18	63.19	96.13	62.35	106.37	82.01
1991-95	64.35	63.32	100.92	76.20	59.64	74.43	52.40	91.24	69.43
1996-2000	43.50	48.76	71.65	54.63	52.97	45.00	42.09	82.83	55.72
Age 65 - 79									
1971-75	1124.33	946.29	906.64	992.42	714.68	917.68	598.96	1152.58	845.97
1976-80	914.49	810.72	878.39	867.87	691.74	816.24	596.45	874.81	744.81
1981-85	782.64	676.87	839.75	766.42	539.29	725.28	555.29	699.54	629.85
1986-90	677.01	548.04	788.13	671.06	501.59	634.98	504.24	578.59	554.85
1991-95	508.72	425.93	682.67	539.11	476.58	525.92	436.66	480.86	480.00
1996-2000	356.12	342.96	519.15	406.08	406.92	369.23	371.66	432.85	395.17

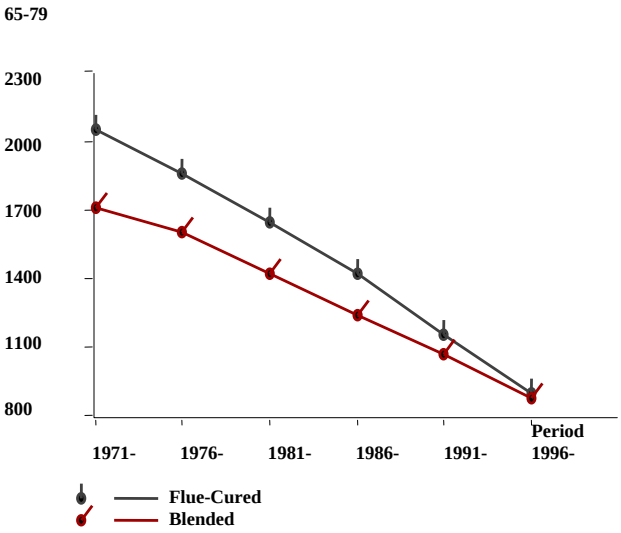
[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Figure 3/1H
IHD rates (per 100,000 per year)
Flue-cured versus Blended Cigarettes

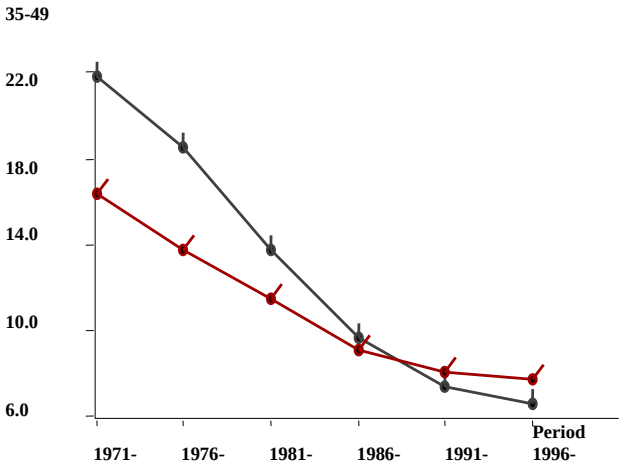
Males

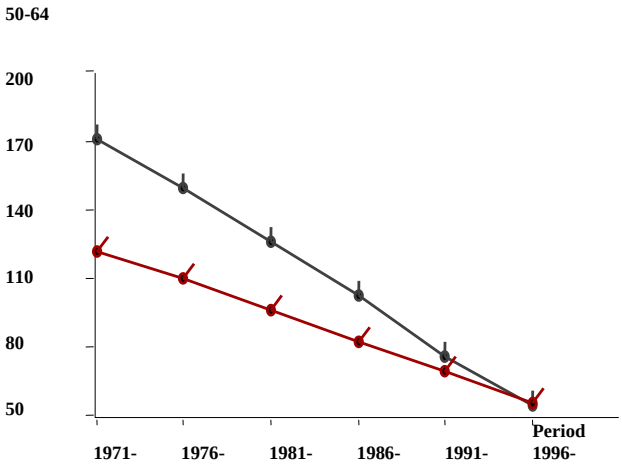






Females





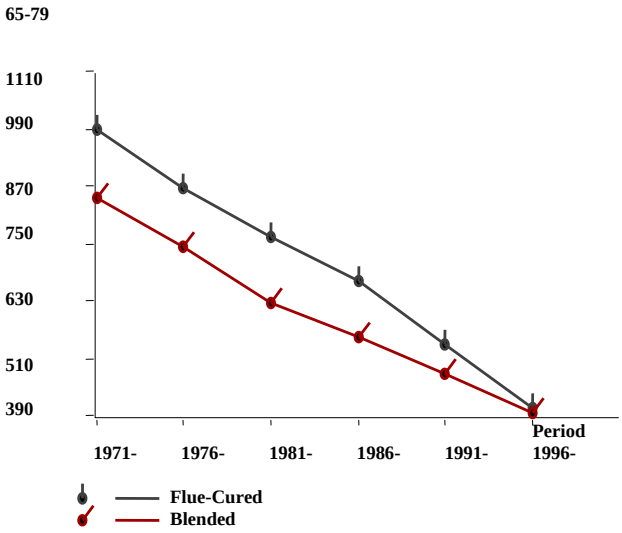
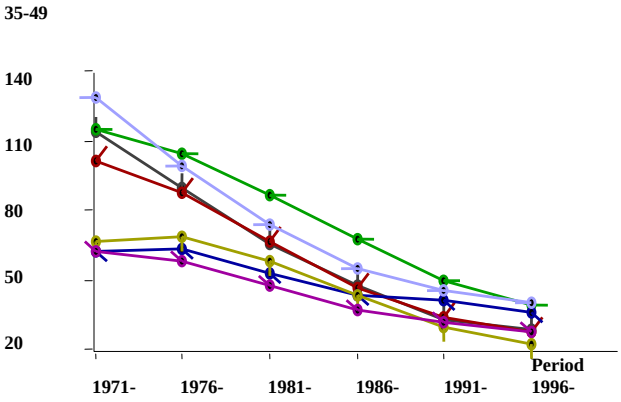
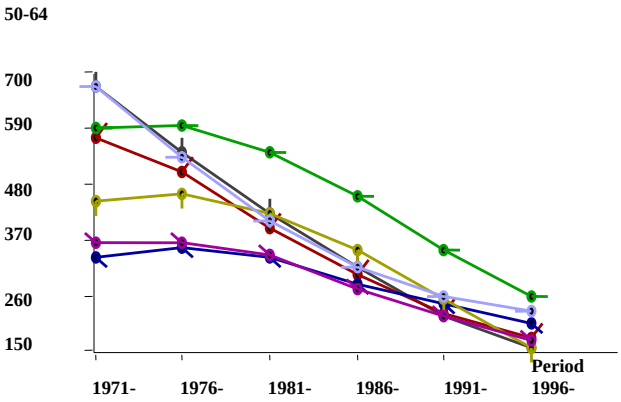
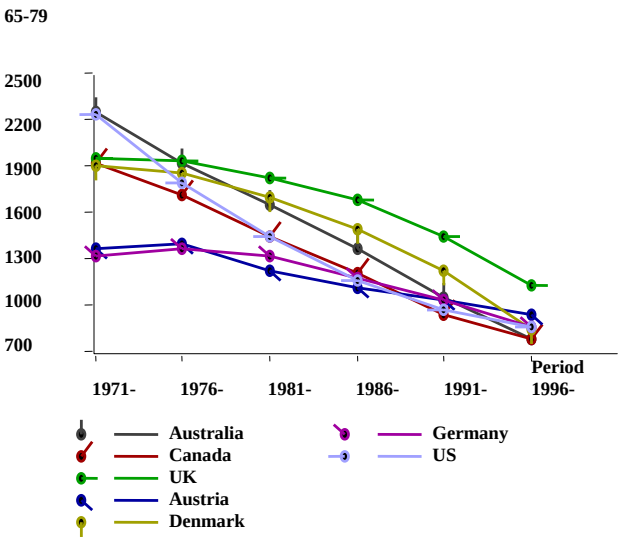


Figure 3/2H
IHD rates (per 100,000 per year)
Comparison of the seven countries

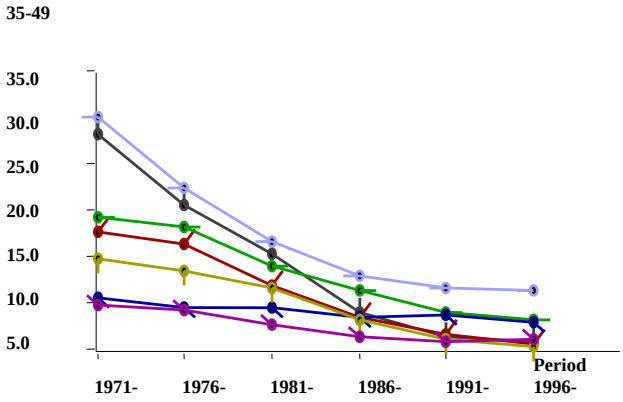
Males

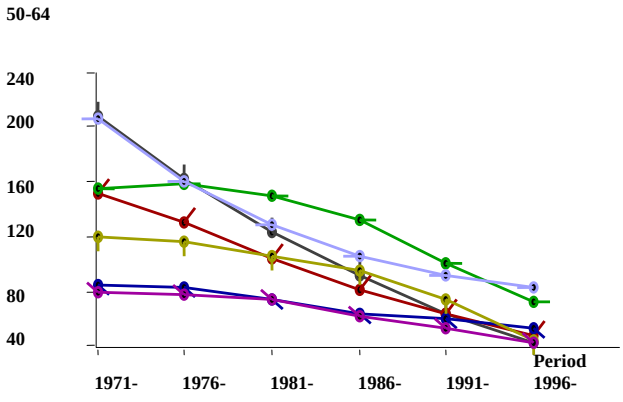






Females





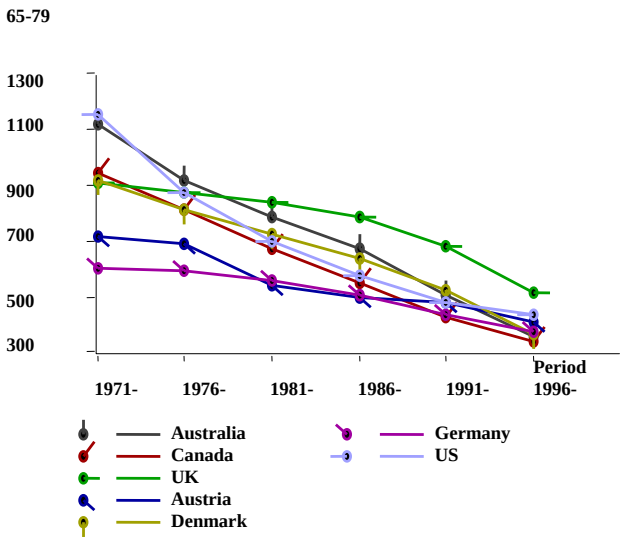


Table 3/1C
COPD rate (per 100,000 per year)

Males

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	8.25	6.35	10.11	8.24	4.65	6.99	6.64	6.76	6.26
1976-80	6.25	4.65	7.22	6.04	4.37	4.83	5.61	4.76	4.89
1981-85	4.95	2.55	5.05	4.19	4.39	5.17	4.22	3.17	4.24
1986-90	4.03	2.02	3.93	3.32	3.12	2.91	2.99	3.17	3.05
1991-95	2.52	1.36	2.84	2.24	2.44	2.40	3.06	3.04	2.73
1996-2000	1.81	1.11	2.49	1.80	2.52	2.66	2.68	3.13	2.75 (+)
Age 50 - 64									
1971-75	81.14	53.14	102.02	78.77	32.48	57.01	62.91	59.66	53.02
1976-80	63.65	44.75	76.56	61.66	28.07	54.83	50.90	48.73	45.63
1981-85	52.83	30.59	59.68	47.70	31.99	54.60	42.77	42.11	42.86
1986-90	46.57	27.17	49.61	41.12	27.81	54.69	37.13	40.90	40.13
1991-95	35.02	21.63	38.14	31.60	23.47	40.82	33.89	38.88	34.27
1996-2000	25.45	16.28	32.47	24.73	21.55	33.38	26.17	35.95	29.26
Age 65 - 79									
1971-75	494.93	273.53	586.99	451.82	224.99	260.03	421.58	275.97	295.64
1976-80	426.80	260.28	479.40	388.83	198.14	262.73	349.39	264.10	268.59
1981-85	383.90	250.59	401.58	345.36	202.89	306.02	290.71	257.94	264.39
1986-90	343.08	250.27	374.57	322.64	174.17	331.67	258.83	254.80	254.87
1991-95	287.29	223.29	317.00	275.86	164.59	324.52	244.55	247.75	245.35
1996-2000	223.79	192.29	266.39	227.49	146.90	341.29	202.32	242.51	233.26

[1] Significant differences are coded as follows: +++ $p<0.001$, ++ $p<0.01$, + $p<0.05$, (+) $p<0.1$ where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Table 3/1C (continued)
COPD rate (per 100,000 per year)

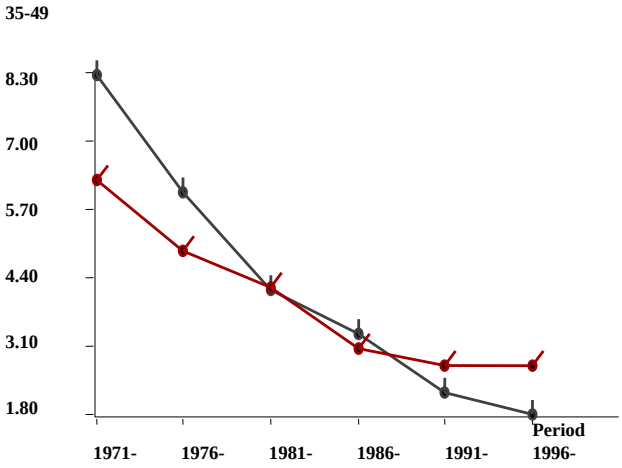
Females

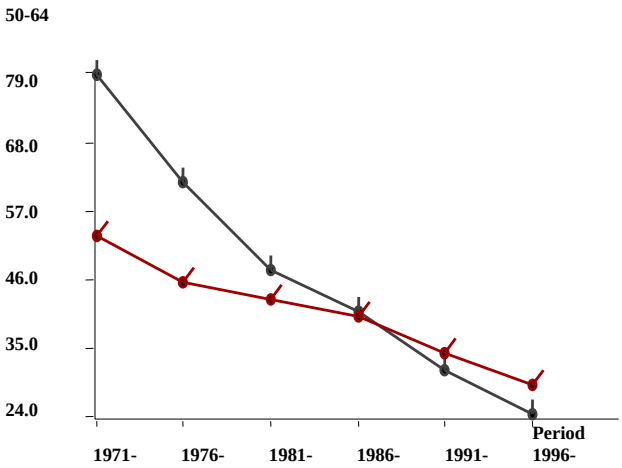
	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	7.25	3.86	7.56	6.23	2.33	4.18	4.06	4.97	3.88 (-)
1976-80	5.46	3.41	5.66	4.84	2.39	4.50	4.06	3.52	3.62
1981-85	4.48	1.94	4.01	3.48	2.15	4.07	3.27	2.88	3.09
1986-90	4.47	1.50	3.27	3.08	2.09	4.12	2.22	2.85	2.82
1991-95	2.68	1.26	2.47	2.14	1.57	2.07	1.98	2.93	2.14
1996-2000	2.14	0.99	2.22	1.79	1.02	3.03	1.87	3.15	2.27
Age 50 - 64									
1971-75	24.98	18.16	32.60	25.25	10.57	19.89	14.89	20.37	16.43
1976-80	25.43	16.51	31.82	24.59	10.83	27.24	14.74	21.47	18.57
1981-85	26.80	14.29	32.25	24.45	9.19	38.36	13.81	23.48	21.21
1986-90	28.42	15.09	32.66	25.39	9.27	49.45	12.05	27.99	24.69
1991-95	23.74	14.31	27.01	21.69	7.92	49.95	12.46	30.30	25.16
1996-2000	20.03	13.24	24.53	19.27	7.77	47.12	11.11	30.26	24.07
Age 65 - 79									
1971-75	73.21	55.55	108.95	79.24	64.40	65.72	80.57	54.35	66.26
1976-80	81.80	60.61	97.46	79.96	51.65	78.62	67.25	67.48	66.25
1981-85	98.77	66.92	103.17	89.62	59.49	102.01	61.61	92.49	78.90
1986-90	120.67	87.64	130.06	112.79	50.32	146.33	62.21	122.54	95.35
1991-95	128.50	95.34	153.45	125.76	49.85	200.92	71.36	148.38	117.63
1996-2000	113.90	100.73	162.55	125.72	44.17	279.10	66.78	166.28	139.08

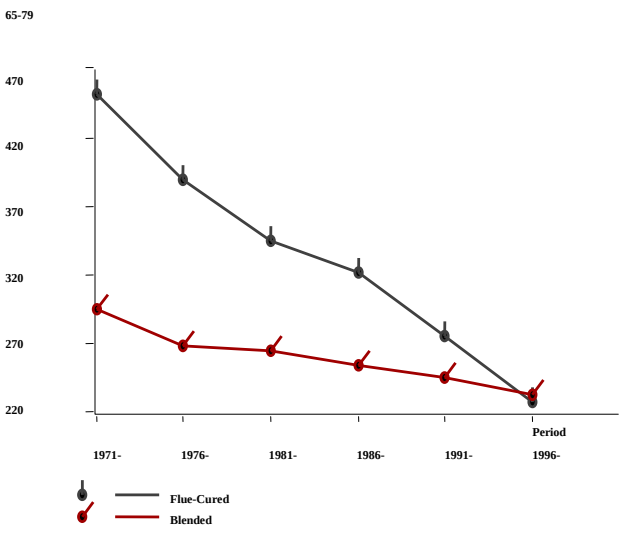
[1] Significant differences are coded as follows: +++ $p<0.001$, ++ $p<0.01$, + $p<0.05$, (+) $p<0.1$ where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Figure 3/1C
COPD rates (per 100,000 per year)
Flue-cured versus Blended Cigarettes

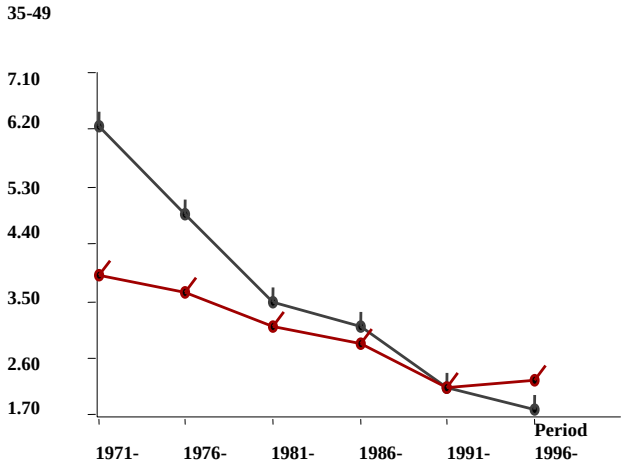
Males

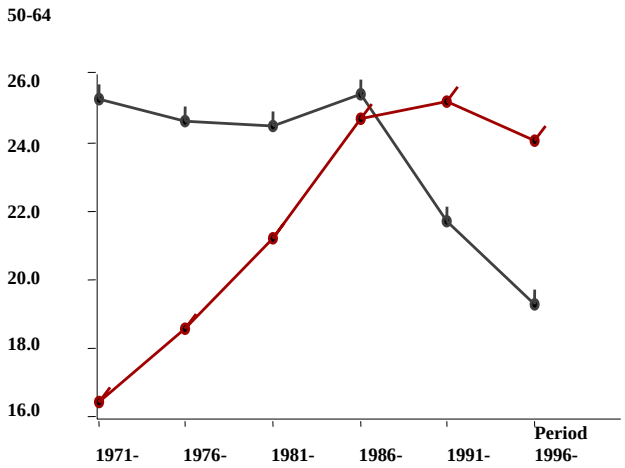






Females





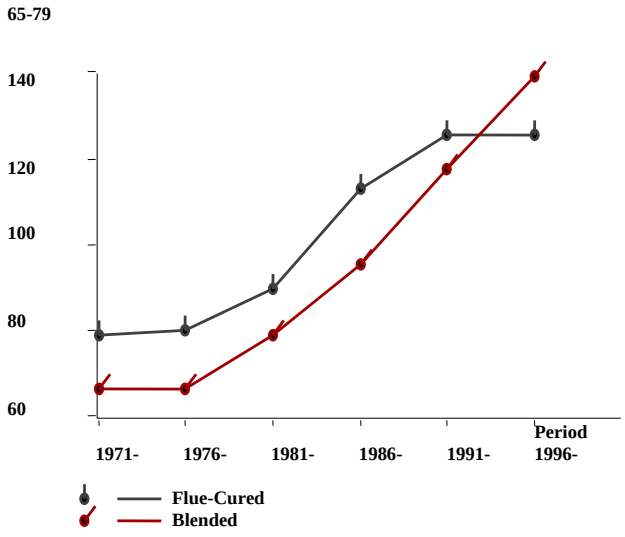
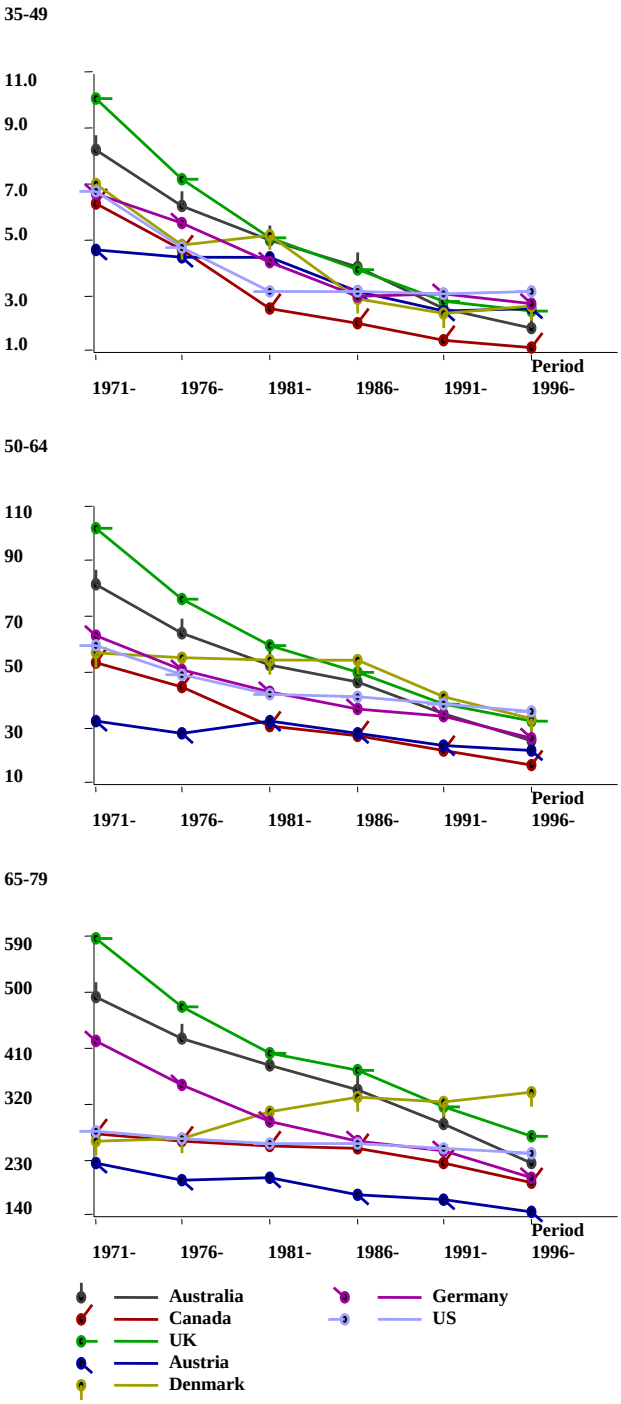
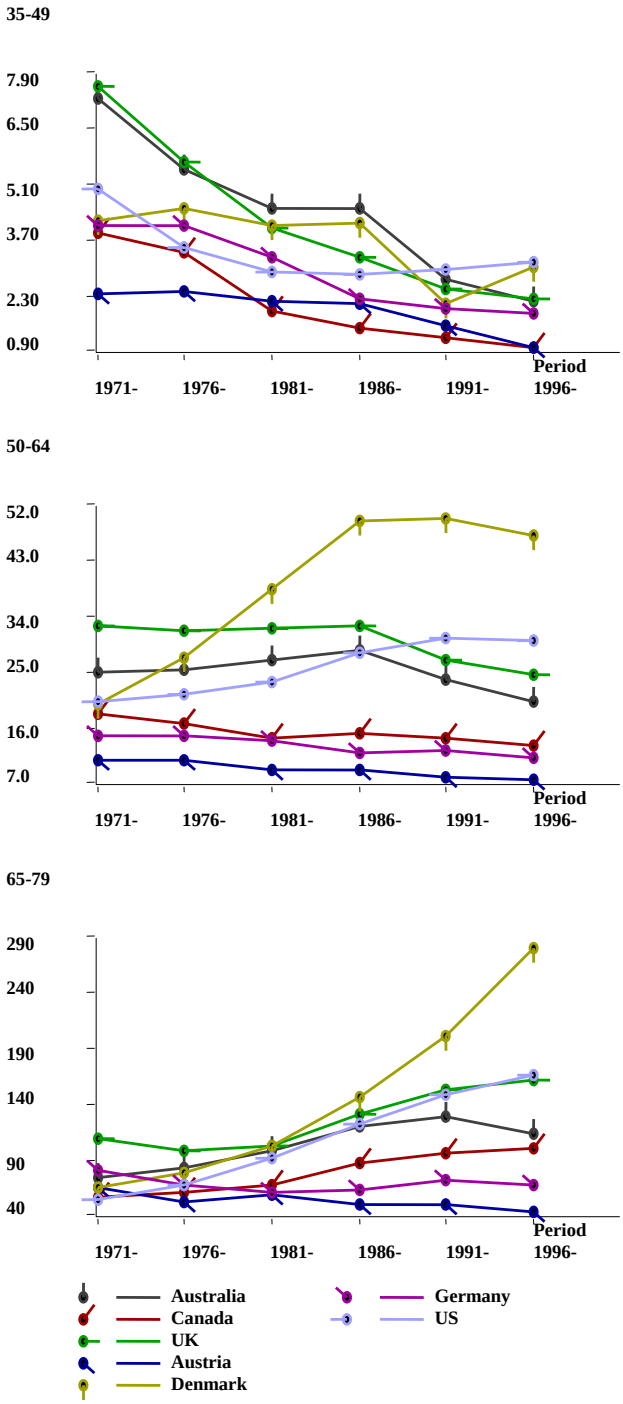


Figure 3/2C
COPD rates (per 100,000 per year)
Comparison of the seven countries

Males



Females



4. National estimates of current smoking prevalence

4.1 Derivation

ISS2[3] presents tables of current smoking prevalence by country, sex and age group for surveys published up to 1995. It also provides details of the sources used and of the product (manufactured cigarettes; total cigarettes – including handrolled; cigarettes – type unspecified; all products; unspecified) and frequency (all smokers – including occasional; regular or daily smokers; unspecified) relevant to each set of estimates.

Supplement 1 to ISS2[9] presents tables of summary estimates of current smoking prevalence in standard five-year period and five-year age group format. It also gives details of how these estimates were derived from the original data by survey and variable age group. These data are also available in IMASS.

Data for later surveys were sought, and in some cases some additional data up to 1995 were also found. Using the same methodology as before, the tables by survey were updated, as were the summary estimates by standard period and age group format. The tables by survey will eventually be published in the website edition of ISS, and are available on request. The summary estimates are available on the EXCEL database (see section 8).

That database contains two sets of current smoking prevalence, one referred to as "total cigarettes," the other as "manufactured cigarettes." These are as defined in ISS2 Supplement 1, and are based on results from surveys with appropriate product definitions, the appropriate definition depending on country and time period, and on the frequency of smoking of handrolled cigarettes and of pipes and cigars.

For the data for total cigarettes, which are those used in the tables and figures in this report, the data for Denmark and UK are for surveys which asked about prevalence of cigarette smoking unspecified or prevalence of cigarette smoking including handrolled. The same is true for Australia and

Canada for the 1970s and Germany for the 1970s and 1980s. For Australia and Canada and Germany for later time periods, the definition also allows surveys which asked about smoking of any product or of smoking unspecified. For Austria and US, any definition of smoking is allowed including smoking of manufactured cigarettes specifically.

4.2 Differences between countries

The data on prevalence of current smoking are presented in Table 4/1 and plotted in Figure 4/1 and Figure 4/2. In both sexes and all age groups, the mean prevalence of current smoking was higher in flue-cured than in blended countries in 1971-1975. However the decline in prevalence over time was greater in flue-cured countries and the difference in mean prevalence reduced and eventually reversed (except for females aged 65-79 where the means became similar by 1996-2000. None of the flue-cured/blended differences were statistically significant ($p<0.05$), due to the between-country variation. Thus, looking at one of the largest apparent differences (females, aged 50-64, 1971-1975) the comparison is between 27.04%, 30.53% and 43.76% in, respectively, Australia, Canada and UK, and 8.13%, 34.98%, 18.38% and 30.27%, in Austria, Denmark, Germany and US.

The pattern of decline in rates varies by country, somewhat differently by sex and age group. In men aged 35-49 the decline is evident throughout, but most marked in the flue-cured countries and in the US. In men aged 50-64 the decline is evident throughout, but most marked in the flue-cured countries and least marked in Denmark. In men aged 65-79, the decline has been substantial in all countries, for example about halving in the UK, except in Denmark, where no decline is evident at all. In females, prevalence has increased in all age groups in Austria, showed little or no decline in Denmark and Germany, but elsewhere has declined (except in Canada aged 65-79).

Table 4/1
Prevalence of Current Smoking (%)

Males

	Country									
	Flue-cured				Blended					
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]	
Age 35 - 49										
1971-75	46.20	51.03	55.03	50.76	43.13	49.43	51.07	46.67	47.58	
1976-80	42.07	46.27	47.67	45.33	39.57	46.57	47.73	44.60	44.62	
1981-85	37.17	41.93	37.70	38.93	32.40	44.50	38.83	36.17	37.98	
1986-90	29.67	35.93	41.47	35.69	40.83	42.80	42.03	31.63	39.33	
1991-95	30.67	33.10	35.60	33.12	43.07	41.67	41.13	32.13	39.50	
1996-2000	28.43	30.83	30.20	29.82	38.23	40.60	40.67	28.60	37.03	(+)
Age 50 - 64										
1971-75	40.35	47.51	53.35	47.07	39.56	40.09	45.48	38.72	40.96	
1976-80	37.06	42.63	47.14	42.27	38.32	41.92	42.17	35.11	39.38	
1981-85	33.82	38.79	36.18	36.27	29.94	44.49	31.94	30.39	34.19	
1986-90	26.42	31.38	37.88	31.89	34.38	41.21	32.71	27.89	34.05	
1991-95	24.22	26.58	31.51	27.44	34.04	37.14	30.09	25.43	31.68	
1996-2000	22.15	23.81	25.05	23.67	26.13	35.91	29.22	22.74	28.50	
Age 65 - 79										
1971-75	29.96	32.50	43.04	35.17	31.23	23.78	34.56	25.77	28.83	
1976-80	25.59	31.31	36.31	31.07	29.84	26.29	30.83	22.31	27.32	
1981-85	25.53	26.20	28.08	26.60	28.67	25.47	24.20	21.27	24.90	
1986-90	19.51	20.93	28.87	23.10	26.24	27.78	23.96	19.02	24.25	
1991-95	16.17	18.19	23.04	19.13	23.92	27.14	20.06	16.78	21.98	
1996-2000	15.20	16.10	16.07	15.79	15.70	26.81	18.00	14.37	18.72	

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Table 4/1 (continued)
Prevalence of Current Smoking (%)

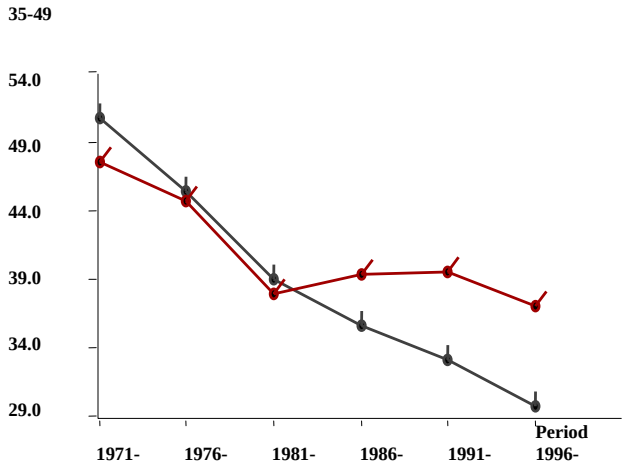
Females

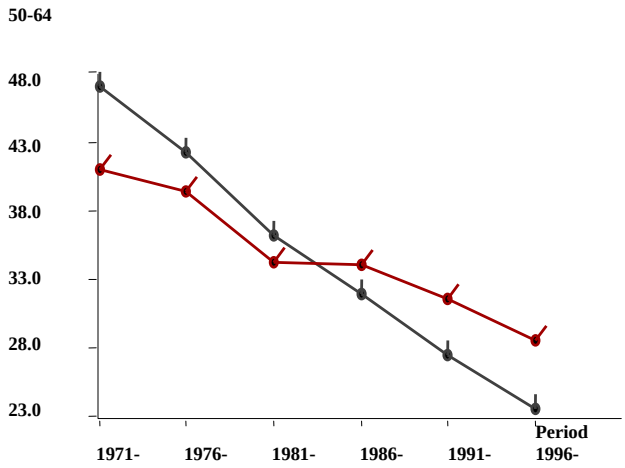
	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	33.30	37.07	48.53	39.63	12.53	46.53	30.27	36.73	31.52
1976-80	30.27	37.70	43.63	37.20	17.40	45.60	28.53	37.63	32.29
1981-85	28.20	34.83	35.47	32.83	22.10	45.83	25.70	30.10	30.93
1986-90	24.07	32.20	39.30	31.86	23.33	43.70	29.83	26.00	30.72
1991-95	24.23	29.20	34.33	29.26	29.73	41.87	31.20	26.93	32.43
1996-2000	23.53	27.20	28.80	26.51	30.77	40.60	33.60	24.30	32.32
Age 50 - 64									
1971-75	27.04	30.53	43.76	33.78	8.13	34.98	18.38	30.27	22.94
1976-80	25.73	31.66	40.98	32.79	11.39	37.43	18.73	30.39	24.49
1981-85	21.18	29.43	35.84	28.82	16.59	40.98	15.06	24.73	24.34
1986-90	19.58	26.42	34.58	26.86	12.83	43.78	17.11	22.64	24.09
1991-95	17.28	23.27	30.28	23.61	14.96	37.78	15.94	22.14	22.71
1996-2000	14.71	21.32	24.96	20.33	17.22	34.02	18.79	19.88	22.48
Age 65 - 79									
1971-75	15.62	12.47	24.46	17.51	3.97	17.62	9.69	12.18	10.86
1976-80	15.10	15.30	23.44	17.95	5.31	18.62	9.34	16.90	12.54
1981-85	11.29	15.58	23.76	16.87	7.06	21.12	8.27	14.79	12.81
1986-90	11.49	15.37	22.82	16.56	6.83	25.61	8.42	13.77	13.66
1991-95	9.73	14.40	19.81	14.65	8.67	24.34	7.16	13.62	13.45
1996-2000	8.22	13.04	17.47	12.91	7.11	22.40	8.54	12.61	12.67

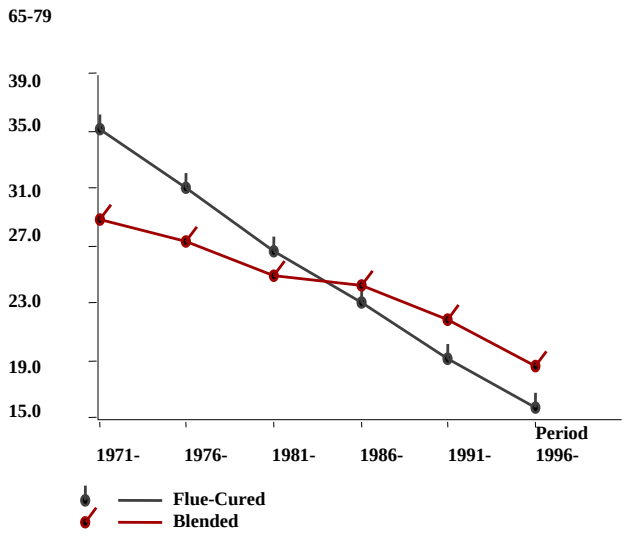
[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Figure 4/1
Prevalence of current smoking (%)
Flue-cured versus Blended Cigarettes

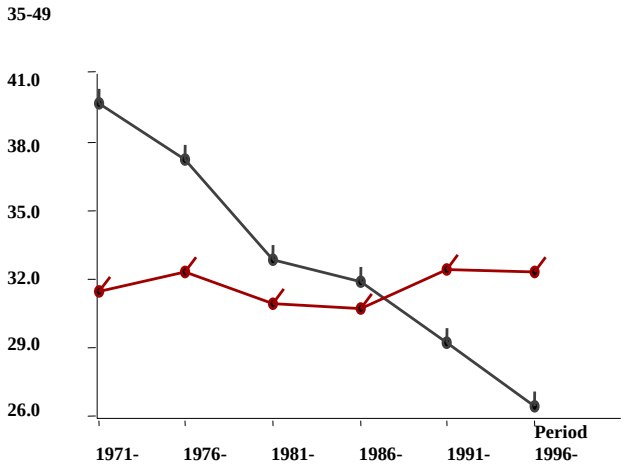
Males

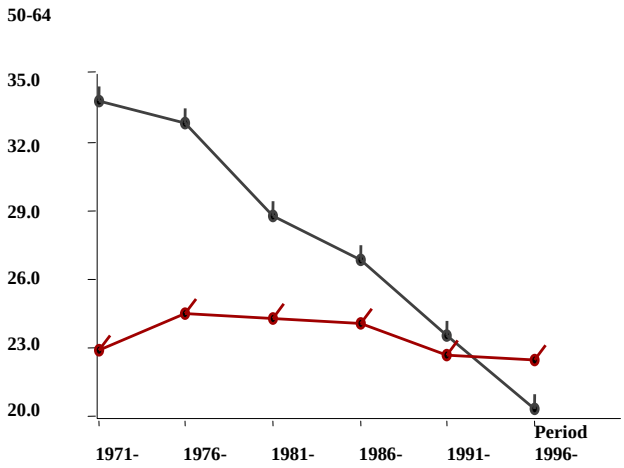






Females





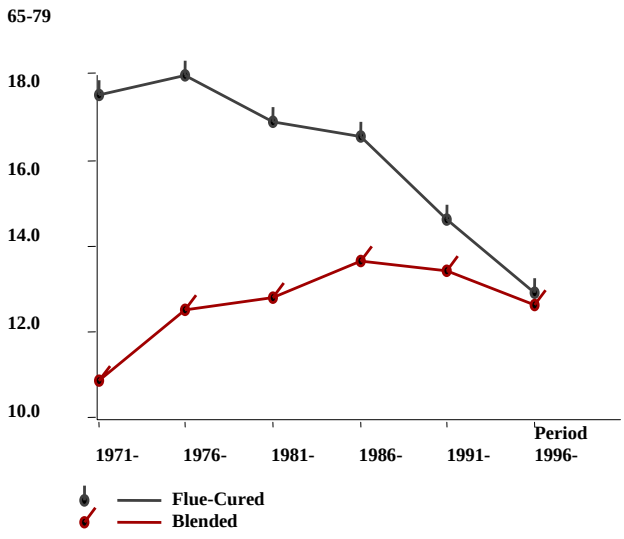
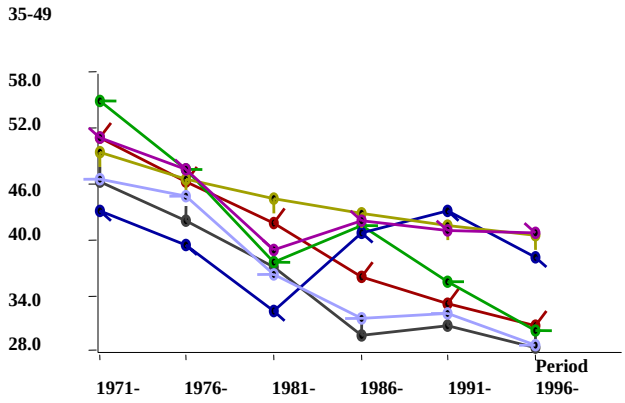
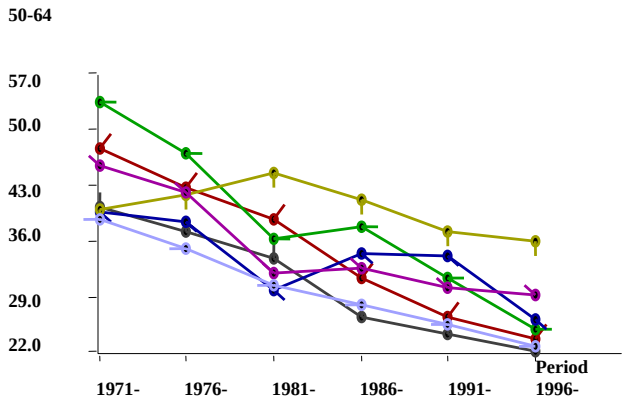
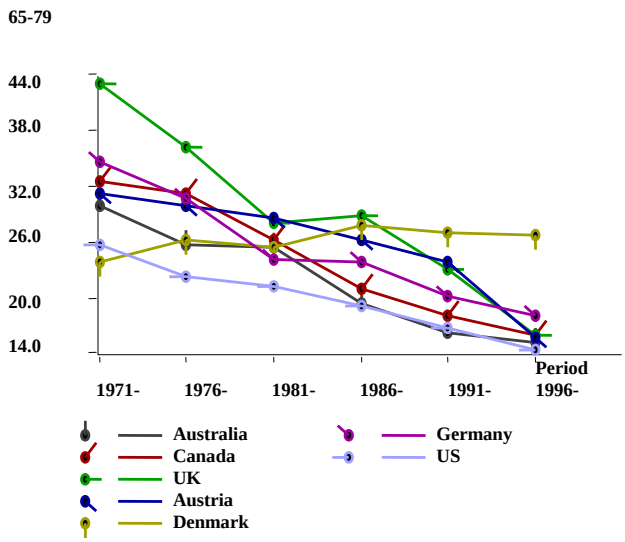


Figure 4/2
Prevalence of current smoking (%)
Comparison of the seven countries

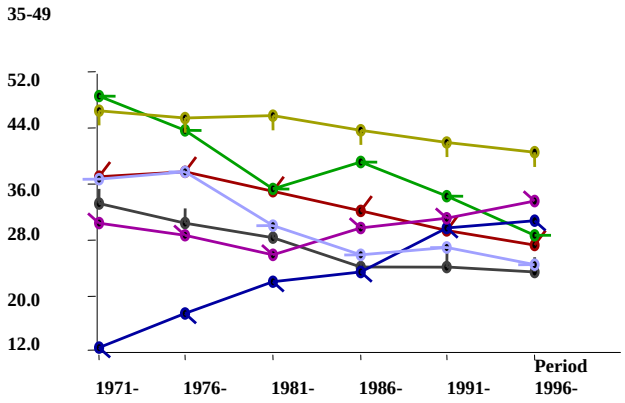
Males

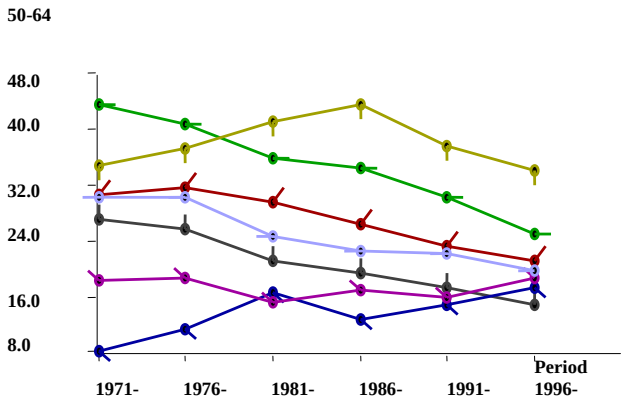


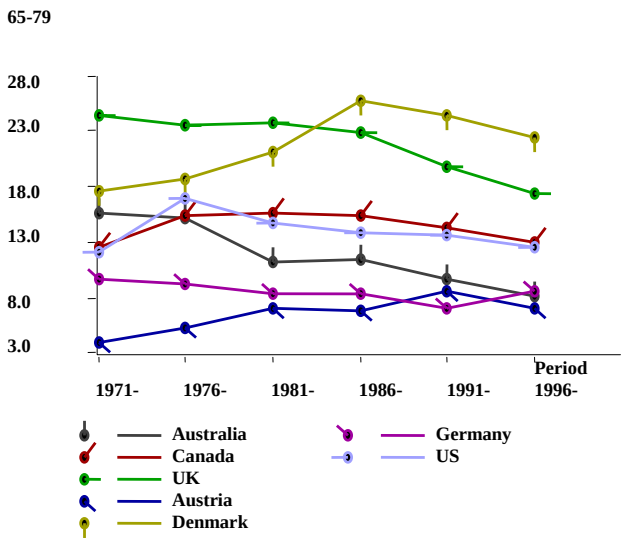




Females







5. National estimates of ex-smoking prevalence

5.1 Derivation

Estimates of ex-smoking prevalence are not included in ISS2 or IMASS, so it was necessary to derive them from available sources. Fuller detail of the methodology is given in Appendix 5/1 and is summarized here. There were a number of steps.

First, sources used in ISS2[3] which had provided data for current smoking prevalence were inspected, unless they clearly related to teenagers or to years before 1971. Other sources were then sought for more recent adult data.

Data on prevalence of ex-smoking by age group were extracted into tables similar in style to the tables for current smoking in ISS2, with product and frequency similarly defined. As discussed in Appendix 5/1, failure to adapt the definitions of product and frequency may be a limitation of the work. Appendix 5/1 presents the data extracted and gives details of sources of the surveys.

The next step was to derive estimates of prevalence of ex-smoking by five year age groups from the survey data by variable age groups. A first approach was to repeat the method used in ISS2 Supplement 1[9] but, as discussed in Appendix 5/1, this proved unsatisfactory, presumably because of the much greater variation in prevalence by age for ex-smoking than for current smoking and the very different nature of the age relationships. This first approach was abandoned and a second approach was used, involving a modified form of linear interpolation/extrapolation. This is also described in detail in Appendix 5/1.

Having obtained estimates by five-year age group for each survey, these were combined to produce five-year period averages. If a period had no estimates for a given five-year age group, and both earlier and later estimates

were available for that age group, then linear interpolation was used to fill the gaps.

The five-year age group and five-year period data are those given in the EXCEL database. The database includes two sets of estimates, one labelled "All products (MC, TC & A)" and "All cigarettes (MC & TC)." The first is that used in our analyses and includes all the ex-smoking estimates regardless of whether the question concerned ex-smoking generally or ex-smoking specifically of cigarettes. The reasons for this choice are discussed in Appendix 5/1.

5.2 Differences between countries

The data on prevalence of ex-smoking are presented in Table 5/1 and plotted in Figure 5/1 and Figure 5/2. Note that the means for blended cigarettes for 1971-1975 are based on only one country, US, there being no data available for Austria, Denmark or Germany at that time. As the prevalence of ex-smokers is generally substantially higher in the US than in Austria, Denmark or Germany at least up to 1991-1995, this gives a somewhat misleading impression. Over the period 1976 onwards, when estimates are available for all countries, ex-smoking prevalence is generally increasing over time in both sexes and all age groups and higher in flue-cured than blended countries. While the flue-cured/blended difference is consistently seen, it is only significant (at $p<0.05$) for men aged 35-49 and aged 50-64 in 1996-2000.

Table 5/1
Prevalence of Ex-Smoking (%)

Males

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	21.33	23.80	18.33	21.16	-	-	-	28.97	28.97
1976-80	22.47	24.20	21.90	22.86	18.63	16.27	13.93	28.27	19.28
1981-85	26.43	26.53	25.13	26.03	19.07	14.50	27.13	31.93	23.16
1986-90	29.20	33.43	25.63	29.42	19.43	19.00	28.43	30.63	24.38
1991-95	30.27	29.27	25.93	28.49	16.70	19.20	25.67	26.77	22.08 (-)
1996-2000	29.80	31.80	26.27	29.29	22.47	22.07	25.30	22.70	23.13 -
Age 50 - 64									
1971-75	31.42	30.86	24.03	28.77	-	-	-	37.61	37.61
1976-80	35.17	30.38	29.43	31.66	30.11	21.52	20.43	40.43	28.12
1981-85	36.31	34.48	34.68	35.16	29.33	18.40	40.29	44.48	33.13
1986-90	39.88	44.53	37.19	40.53	28.56	30.27	40.13	46.35	36.33
1991-95	40.63	46.29	40.57	42.50	27.65	24.59	36.94	43.91	33.28
1996-2000	41.84	49.02	42.44	44.43	32.54	33.27	38.21	41.37	36.35 -
Age 65 - 79									
1971-75	40.72	38.04	29.08	35.95	-	-	-	36.70	36.70
1976-80	42.90	34.99	37.42	38.44	35.21	32.27	25.49	48.96	35.48
1981-85	46.33	42.01	44.54	44.30	35.81	26.88	51.63	54.62	42.24
1986-90	47.17	55.43	49.34	50.65	36.41	41.12	57.52	57.51	48.14
1991-95	54.87	66.20	54.33	58.47	37.89	40.16	51.81	57.13	46.75
1996-2000	54.61	59.54	56.33	56.83	43.39	46.13	56.33	56.76	50.65

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Table 5/1 (continued)
Prevalence of Ex-Smoking (%)

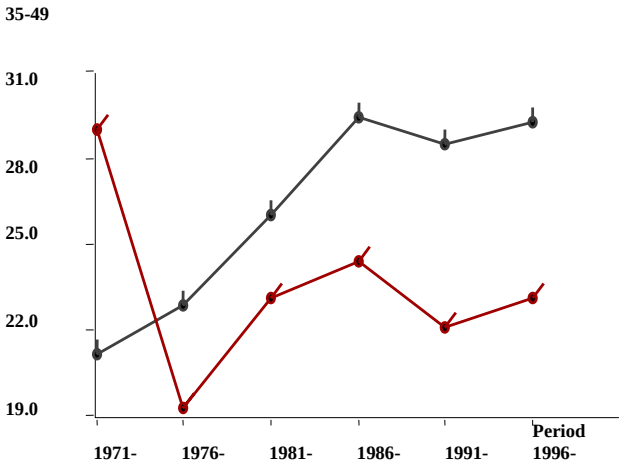
Females

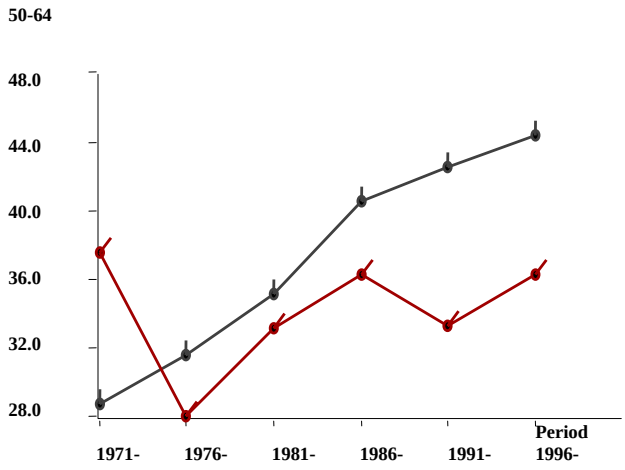
	Country									
	Flue-cured				Blended					
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]	
Age 35 - 49										
1971-75	11.33	15.23	10.93	12.50	-	-	-	16.90	16.90	
1976-80	13.13	14.50	13.40	13.68	6.17	10.97	5.53	16.47	9.78	
1981-85	15.50	17.50	16.53	16.51	7.77	9.63	13.67	20.57	12.91	
1986-90	19.10	24.27	17.20	20.19	9.33	13.97	17.93	22.27	15.88	
1991-95	24.43	24.53	20.10	23.02	11.67	18.07	19.03	20.23	17.25	(-)
1996-2000	25.77	27.13	20.97	24.62	18.37	21.90	23.30	18.53	20.53	
Age 50 - 64										
1971-75	9.44	15.94	13.41	12.93	-	-	-	14.97	14.97	
1976-80	13.10	13.15	17.09	14.45	6.92	12.31	5.26	17.15	10.41	
1981-85	17.37	15.57	19.86	17.60	7.03	12.56	10.96	23.27	13.45	
1986-90	18.45	25.38	19.31	21.04	7.10	19.81	12.75	26.46	16.53	
1991-95	24.43	30.11	24.05	26.20	10.22	19.67	13.43	26.68	17.50	
1996-2000	25.39	31.61	26.91	27.97	17.43	25.64	17.52	26.82	21.85	
Age 65 - 79										
1971-75	10.18	20.72	12.03	14.31	-	-	-	11.53	11.53	
1976-80	12.82	9.77	17.78	13.46	5.29	16.28	3.88	16.22	10.42	
1981-85	15.98	14.03	22.07	17.36	6.10	19.37	9.26	24.06	14.69	
1986-90	19.90	26.32	24.29	23.50	6.87	26.07	12.11	28.52	18.39	
1991-95	23.41	33.40	30.84	29.22	8.54	23.63	8.72	28.56	17.36	
1996-2000	24.96	31.72	32.14	29.61	13.41	31.00	11.46	28.53	21.10	

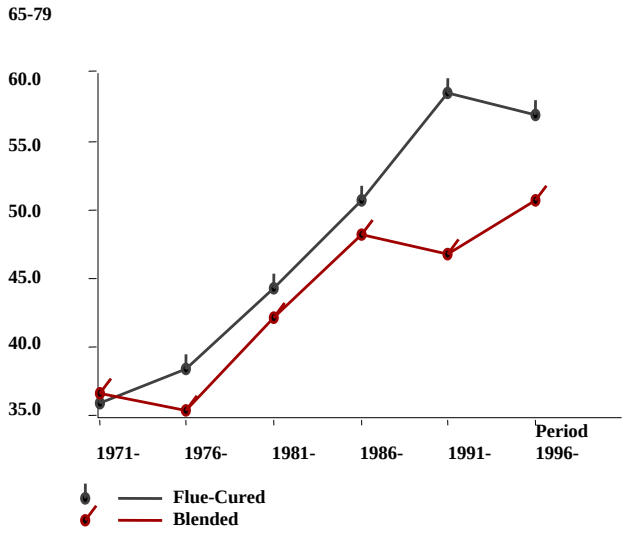
[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Figure 5/1
Prevalence of ex-smoking (%)
Flue-cured versus Blended Cigarettes

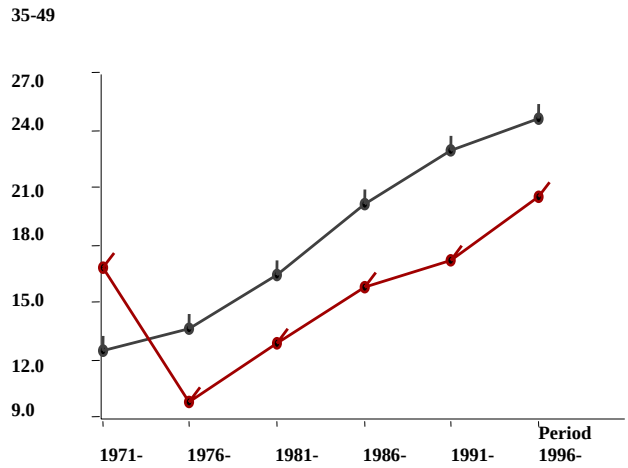
Males

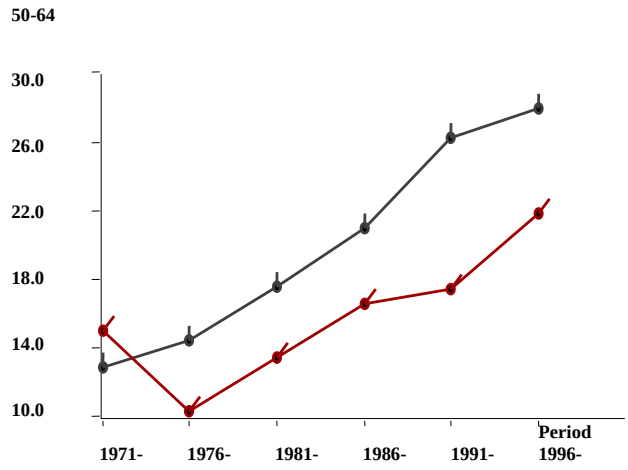






Females





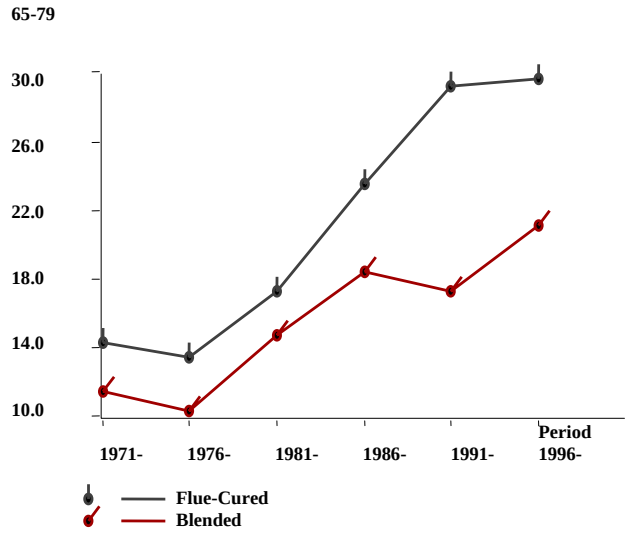
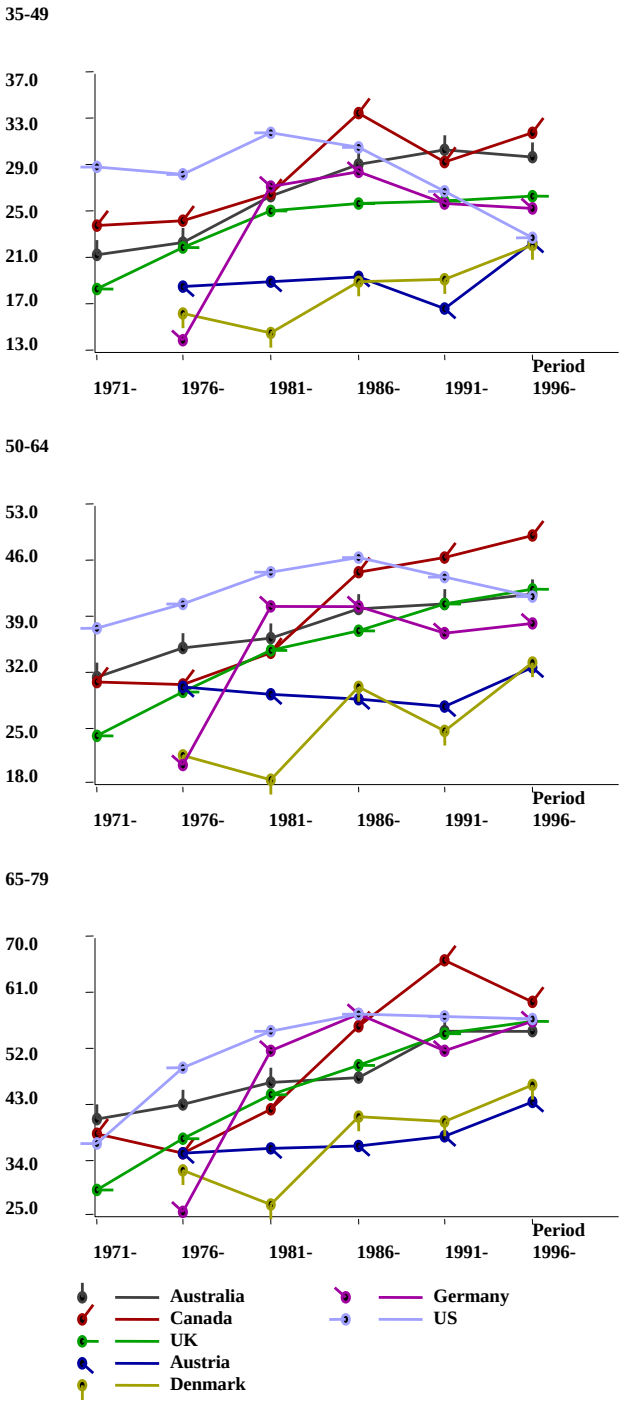
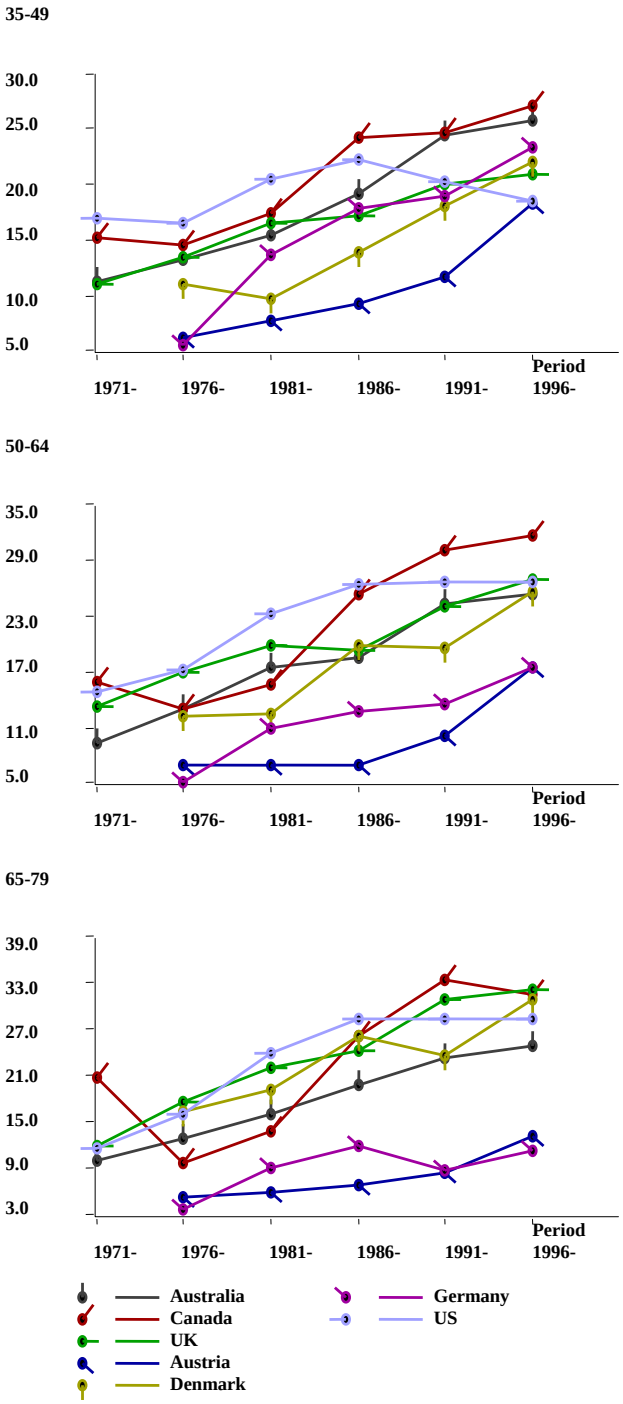


Figure 5/2
Prevalence of ex-smoking(%)
Comparison of the seven countries

Males



Females



6. National estimates of daily cigarette consumption per smoker

6.1 Derivation

As for current smoking prevalence, ISS2[3] presents tables of daily cigarette consumption per smoker by country, sex and age group for surveys published up to 1995, as well as details of the sources used and of the product to which each set of estimates is relevant. These were updated and will in due course appear on the website edition of ISS.

No tables of daily cigarette consumption per smoker appear in Supplement 1 to ISS2[9] or on IMASS, attention there being restricted to daily cigarette consumption per adult.

Estimates of daily cigarette consumption per smoker for age 35+ were made for each survey, regardless of product definition, provided its minimum age (or an age break) was between 25 and 50, and its maximum age was at least 64. These were based on all estimates for all age groups wholly included in the age range 35+, as well as on the estimate for any age group overlapping the age 35 (e.g. 30-39), providing the lower limit of this age group was at least 25. Consumption was assumed constant over age within each age group, so that for a given year of age it could be estimated from the age group containing that year. For each selected survey the estimate of daily cigarette consumption per smoker for age 35+ was then calculated by population weighting based on all available single year of age estimates in that broad age range. Finally, estimates for a five year period were obtained by simple averaging of the results for all the surveys conducted in that period.

6.2 Differences between countries

The data on daily cigarette consumption per smoker are presented in Table 6/1 and plotted in Figure 6/1 and Figure 6/2. Unlike the mortality rates and the prevalences of current and ex smoking the data are not by age, being estimates for the combined age group 35+. It should be noted that data for Austria are only available for three of the periods (1981-85, 1991-95, 1996-

2000) so the blended means are sometimes based on three countries and sometimes on four.

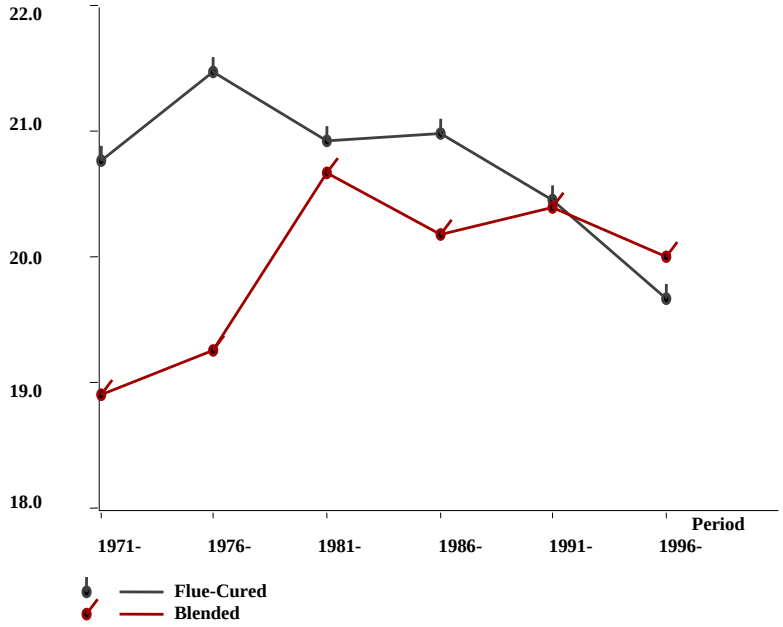
Though none of the flue-cured/blended differences are statistically significant (at $p<0.05$), the general tendency is for daily cigarette consumption to be somewhat higher in the flue-cured countries, although generally highest in the US. The variations over time and between country are much less than seen for the other smoking statistics or the mortality rates, with daily cigarette consumption per smoker being typically about 20 in males and about 16 in females. There has been some evidence of a decline in the UK and US in both sexes, of an increase in Denmark in both sexes, and of an increase in Australia and Germany in females.

Table 6/1
Cigarettes per smoker per day (age 35+)

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean
Males									
1971-75	21.25	19.50	21.58	20.78	-	12.95	19.50	24.26	18.90
1976-80	21.66	21.26	21.55	21.49	-	14.75	18.86	24.21	19.27
1981-85	21.73	20.97	20.12	20.94	21.77	15.95	21.07	23.88	20.67
1986-90	21.27	21.71	20.00	20.99	-	16.96	20.30	23.27	20.18
1991-95	21.59	21.34	18.45	20.46	20.96	18.18	19.99	22.51	20.41
1996-2000	21.19	20.45	17.39	19.68	21.22	18.55	19.03	21.21	20.00
Females									
1971-75	17.30	16.32	15.16	16.26	-	10.91	12.20	19.80	14.30
1976-80	17.08	17.70	16.34	17.04	-	11.97	14.34	18.90	15.07
1981-85	17.19	17.69	16.22	17.03	14.66	13.26	15.23	19.34	15.62
1986-90	17.94	18.01	16.27	17.41	-	13.82	15.24	18.61	15.89
1991-95	18.97	17.52	15.44	17.31	15.95	14.39	16.23	19.14	16.43
1996-2000	19.57	17.14	14.52	17.08	13.00	14.62	15.35	17.56	15.13

Figure 6/1
Cigarettes per smoker per day (age 35+)
Flue-cured versus Blended Cigarettes

Males



Females

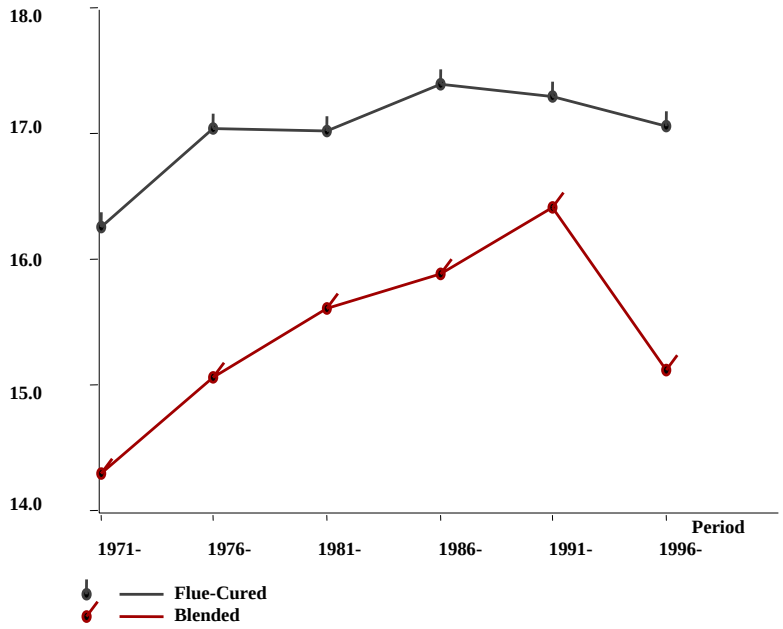
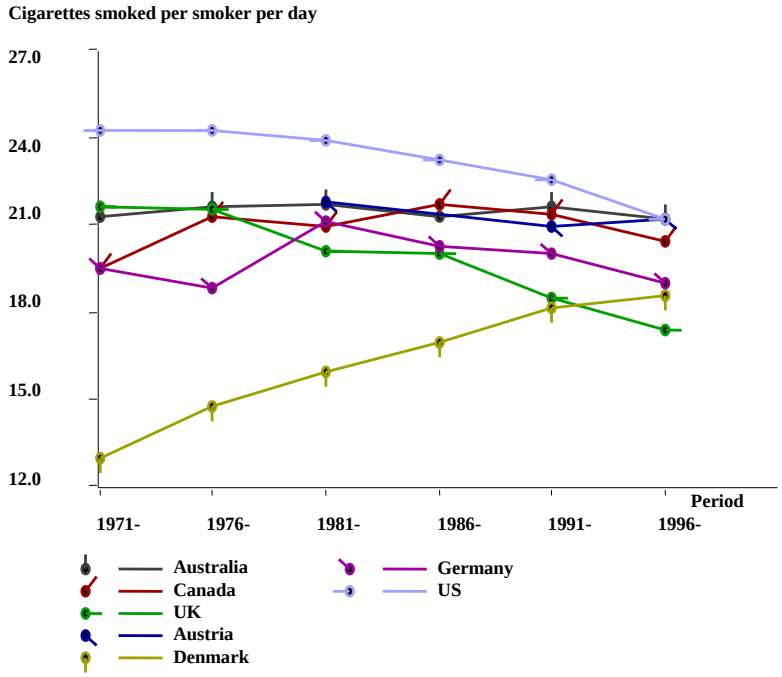
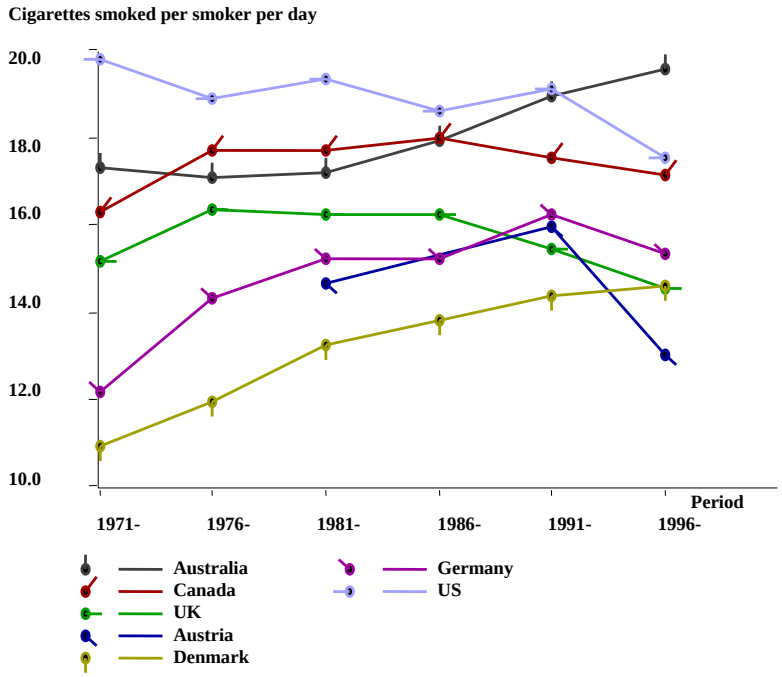


Figure 6/2
Cigarettes per smoker per day (age 35+)
Comparison of the seven countries

Males



Females



7. Relative risk estimates of current and ex-smoking for lung cancer, IHD and COPD based on all available epidemiological data for the countries of interest

7.1 Lung cancer

Based on the data recorded for the IESLC project [4,5] (which concerned all lung cancer studies with over 100 cases published by the year 2000) 80 estimates of the current vs never smoking relative risk and 80 estimates of the ex-smoking vs never relative risk were identified relevant to the countries of interest. These estimates were all sex-specific, not by amount smoked and for all lung cancer types and all ages combined. The distribution of estimates by country, sex, period, product smoked and denominator was as follows:

Factor/level	Current smoker	Ex-smoker
Flue-cured		
Australia	1	1
Canada	5	5
UK	16	15
Total	22	21
Blended		
Austria	1	1
Denmark	1	3
Netherlands	1	1
Germany	5	6
US	50	48
Total	58	59
Sex		
Male	47	47
Female	33	33
Period		
1970-79	18	16
1980-89	45	49
1990-99	17	15
Product smoked		
All/unspecified	13	21
Cigarettes ± pipes or cigars	57	52
Cigarettes only	10	7
Denominator		
Never smoked	49	49
Never smoked cigarettes	31	31

It can be seen that, with the exception of the US and UK, data for most of the countries considered are quite limited. It can also be seen that there was a higher proportion of estimates for males (59%) than for females (41%). Over half the estimates related to the period 1980-1989, and the majority to cigarette smoking regardless of whether pipes or cigars were smoked and compared to those who had never smoked any product.

Fixed-effects meta-analysis of the total data using inverse-weighted regression analysis gave the following results.

Comparison	Relative risk (95% CI)	Heterogeneity chisquared (df)
Current vs never smoking	10.93 (10.57-11.30)	794.37 (79)
Ex- vs never smoking	5.95 (5.72-6.19)	662.17 (79)

It was clear that the estimates had considerable heterogeneity and models were fitted in an attempt to explain this involving the factors period, sex, smoking product, denominator and country. For both current and ex-smoking there was a clear effect of period, with inclusion of the factor reducing the heterogeneity chisquared for current smoking by 183.13 on 2 d.f. and for ex-smoking by 107.48 on 2 d.f., both reductions being highly significant ($p<0.001$). (Significance was tested using F test based on the ratio of the drop in deviance per d.f. to the residual deviance per d.f.) This suggests that period ought to be taken into account in our later analyses.

For both current and ex-smokers, there was no real evidence of any difference in estimates by sex or by the denominator of the relative risk. There was some tendency for both data sets for relative risks to be higher if the estimates for smoking product were for “cigarette smoking ± pipes or cigars” than if they were for “cigarette only” or for “all/unspecified”. However, for neither current smokers nor ex-smokers was the difference statistically significant using the approximate F test.

Variation in relative risk by age was not considered in these analyses, as previous work has shown that this is not marked.[10] Other workers (e.g.[11]) attempting to quantify lung cancer deaths due to smoking have usually used a relative risk not taking age into account.

For the purposes of the analyses described in section 9, attention was restricted to the following set of six estimates above by time period.

Comparison	Time period	Relative risk (95% CI)	
Current vs never smoking	1970-1979	6.74	(6.23-7.28)
	1980-1989	12.39	(11.88-12.93)
	1990-1999	11.47	(10.64-12.36)
Ex- vs never smoking	1970-1979	3.47	(3.08-3.92)
	1980-1989	6.56	(6.28-6.85)
	1990-1999	4.72	(4.15-5.35)

(Note that the three time periods cover the time period 1970-1999, slightly different from the 1971-2000 period used for the national mortality and smoking data. This minor difference will be ignored and the 1970-1979 relative risk taken to apply to the periods 1971-75 and 1976-80 and so on.)

The regression analyses conducted included a test of the effect of flue-cured vs blended adjusted for period, sex, smoking product and denominator. For both current smokers and ex-smokers, the estimate was somewhat higher for blended than for flue-cured, by a factor of 1.19 for current smokers and by a factor of 1.34 for ex-smokers. However, in both cases the effect was far from significant using the approximate F test.

Further details of all the regression analyses, including the individual study estimates used, are available on request.

7.2 IHD

Whereas for lung cancer and COPD previous work had already been carried out to collect relevant data, this was not the case for IHD. Appendix 7/1 describes analyses carried out using a database of 204 relative risks for ever smokers, current smokers or ex-smokers derived from an extensive literature search and, where necessary, derivation of appropriate risk estimates from the data reported. The relative risks were both sex- and age-specific, initial analyses of data from some very large data sets revealing a strong tendency for relative risks to decline with increasing age. For both current and ex-smokers, the largest effects were over different periods of study and different ages. After adjustment for age there was some evidence that relative risk estimates were higher for females, though this was only significant ($p \cong 0.01$) for current smokers (females vs males, RR = 1.15) and not for ex-smokers (females vs males, RR = 1.11). There was no clear evidence that age-adjusted risks varied for fatal and non-fatal IHD or between prospective and case-control studies.

After adjustment for five year age group, sex, period of study and fatality of IHD there was some evidence that risk estimates from countries where flue-cured cigarettes were smoked were higher than those where blended cigarettes were smoked but the difference was not great (RR = 1.14 for current smokers, RR = 1.03 for ex-smokers) and was only significant for current smokers.

The analyses described above used all the available relative risks on the database, including some that were less relevant to their intended use in section 9 when estimating national mortality rates by smoking habit. Accordingly, some further analyses were carried out in which attention was restricted to the period from 1970 and the age range 35-79, with results from the Netherlands and for combined sexes excluded. This left 60 estimates for current smokers and 30 for ex-smokers. The distribution of relative risks by country and various factors was as follows:

Factor/level	Current smoker	Ex-smoker
Flue-cured		
Australia	3	3
Canada	3	3
UK	10	10
Total	16	16
Blended		
Austria	0	0
Denmark	2	2
Germany	3	0
US	39	12
Total	44	14
Age group		
35-49	16	7
50-64	21	9
65-79	23	14
Period		
1970-1979	19	10
1980-1989	34	13
1990+	7	7
Sex		
Male	33	47
Female	27	33
IHD type		
Fatal	40	17
Non fatal	10	8
Both	10	5
Study type		
Prospective	47	22
Case-control	13	8

Inverse-variance weighted regression analysis for current smokers showed substantial heterogeneity between the estimates (deviance = 821.35 on 59 d.f.). The greatest contributor to this was variation by age group ($p<0.001$), explaining 56% of the deviance. After adjustment for age, period ($p<0.01$) and sex ($p<0.001$) had smaller effects though still significant. Based on a model involving these three factors, estimated relative risks were as follows:

		Age group		
Sex	Period	35-49	50-64	65-79
Males	1970-1979	2.85	2.23	1.47
	1980-1989	3.37	2.64	1.74
	1990+	3.03	2.37	1.56
Females	1970-1979	3.48	2.73	1.79
	1980-1989	4.11	3.22	2.12
	1990+	3.70	2.90	1.91

Although the inclusion of these three factors had reduced the deviance substantially, to 240.01 on 54 d.f., it was still substantial. Additional analysis showed that there was still a clear effect of age within age group (with the midpoint of the age group of the relative risk entered as a single parameter), with risk declining with increasing age ($p<0.001$), but no other factor clearly contributed to the deviance. It was decided that, for the purposes of the analyses in section 10, it was sufficient to use the above table of estimates.

In an analysis adjusted for the effects of age group, period and sex, there was a tendency for risk to be higher for the countries using flue-cured cigarettes with risk higher by a factor of 1.18 ($p<0.01$). To a considerable extent, though, this comparison is of UK vs US, as these two countries provided 49 of the total of 60 estimates (82%).

Similar analyses were carried out for ex-smokers. Although the relative risks were much less elevated and the effects of age and sex were less clear, they were still in the same direction (reducing with increasing age, higher in females) and it was decided to use results from an equivalent model to that used for current smokers when conducting the analyses in section 10. The estimated relative risks were as follows:

		Age group		
Sex	Period	35-49	50-64	65-79
Males	1970-1979	1.97	1.60	1.25
	1980-1989	1.50	1.22	0.95
	1990+	1.44	1.17	0.91
Females	1970-1979	2.16	1.75	1.37
	1980-1989	1.65	1.33	1.04
	1990+	1.58	1.28	1.00

In an analysis adjusted for the effects of age group, period and sex, there was no marked difference between relative risks from countries using flue-cured and blended cigarettes (flue-cured vs blended RR = 0.97).

Fuller details of these regression analyses are available on request.

7.3 COPD

Based partly on a COPD database Alison Thornton had prepared earlier for COPD, and partly on additional literature searches, 12 studies were identified that provided relative risk estimates for current (vs. never) smoking for the countries of interest, of which eleven also provided relative risk estimates for ex-smoking. Eight of these studies were conducted in the US, three in the UK and one in Denmark. Most of the studies provided information separately for males and females. There was no significant variation in current or ex-smoker relative risk by country or sex, but there was a tendency for older studies to produce lower estimates. As the older studies generally related to deaths occurring before 1971, the starting period for our analysis, it seems appropriate to use the estimates based on the six more recent studies [12-17] for the purposes of the analyses described in section 10. The relevant meta-analyses based on 11 sex-specific estimates for current smoking and on 10 for ex-smoking, can be summarized as follows:

Comparison	Relative risk 95% CI)	Heterogeneity chisquared (df)
Current vs never smoking	11.59 (10.05-13.37)	9.06 (10)
Ex- vs never smoking	7.05 (5.97-8.32)	7.65 (9)

The estimates that were meta-analysed were for all ages. One of the studies (CPSII [15]) presented data suggesting that there is no marked variation in relative risk by age and that the estimates of 11.59 (current) and 7.05 (ex) will be taken to apply generally.

Given that the data came mainly from the US and that there are no data at all for Australia, Canada, Austria or Germany, they do not provide any useful light on the flue-cured/blended difference. However, they do not suggest any marked difference between the UK (flue-cured) and US or Denmark (blended).

Appendix 7/2 provides details of the studies included, and the relative risk estimates considered as well as presenting the results of the various meta-analyses conducted.

8. The EXCEL database

Attached to this report is a copy of the EXCEL database which contains all the derived estimates by sex, disease, period and five year age group.

The first sheet "Lung cancer males" contains data on mortality rates (per 100,000 per year) in rows 10-15, with five year period (1971-1975, … 1996-2000) varying by row. Five year age groups run across the page with results shown for ages 15-19, 20-24, 80-84, 85+ first, followed by overall mortality rates for age 15-85 with no population weights and then for age 15-85 with European standard weights. Within each age group, rates are shown in turn for each flue-cured country (Australia, Canada, UK) together with their mean, and then for each blended country (Austria, Denmark, Germany, Netherlands, US) together with their mean. (Note that results for Netherlands are included on the EXCEL database but have not been used in this report.)

In rows 17-22 are corresponding numbers of deaths, the format being similar to that for the rates except that means over flue-cured and blended countries are not shown and that no results are given for age 15-85 with European standard weighting.

Rows 24-29 contain data for percent current smokers in similar format. A drop-down in row 23 allows the user to select data for total cigarettes or for manufactured cigarettes. As noted in section 4, that for total cigarettes should be used. No means, or estimates for ages 15-85 combined are given. Data are complete except for some missing data for Netherlands (shown as 0).

Rows 31-36 contain data for percent ex-smokers. The drop-down in row 30 allows the user to select data for all products or for all cigarettes. As noted in section 5, that for all products should be used. No means or estimates for age 15-85 are given. Zero estimates generally imply missing data, certainly for the age range of 35-79, with which we are concerned. For this age range, data are not available at all for Netherlands, or for 1971-75 for Austria, Denmark and Germany.

Rows 38-44 contain data on daily cigarettes per smoker (CPS) for age 35+. The data are entered under each age group to which they apply. (The same data in a different format also appear in sheets “CPS males” and “CPS females”).

Finally, in rows 45-50 (current smokers) and rows 52-57 (ex-smokers), the relative risk estimates are included. They are not country specific, and for each age group are shown in the mean columns. Estimates for age 35-49 have been assumed to apply to earlier ages, and estimates for age 65-79 to higher ages.

The next sheet “Lung Cancer females” gives similar data for females. The following four sheets “COPD males”, “COPD females”, “IHD males” and “IHD females” are similarly laid out, the mortality rates, deaths and relative risks being for the appropriate cause, the smoking data being identical to that in the lung cancer sheets.

Sheet “Selection data” is merely used to make the drop-downs referred to above work.

Sheet “Pop weightings” shows the European standard weightings used by age, as well as the World Standard weightings which are not used.

9. Indices of relative cigarette effect

9.1 Unadjusted for cigarette consumption

As described in section 2.5, mortality rates in the seven countries were compared after adjustment for the prevalence of current and ex-smoking. Using the estimated prevalence of current and ex-smoking for each country and a common estimate of the relative risk for current and ex-smoking, estimates were made for each country of an index of relative cigarette effect, F. Values of F above 1 suggest that the common relative risk estimates underestimate the true relative risk estimates in that country, while values below 1 indicate that they overestimate it. The F values were calculated for each country, disease, five year age group and five year period, separately for males and females. As previously, the tables and figures are based on results for 15 year age groups.

Tables 9/1L, 9/1H and 9/1C tabulate the F factors for lung cancer, IHD and COPD respectively by sex, broad age group and period. Figures 9/1L, 9/1H and 9/1C plot the mean F values for the flue-cured countries combined and for the blended countries combined, while Figures 9/2L, 9/2H and 9/2C plot the F values for each country individually. Note that because of the lack of ex-smoking prevalence data for Austria, Denmark and Germany for 1971-1975, no F values could be calculated for these countries in this period. As a result of this, the mean for the blended countries combined for 1971-1975 is actually only for the US. A more consistent comparison is obtained by limiting attention to the periods starting with 1976-1980.

For lung cancer the only significant difference ($p<0.05$) between flue-cured and blended is for males aged 35-49 in the latest period, 1996-2000. Here F values are 1.50 in the US and 1.19, 1.14 and 0.92 in Austria, Germany and Denmark, the other three blended countries, as compared to 0.93, 0.75 and 0.56 in Canada, UK and Australia, the flue-cured countries. It is interesting to compare the F values in Table 9/1L men in this age group and period with the rates in Table 3/1L, bearing in mind the current and ex-smoking prevalences shown in Tables 4/1 and 5/1. Austria and Germany had higher rates than the US; but their F values are lower, mainly because current smoking prevalence

is substantially higher in Austria and Germany than the US. The US had a rate 1.98 times higher than that of Australia. However adjustment for smoking has not explained this difference. Rather, since the two countries have similar current smoking prevalence and Australia has a somewhat higher ex-smoking prevalence it has increased the difference, with the F value for the US higher by a factor 2.68.

The high lung cancer F values for the US are evident generally for both sexes, with the exception of the earlier periods for age 65-79 in men. Generally, the impression gained from inspection of Table 9/1L is that there are substantial differences between countries which are unexplained by differences in prevalence of current and ex-smoking, and are not readily explained in terms of flue-cured and blended difference. The most notable differences between countries are the generally low F values in Australia and high F values in the US, and, in females, the low F values in Austria and Germany.

For IHD, Table 9/1H reveals a problem with the method in the shape of some negative F values, with one exception all in the age group 65-79. For age 65-79 there are substantial variations in rates, e.g. for 1996-2000 in males varying from 780.70 in Australia to 1129.36 in the UK. However relative risk estimates are quite low – for males only 1.56 for current smoking and 0.91 for ex-smoking – so that only a small proportion of the rate can be attributed to smoking. As a result, for countries with relatively low rates the observed rate is actually less than the estimated common rate for never smokers, so that the F value becomes negative. Clearly the assumption that there is no variation in the never smoker IHD rate between countries is inappropriate. Although we plot the F values for ages 35-49 and 50-64 where relative risks are higher, these results are also open to question. In any case they do not show any significant ($p<0.05$) differences between flue-cured and blended countries. Generally, for IHD, the substantial differences in rates between countries, particularly between those using blended cigarettes, are not explained by differences in current and ex-smoking prevalence. Indeed the differences are often more marked with the F factors, for example in females aged 35-49 in

recent years, IHD rates have been substantially higher in the US than in Austria, Denmark or Germany despite a lower prevalence of current smoking.

For COPD (see Table 9/1C), where relative risk estimates are much higher there is no problem with negative F values. However, there is no significant evidence of a difference between flue-cured and blended countries for any combination of sex, age and period. There are a number of patterns evident in Table 9/1C. One is the tendency for flue-cured countries to have somewhat higher F values on average at the beginning of the period studied, but somewhat lower F values on average at the end. Other include the generally low F values in Canada in both sexes, the high F values in UK males, the high F values in Australia except quite recently, the high F values in Demark in recent years in the older age groups, and the shift over time in the US in both sexes from a low to a high F value. But there seems nothing in the data to suggest any consistent flue-cured/blended difference.

9.2 Adjusted for cigarette consumption

As further described in section 2.5, the F values can be modified to take into account variation in daily cigarette consumption per smoker, producing what we refer to as G values.

Tables 9/2L, 9/2H and 9/2C tabulate the G values, while plots by cigarette type are shown in Figures 9/3L, 9/3H and 9/3C and plots by country in Figures 9/4L, 9/4H and 9/4C. Cigarette consumption data are also missing for Austria for 1976-1980 and 1986-1990. Thus while we also have estimates for the three flue-cured countries, we only have estimates for the US in 1971-1975, and for three countries in 1976-1980 and 1986-1990.

For lung cancer (Table 9/2L) the advantage of flue-cured over blended for males aged 35-49 for 1996-2000 is slightly strengthened after adjustment for cigarette consumption, so that now there is no overlap between the G values for the blended countries (1.41, 1.19, 1.12, 0.99) and those for the flue-cured countries (0.91, 0.86, 0.52). Also a near significant ($0.05<p<0.1$) difference in the same direction is seen for 1986-1990 and 1991-1995.

However the relatively minor differences between country in daily cigarette consumption per smoker, particularly in recent years, means that the conclusions to be drawn from the G values are not much different from those to be drawn from the F values. Certainly looking at the data as a whole there is no convincing evidence that rates differ between flue-cured and blended countries after adjustment for prevalence of current and ex-smoking and daily cigarette consumption.

For IHD (Table 9/2H) data are only shown for ages 35-49 and 50-64 due to the problem with negative values noted above, and the G values must be regarded as of doubtful worth for even these age groups. Certainly they show no evidence of a specific flue-cured/blended effect, but emphasise that differences between countries cannot be explained in terms of smoking.

For COPD (Table 9/2C) the data patterns described in section 9.1 for F values remain evident for G values, and again there is nothing in the data to suggest any consistent flue-cured blended difference.

Table 9/1L
Lung cancer F factors

Males

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	0.73	0.80	1.07	0.87	-	-	-	1.39	1.39
1976-80	0.75	0.93	1.12	0.93	1.07	0.61	0.99	1.50	1.04
1981-85	0.72	0.95	0.99	0.89	1.25	0.72	1.06	1.35	1.10
1986-90	0.69	0.96	0.82	0.82	1.35	0.78	1.08	1.33	1.13
1991-95	0.61	1.02	0.82	0.81	1.25	0.83	1.12	1.34	1.13
1996-2000	0.56	0.93	0.75	0.75	1.19	0.92	1.14	1.50	1.19 +
Age 50 - 64									
1971-75	0.82	0.77	1.29	0.96	-	-	-	1.09	1.09
1976-80	0.84	0.98	1.24	1.02	0.88	0.97	0.84	1.22	0.98
1981-85	0.86	0.97	1.08	0.97	1.06	0.98	0.89	1.17	1.03
1986-90	0.86	1.10	0.89	0.95	0.98	0.93	0.96	1.29	1.04
1991-95	0.79	1.10	0.85	0.91	0.96	0.90	1.06	1.36	1.07
1996-2000	0.71	1.03	0.84	0.86	1.19	0.83	1.08	1.33	1.11
Age 65 - 79									
1971-75	0.86	0.74	1.40	1.00	-	-	-	0.93	0.93
1976-80	0.87	0.84	1.32	1.01	0.95	1.08	0.98	0.91	0.98
1981-85	0.85	1.00	1.28	1.05	0.83	1.29	0.84	0.96	0.98
1986-90	0.95	1.09	1.15	1.06	0.83	1.11	0.80	1.06	0.95
1991-95	0.89	1.04	1.09	1.01	0.83	1.03	0.91	1.19	0.99
1996-2000	0.84	1.10	1.05	1.00	0.94	0.96	0.88	1.23	1.00

[1] Significant differences are coded as follows: +++ $p<0.001$, ++ $p<0.01$, + $p<0.05$, (+) $p<0.1$ where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Table 9/1L (continued)
Lung cancer F factors

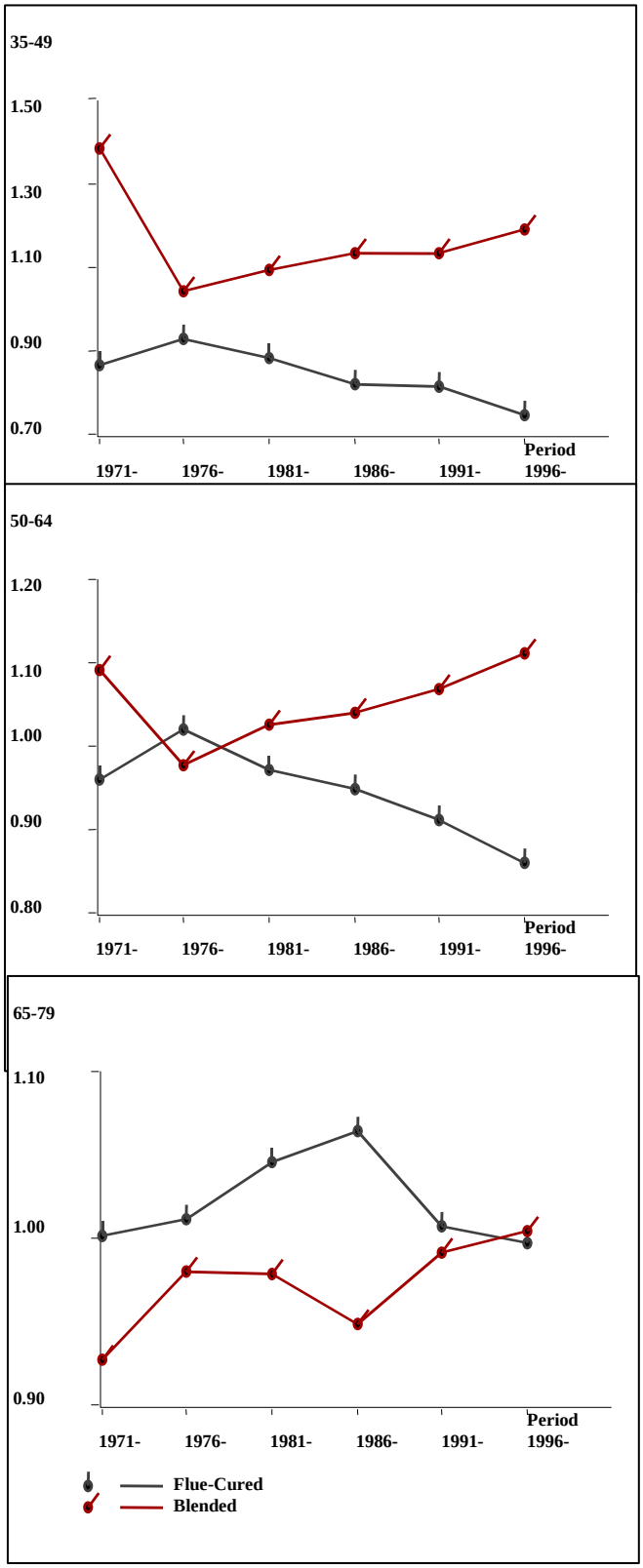
Females

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	0.49	0.78	1.04	0.77	-	-	-	1.61	1.61
1976-80	0.69	1.08	0.97	0.91	0.47	1.24	0.24	1.69	0.91
1981-85	0.71	1.30	0.90	0.97	0.47	1.16	0.48	1.58	0.92
1986-90	0.93	1.29	0.74	0.99	0.64	1.12	0.67	1.47	0.98
1991-95	0.57	1.52	0.71	0.93	0.83	1.15	0.82	1.33	1.03
1996-2000	0.56	1.55	0.72	0.94	0.84	1.06	0.87	1.42	1.05
Age 50 - 64									
1971-75	0.61	0.75	1.21	0.86	-	-	-	1.31	1.31
1976-80	0.71	1.00	1.27	1.00	0.60	0.99	0.13	1.55	0.82
1981-85	0.78	1.12	1.00	0.97	0.38	1.15	0.41	1.53	0.87
1986-90	0.73	1.19	0.88	0.94	0.71	1.07	0.38	1.58	0.94
1991-95	0.73	1.27	0.75	0.92	0.45	1.24	0.47	1.57	0.93
1996-2000	0.78	1.35	0.78	0.97	0.42	1.20	0.61	1.51	0.93
Age 65 - 79									
1971-75	0.55	0.67	1.39	0.87	-	-	-	1.27	1.27
1976-80	0.67	1.01	1.30	0.99	1.06	1.01	0.36	1.17	0.90
1981-85	0.89	1.11	1.08	1.03	1.16	0.89	0.49	1.23	0.94
1986-90	0.82	1.09	1.10	1.01	0.85	0.90	0.47	1.42	0.91
1991-95	0.83	1.08	1.03	0.98	0.37	1.02	0.49	1.53	0.85
1996-2000	0.78	1.20	0.96	0.98	0.32	1.10	0.40	1.55	0.84

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Figure 9/1L
Lung Cancer F factors
Flue-cured versus Blended Cigarettes

Males



Females

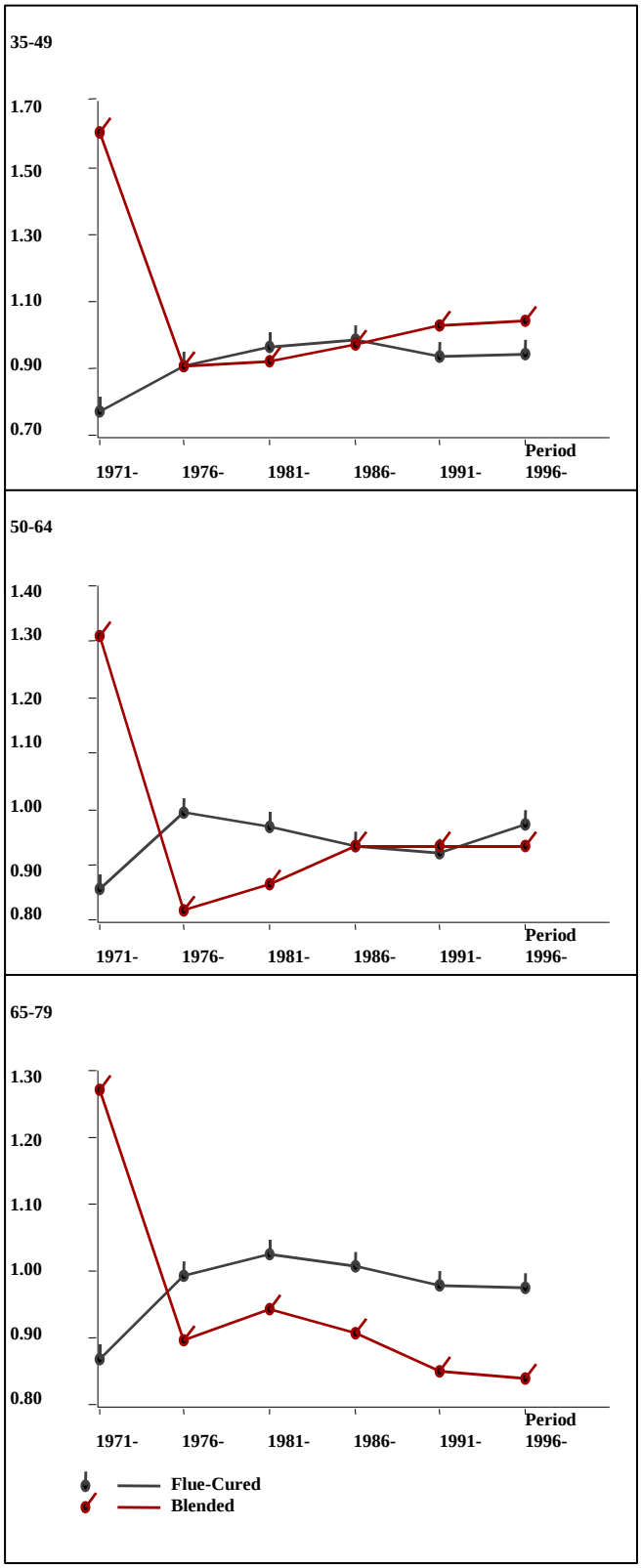
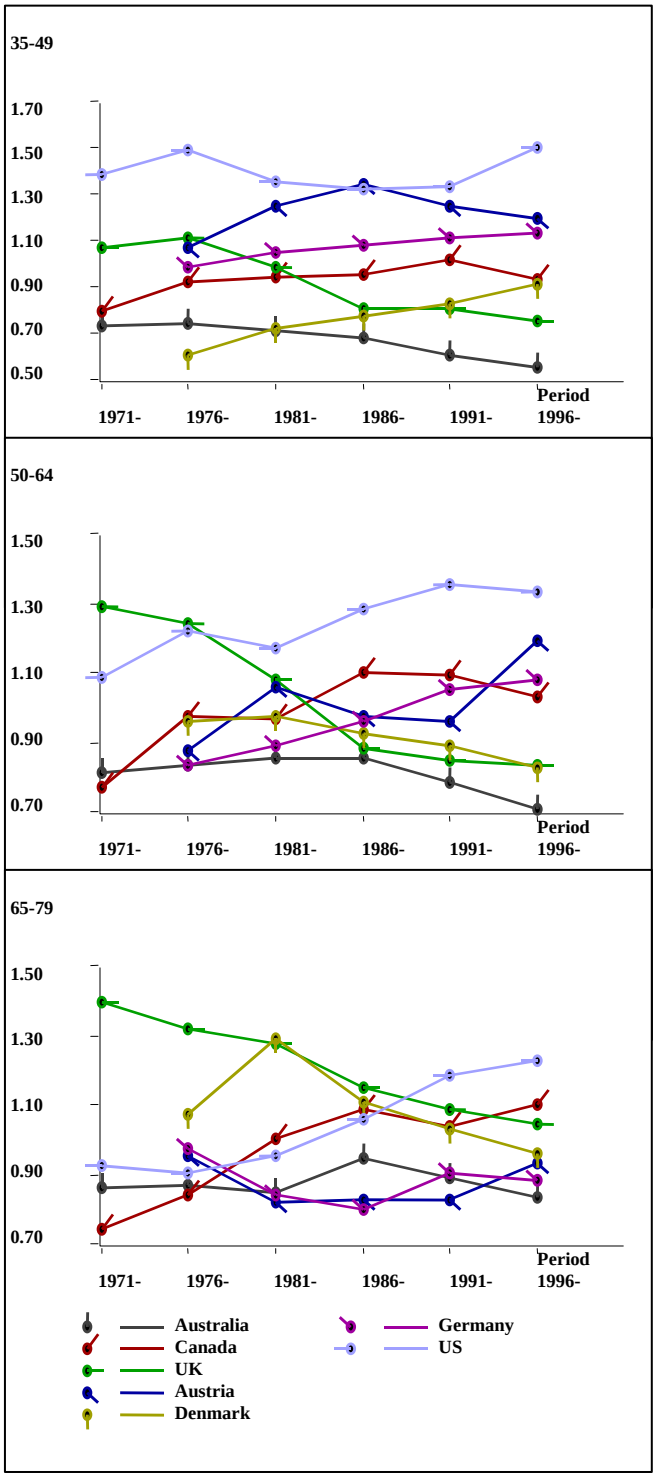


Figure 9/2L
Lung Cancer F factors
Comparison of the seven countries

Males



Females

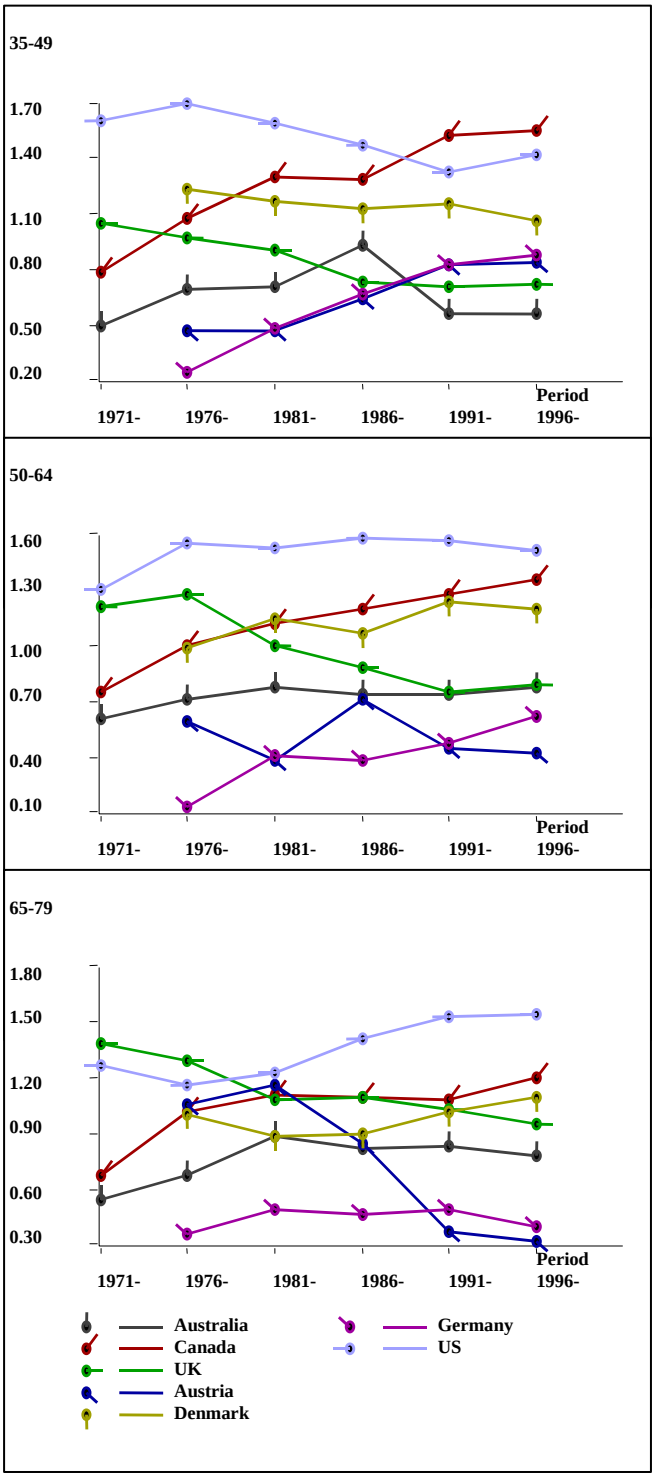


Table 9/1H
IHD F factors

Males

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	1.06	0.77	0.94	0.92	-	-	-	1.25	1.25
1976-80	1.24	1.17	1.44	1.28	0.64	0.62	0.41	1.37	0.76 (-)
1981-85	1.02	1.02	1.60	1.22	0.89	0.64	0.52	1.34	0.85
1986-90	1.20	0.91	1.57	1.23	0.85	0.66	0.51	1.43	0.86
1991-95	0.94	0.85	1.69	1.16	1.04	0.45	0.60	1.56	0.91
1996-2000	1.04	0.74	1.59	1.12	1.18	0.30	0.58	1.95	1.00
Age 50 - 64									
1971-75	1.24	0.75	0.83	0.94	-	-	-	1.23	1.23
1976-80	1.33	1.09	1.47	1.30	0.36	0.92	0.42	1.30	0.75
1981-85	1.09	0.83	1.79	1.24	0.64	0.88	0.60	1.12	0.81
1986-90	1.07	0.85	1.84	1.25	0.59	0.98	0.52	1.07	0.79
1991-95	0.70	0.74	2.08	1.17	0.79	0.81	0.51	1.33	0.86
1996-2000	0.42	0.75	2.12	1.09	1.33	0.25	0.53	1.92	1.01
Age 65 - 79									
1971-75	1.43	0.56	0.62	0.87	-	-	-	1.52	1.52
1976-80	1.71	0.98	1.52	1.40	-0.04	1.51	-0.07	1.27	0.66
1981-85	1.65	0.66	2.26	1.53	-0.25	1.69	0.15	0.83	0.61
1986-90	1.56	0.43	2.60	1.53	-0.12	1.64	0.22	0.09	0.46
1991-95	0.55	-2.30	5.39	1.21	0.07	1.57	-0.12	-1.59	-0.02
1996-2000	-2.65	-2.62	11.20	1.98	2.44	-0.03	0.46	-0.06	0.70

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Table 9/1H (continued)
IHD F factors

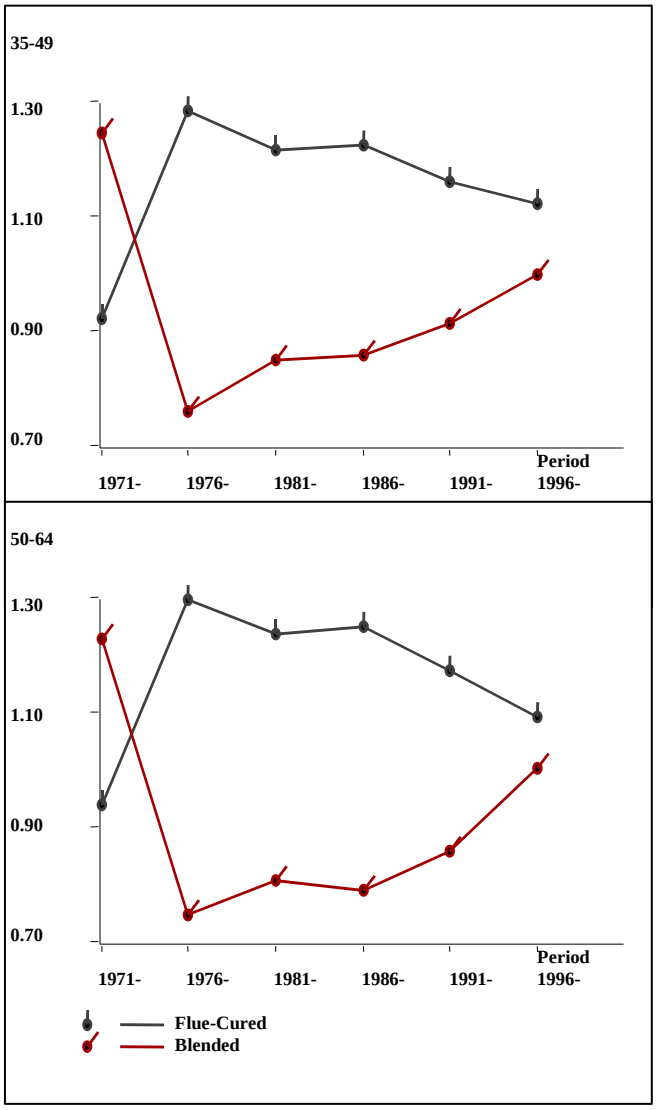
Females

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	1.64	0.49	0.49	0.87	-	-	-	1.57	1.57
1976-80	1.83	0.98	1.01	1.27	0.48	0.56	0.22	1.60	0.71
1981-85	1.52	0.84	1.09	1.15	1.05	0.54	0.38	1.68	0.91
1986-90	1.12	0.71	1.12	0.99	1.29	0.61	0.49	1.96	1.09
1991-95	0.85	0.70	1.21	0.92	1.33	0.40	0.54	2.30	1.14
1996-2000	0.86	0.60	1.20	0.89	1.22	0.35	0.63	2.64	1.21
Age 50 - 64									
1971-75	1.75	0.58	0.50	0.94	-	-	-	1.48	1.48
1976-80	1.90	0.94	1.17	1.33	0.09	0.54	-0.15	1.60	0.52
1981-85	1.63	0.81	1.43	1.29	0.26	0.59	0.27	1.59	0.68
1986-90	1.34	0.72	1.58	1.21	0.33	0.69	0.20	1.68	0.73
1991-95	0.82	0.63	1.62	1.02	0.82	0.61	0.17	2.02	0.90
1996-2000	0.37	0.65	1.53	0.85	1.28	0.20	0.29	2.86	1.16
Age 65 - 79									
1971-75	1.86	0.42	0.16	0.81	-	-	-	2.19	2.19
1976-80	2.10	1.20	1.23	1.51	-0.42	0.80	-1.69	1.45	0.03
1981-85	2.59	0.82	1.66	1.69	-1.39	0.88	-0.77	1.12	-0.04 -
1986-90	2.31	0.33	2.19	1.61	-0.56	0.75	-0.42	0.83	0.15
1991-95	1.32	-0.43	3.13	1.34	0.64	0.79	-0.71	0.76	0.37
1996-2000	-0.38	-0.41	3.04	0.75	1.88	0.17	0.25	2.12	1.10

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Figure 9/1H
IHD F factors
Flue-cured versus Blended Cigarettes

Males



Females

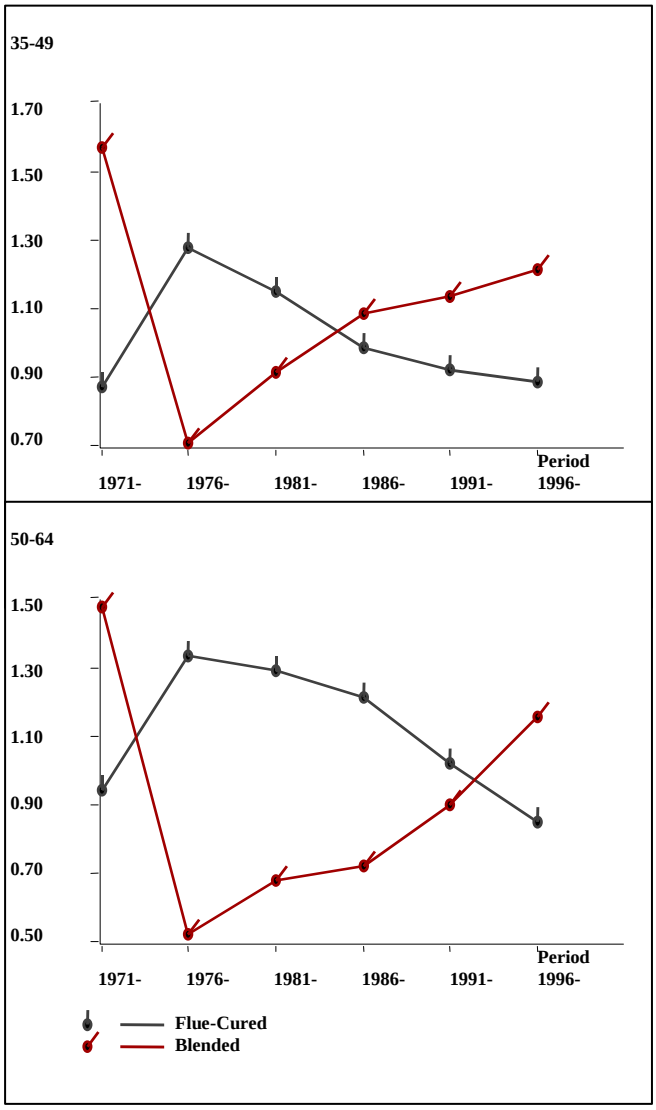
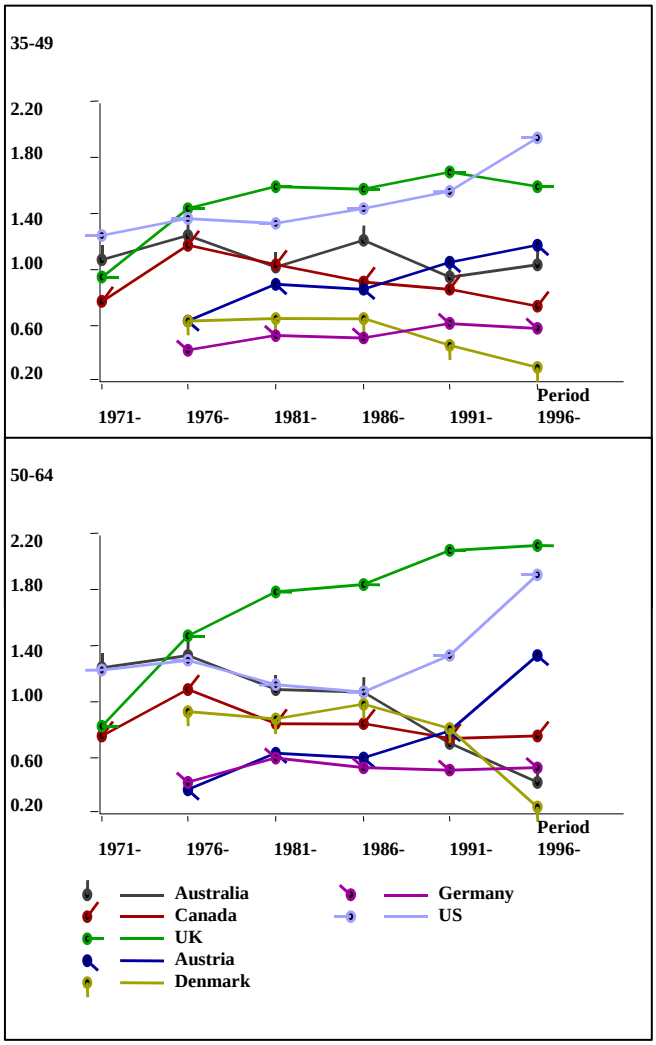


Figure 9/2H
IHD F factors
Comparison of the seven countries

Males



Females

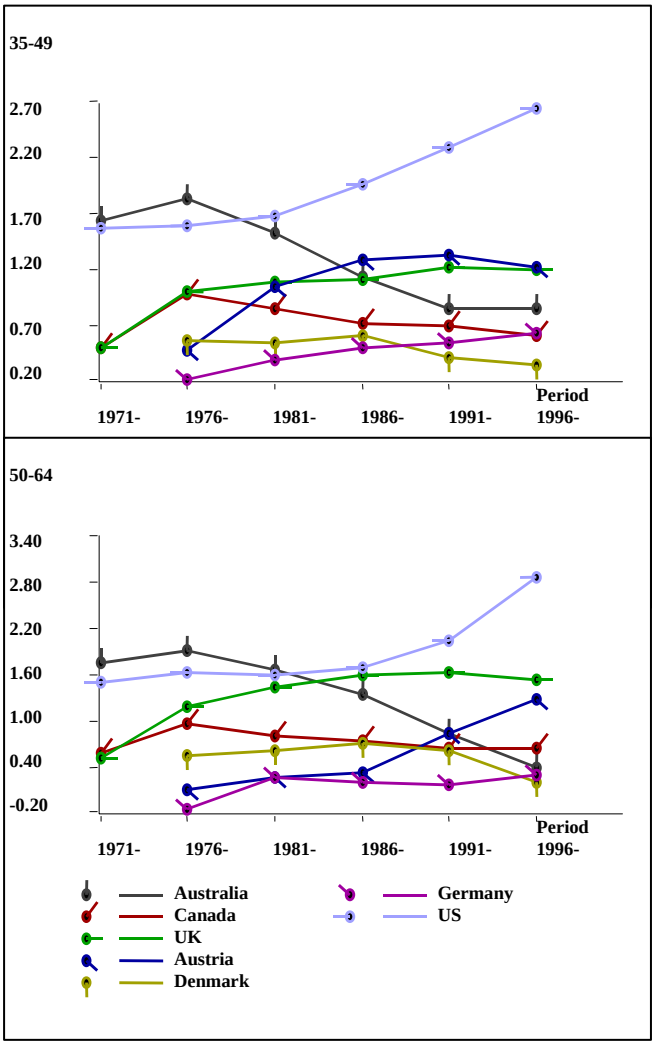


Table 9/1C
COPD F factors

Males

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	1.15	0.77	1.25	1.06	-	-	-	0.84	0.84
1976-80	1.22	0.76	1.29	1.09	0.98	0.93	1.07	0.77	0.94
1981-85	1.30	0.47	1.22	1.00	1.42	1.13	0.96	0.65	1.04
1986-90	1.60	0.51	1.22	1.11	1.07	0.87	0.81	1.02	0.94
1991-95	1.03	0.45	1.15	0.88	0.94	1.06	1.08	1.29	1.09
1996-2000	0.89	0.34	1.14	0.79	1.03	1.03	1.04	1.63	1.18
Age 50 - 64									
1971-75	1.20	0.65	1.33	1.06	-	-	-	0.81	0.81
1976-80	1.23	0.78	1.35	1.12	0.51	1.18	1.02	0.89	0.90
1981-85	1.21	0.56	1.31	1.03	0.82	1.23	0.97	0.90	0.98
1986-90	1.29	0.57	1.13	1.00	0.77	1.31	0.90	1.04	1.00
1991-95	1.13	0.54	1.13	0.93	0.74	1.17	1.04	1.27	1.05
1996-2000	0.94	0.44	1.22	0.87	0.92	1.03	1.01	1.47	1.11
Age 65 - 79									
1971-75	1.24	0.61	1.35	1.07	-	-	-	0.73	0.73
1976-80	1.36	0.78	1.36	1.17	0.52	0.92	1.20	0.82	0.87
1981-85	1.27	0.81	1.32	1.13	0.60	1.32	0.90	0.83	0.91
1986-90	1.39	0.82	1.25	1.15	0.58	1.26	0.81	0.90	0.89
1991-95	1.19	0.72	1.17	1.03	0.64	1.33	0.95	1.00	0.98
1996-2000	1.00	0.72	1.15	0.96	0.69	1.42	0.83	1.12	1.01

[1] Significant differences are coded as follows: +++ $p<0.001$, ++ $p<0.01$, + $p<0.05$, (+) $p<0.1$ where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Table 9/1C (continued)
COPD F factors

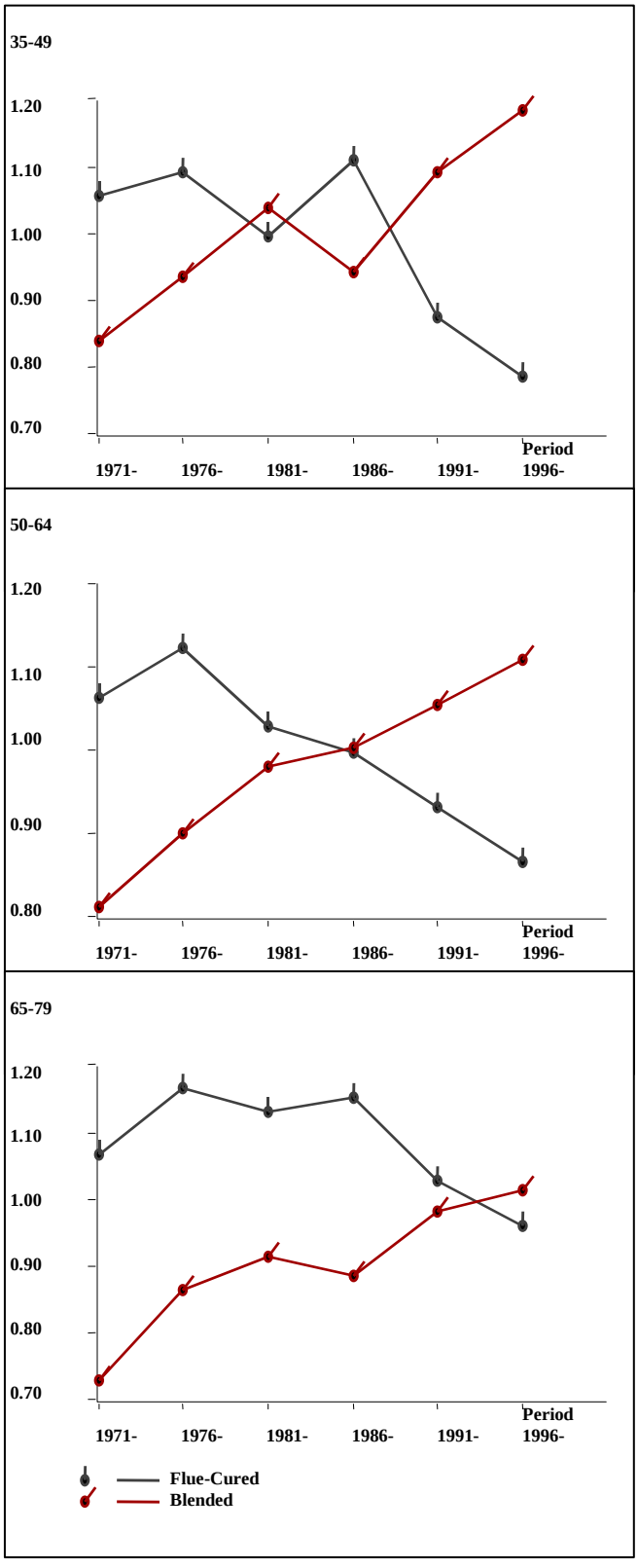
Females

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	1.52	0.60	1.10	1.07	-	-	-	0.83	0.83
1976-80	1.51	0.69	1.10	1.10	1.16	0.77	1.35	0.69	0.99
1981-85	1.67	0.45	1.11	1.08	1.00	0.93	1.26	0.76	0.99
1986-90	2.06	0.35	0.93	1.12	1.00	1.15	0.76	0.94	0.96
1991-95	1.44	0.50	1.13	1.02	0.84	0.70	0.94	1.61	1.02
1996-2000	1.23	0.36	1.15	0.91	0.39	1.17	0.81	2.07	1.11
Age 50 - 64									
1971-75	1.32	0.71	1.14	1.06	-	-	-	0.84	0.84
1976-80	1.34	0.64	1.14	1.04	0.87	1.09	0.98	0.85	0.95
1981-85	1.40	0.47	1.12	1.00	0.43	1.42	0.86	0.92	0.91
1986-90	1.42	0.40	1.02	0.95	0.51	1.50	0.52	1.08	0.90
1991-95	1.16	0.41	0.93	0.84	0.39	1.60	0.66	1.32	0.99
1996-2000	1.15	0.45	1.03	0.88	0.33	1.55	0.56	1.52	0.99
Age 65 - 79									
1971-75	1.14	0.66	1.27	1.02	-	-	-	0.85	0.85
1976-80	1.16	0.82	0.97	0.98	1.40	0.90	1.67	0.77	1.19
1981-85	1.48	0.71	0.88	1.02	1.35	1.00	1.09	0.97	1.10
1986-90	1.44	0.66	1.01	1.04	0.72	1.08	0.77	1.13	0.92
1991-95	1.25	0.54	0.99	0.93	0.35	1.41	0.95	1.17	0.97
1996-2000	0.96	0.54	0.96	0.82	0.14	1.73	0.55	1.24	0.91

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Figure 9/1C
COPD F factors
Flue-cured versus Blended Cigarettes

Males



Females

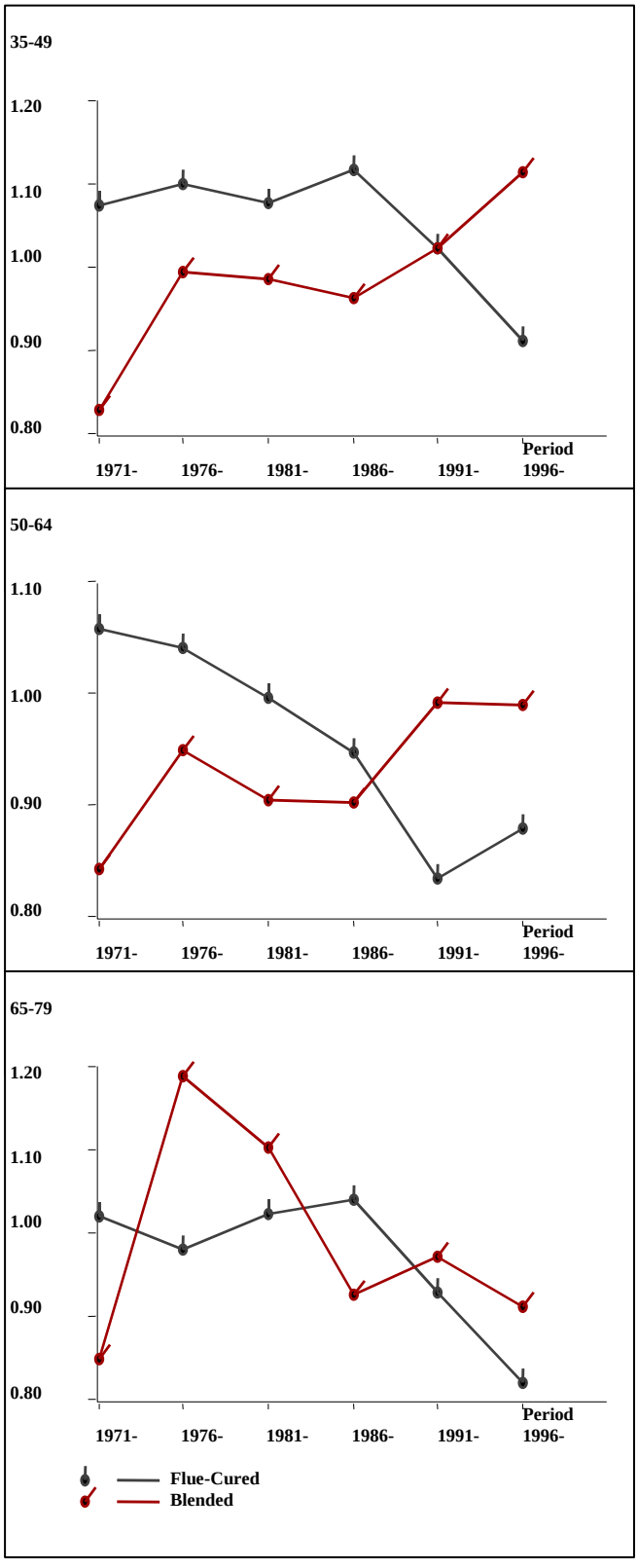
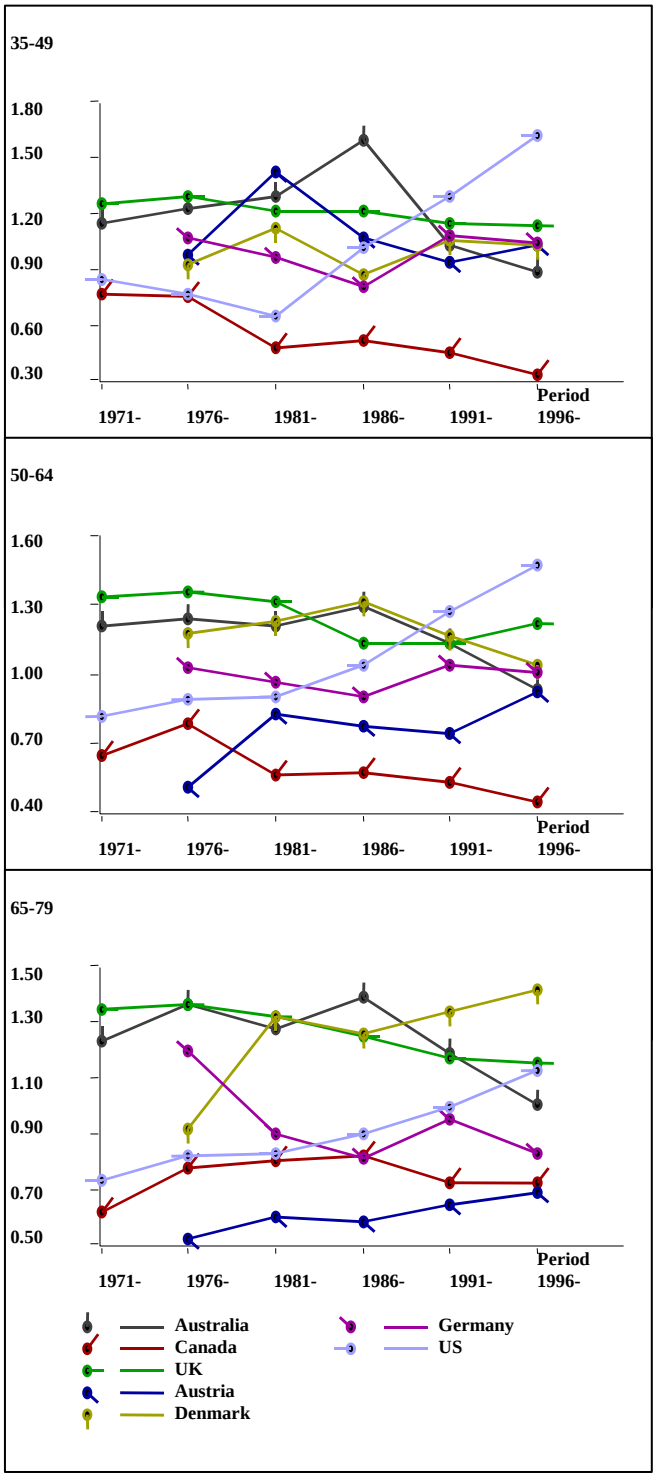


Figure 9/2C
COPD F factors
Comparison of the seven countries

Males



Females

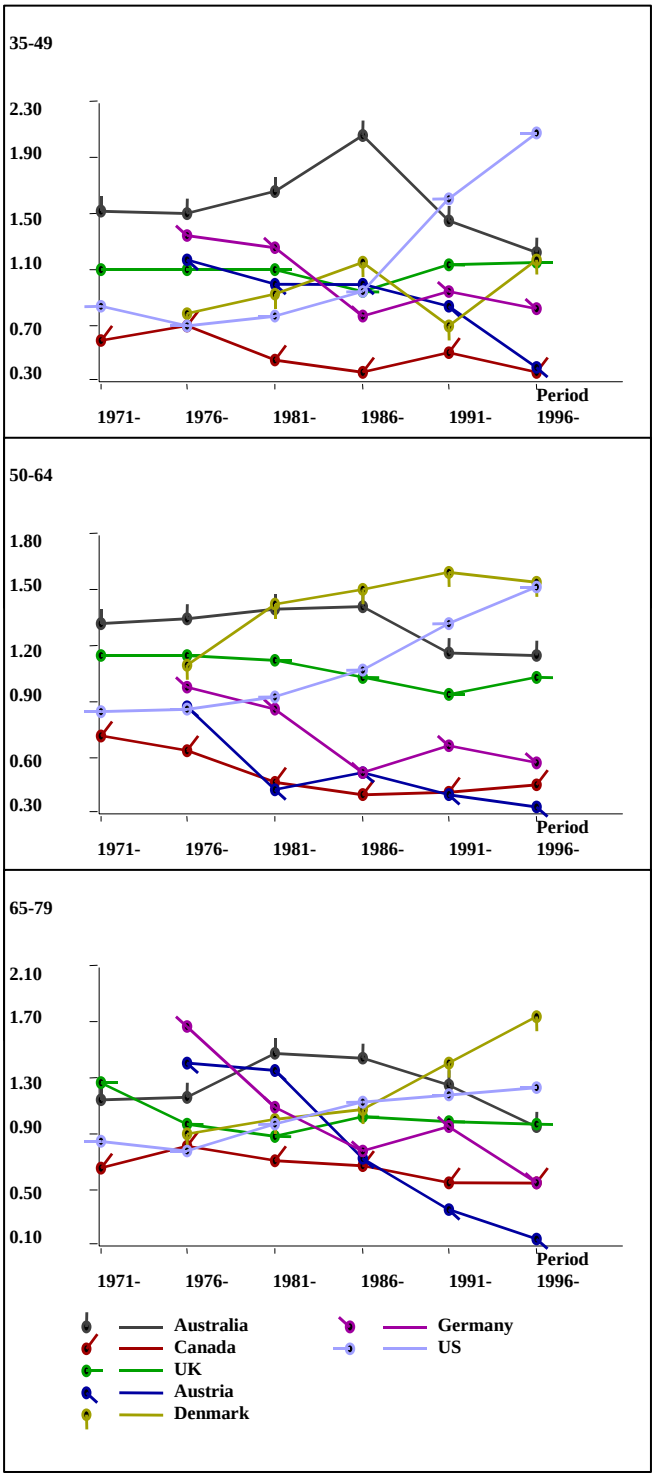


Table 9/2L
Lung cancer G factors

Males

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	0.75	0.88	1.08	0.90	-	-	-	1.24	1.24
1976-80	0.70	0.89	1.06	0.88	-	0.85	1.07	1.26	1.06
1981-85	0.69	0.94	1.02	0.88	1.20	0.94	1.04	1.18	1.09
1986-90	0.67	0.91	0.84	0.80	-	0.94	1.10	1.17	1.07 (+)
1991-95	0.57	0.98	0.90	0.82	1.22	0.93	1.14	1.21	1.13 (+)
1996-2000	0.52	0.91	0.86	0.76	1.12	0.99	1.19	1.41	1.17 +
Age 50 - 64									
1971-75	0.83	0.86	1.30	1.00	-	-	-	0.97	0.97
1976-80	0.79	0.94	1.18	0.97	-	1.33	0.90	1.03	1.09
1981-85	0.82	0.96	1.12	0.97	1.01	1.27	0.88	1.02	1.05
1986-90	0.83	1.04	0.91	0.93	-	1.13	0.98	1.14	1.08
1991-95	0.75	1.05	0.94	0.91	0.94	1.01	1.08	1.23	1.06
1996-2000	0.66	1.00	0.96	0.88	1.12	0.89	1.13	1.25	1.10
Age 65 - 79									
1971-75	0.88	0.82	1.40	1.04	-	-	-	0.83	0.83
1976-80	0.82	0.81	1.25	0.96	-	1.49	1.06	0.77	1.10
1981-85	0.81	1.00	1.32	1.04	0.79	1.68	0.83	0.83	1.03
1986-90	0.92	1.03	1.19	1.05	-	1.34	0.81	0.94	1.03
1991-95	0.84	1.00	1.21	1.02	0.81	1.16	0.93	1.08	1.00
1996-2000	0.79	1.07	1.20	1.02	0.88	1.03	0.92	1.15	1.00

[1] Significant differences are coded as follows: +++ $p<0.001$, ++ $p<0.01$, + $p<0.05$, (+) $p<0.1$ where Blended > Flue-cured.
Minus signs are shown where Blended < Flue-cured.

Table 9/2L (continued)
Lung cancer G factors

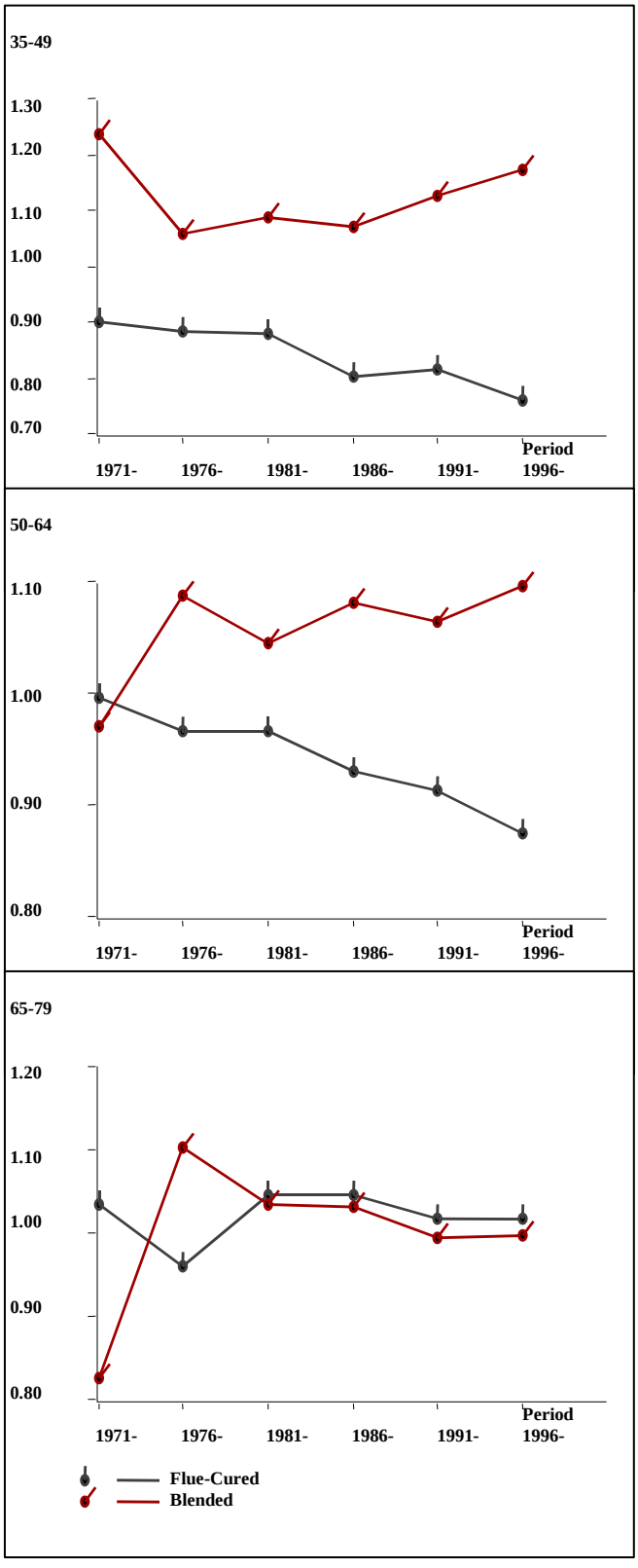
Females

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	0.49	0.82	1.18	0.83	-	-	-	1.39	1.39
1976-80	0.65	0.98	0.95	0.86	-	1.66	0.27	1.43	1.12
1981-85	0.67	1.19	0.90	0.92	0.51	1.43	0.51	1.33	0.94
1986-90	0.86	1.19	0.76	0.94	-	1.36	0.73	1.31	1.13
1991-95	0.50	1.46	0.77	0.91	0.87	1.35	0.85	1.16	1.06
1996-2000	0.46	1.45	0.79	0.90	1.03	1.15	0.91	1.29	1.09
Age 50 - 64									
1971-75	0.61	0.79	1.37	0.92	-	-	-	1.13	1.13
1976-80	0.67	0.91	1.25	0.94	-	1.33	0.14	1.32	0.93
1981-85	0.74	1.03	1.00	0.92	0.42	1.40	0.43	1.29	0.89
1986-90	0.68	1.10	0.90	0.89	-	1.29	0.42	1.41	1.04
1991-95	0.65	1.22	0.82	0.90	0.47	1.45	0.49	1.37	0.95
1996-2000	0.63	1.26	0.86	0.92	0.51	1.31	0.64	1.38	0.96
Age 65 - 79									
1971-75	0.54	0.71	1.57	0.94	-	-	-	1.10	1.10
1976-80	0.63	0.92	1.27	0.94	-	1.35	0.40	0.99	0.91
1981-85	0.84	1.01	1.08	0.98	1.28	1.09	0.53	1.03	0.98
1986-90	0.77	1.01	1.13	0.97	-	1.08	0.51	1.27	0.95
1991-95	0.74	1.04	1.12	0.96	0.39	1.19	0.51	1.35	0.86
1996-2000	0.63	1.12	1.05	0.93	0.39	1.20	0.41	1.41	0.85

[1] Significant differences are coded as follows: +++ $p<0.001$, ++ $p<0.01$, + $p<0.05$, (+) $p<0.1$ where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Figure 9/3L
Lung Cancer G factors
Flue-cured versus Blended Cigarettes

Males



Females

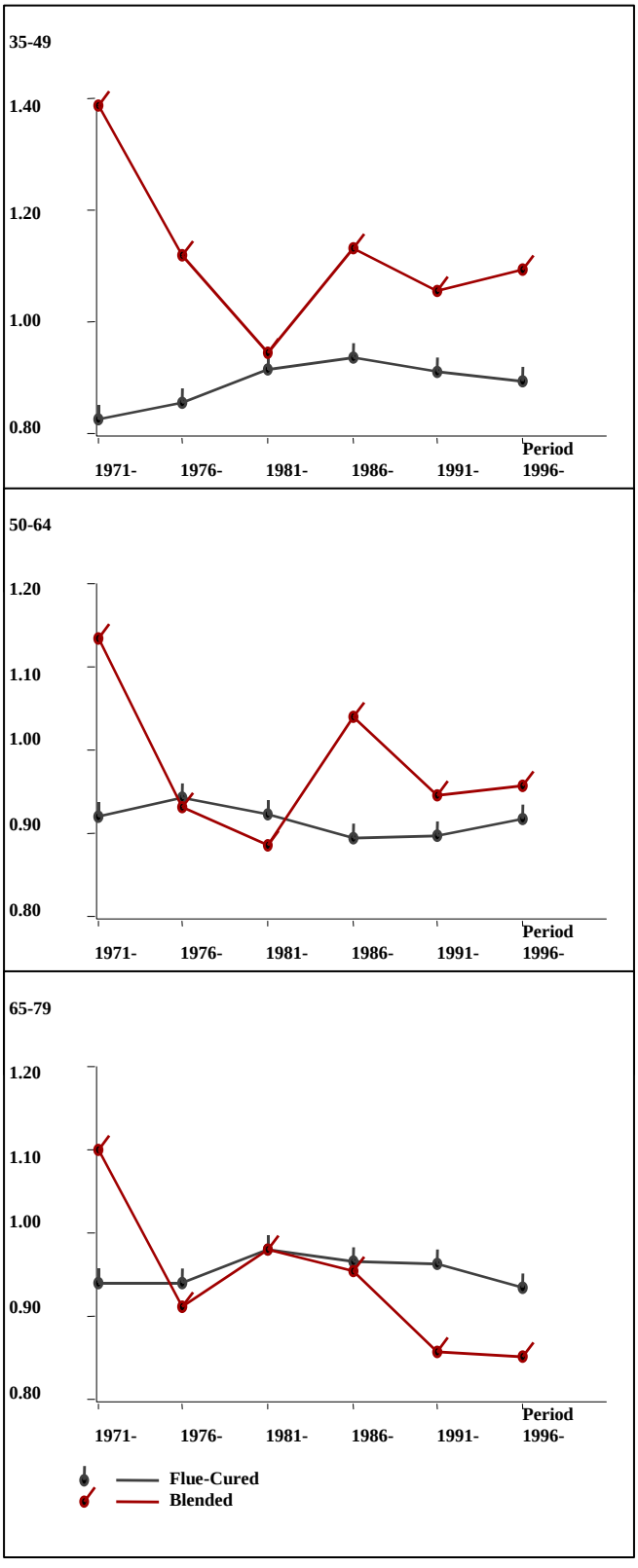
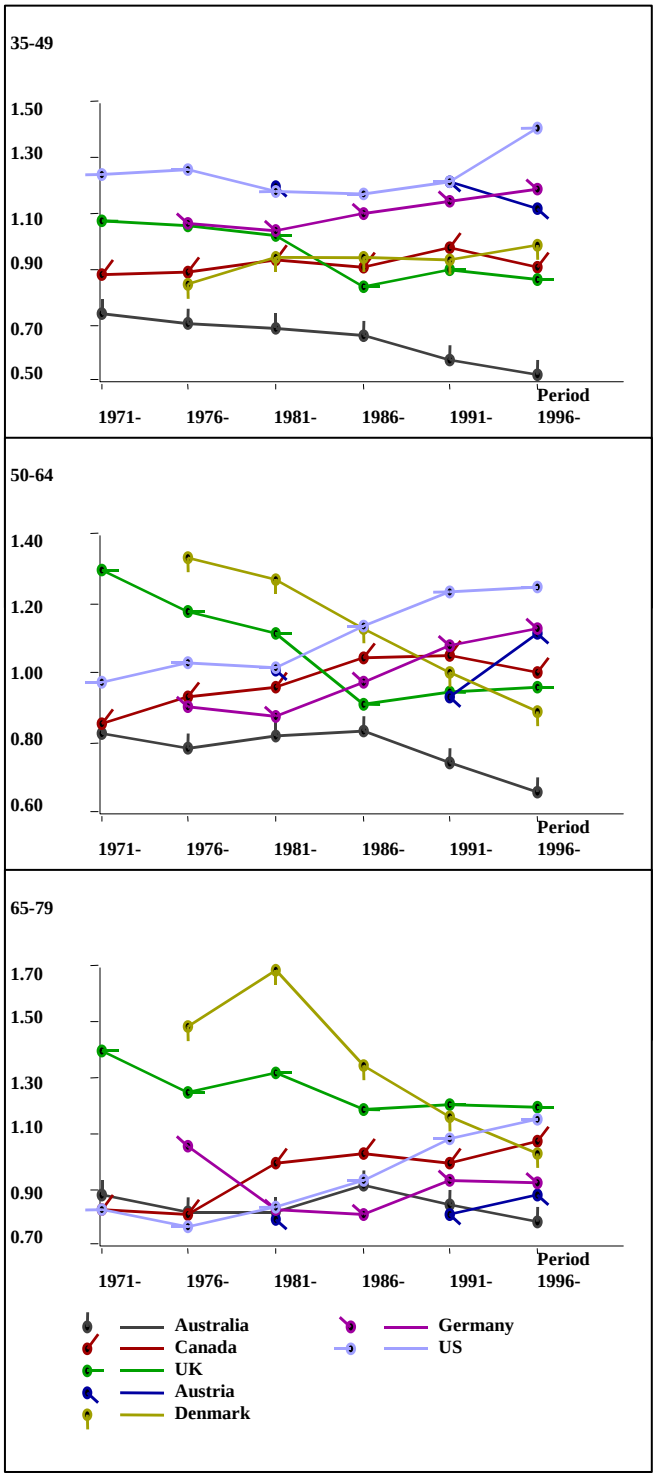


Figure 9/4L
Lung Cancer G factors
Comparison of the seven countries

Males



Females

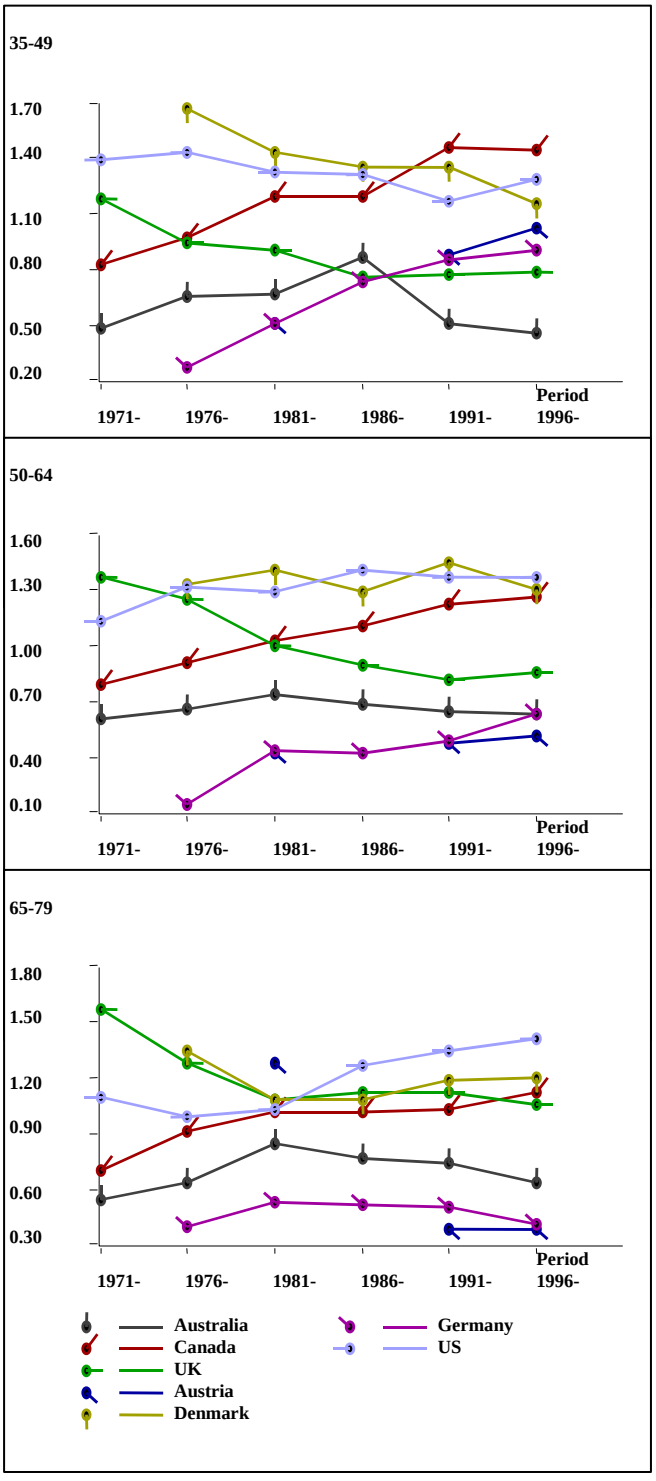


Table 9/2H
IHD G factors

Males

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	1.08	0.85	0.94	0.96	-	-	-	1.11	1.11
1976-80	1.17	1.12	1.36	1.22	-	0.86	0.45	1.15	0.82
1981-85	0.97	1.02	1.66	1.22	0.85	0.84	0.51	1.16	0.84
1986-90	1.16	0.86	1.62	1.21	-	0.80	0.51	1.26	0.86
1991-95	0.89	0.81	1.88	1.19	1.02	0.50	0.62	1.42	0.89
1996-2000	0.97	0.72	1.81	1.17	1.10	0.32	0.60	1.82	0.96
Age 50 - 64									
1971-75	1.26	0.84	0.83	0.98	-	-	-	1.10	1.10
1976-80	1.26	1.05	1.39	1.23	-	1.27	0.45	1.09	0.94
1981-85	1.04	0.83	1.85	1.24	0.61	1.15	0.59	0.97	0.83
1986-90	1.03	0.80	1.89	1.24	-	1.19	0.53	0.95	0.89
1991-95	0.67	0.71	2.30	1.23	0.77	0.91	0.52	1.21	0.85
1996-2000	0.39	0.73	2.42	1.18	1.24	0.27	0.55	1.80	0.96

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Table 9/2H (continued)
IHD G factors

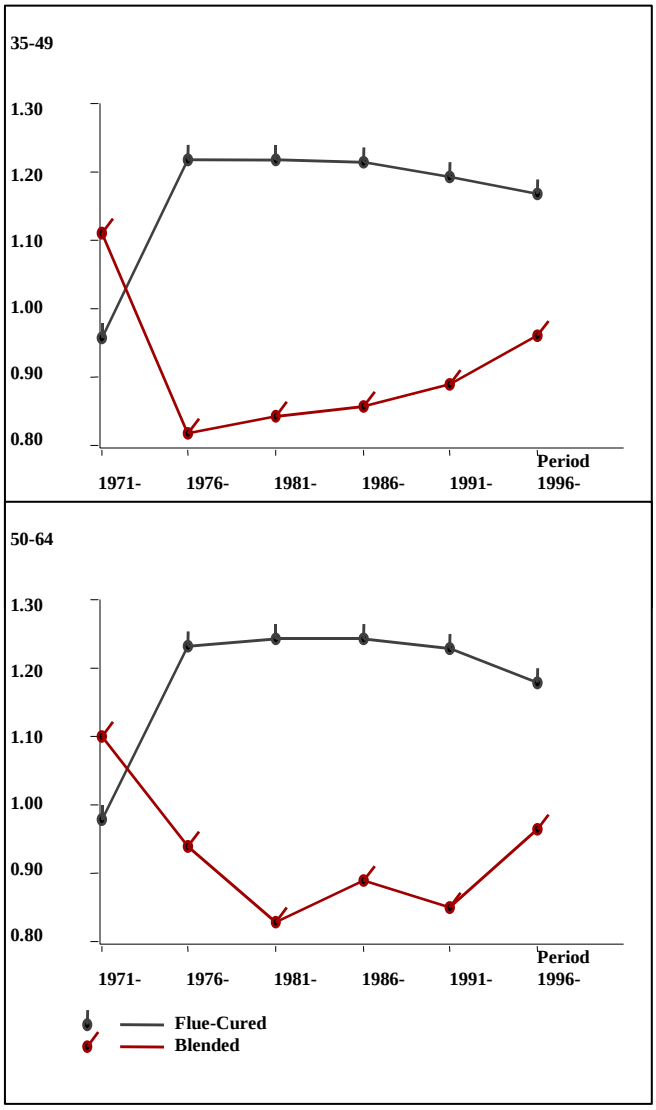
Females

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	1.63	0.51	0.55	0.90	-	-	-	1.36	1.36
1976-80	1.72	0.89	0.99	1.20	-	0.74	0.24	1.36	0.78
1981-85	1.43	0.78	1.09	1.10	1.16	0.66	0.41	1.41	0.91
1986-90	1.04	0.66	1.15	0.95	-	0.73	0.54	1.75	1.01
1991-95	0.75	0.67	1.32	0.92	1.40	0.47	0.56	2.02	1.11
1996-2000	0.70	0.56	1.32	0.86	1.50	0.38	0.66	2.40	1.23
Age 50 - 64									
1971-75	1.73	0.61	0.56	0.97	-	-	-	1.28	1.28
1976-80	1.78	0.85	1.15	1.26	-	0.73	-	1.36	1.05
1981-85	1.54	0.74	1.44	1.24	0.29	0.72	0.29	1.34	0.66
1986-90	1.24	0.66	1.62	1.18	-	0.83	0.22	1.50	0.85
1991-95	0.73	0.61	1.76	1.03	0.86	0.72	0.17	1.77	0.88
1996-2000	0.31	0.61	1.68	0.87	1.57	0.22	0.30	2.60	1.17

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Figure 9/3H
IHD G factors
Flue-cured versus Blended Cigarettes

Males



Females

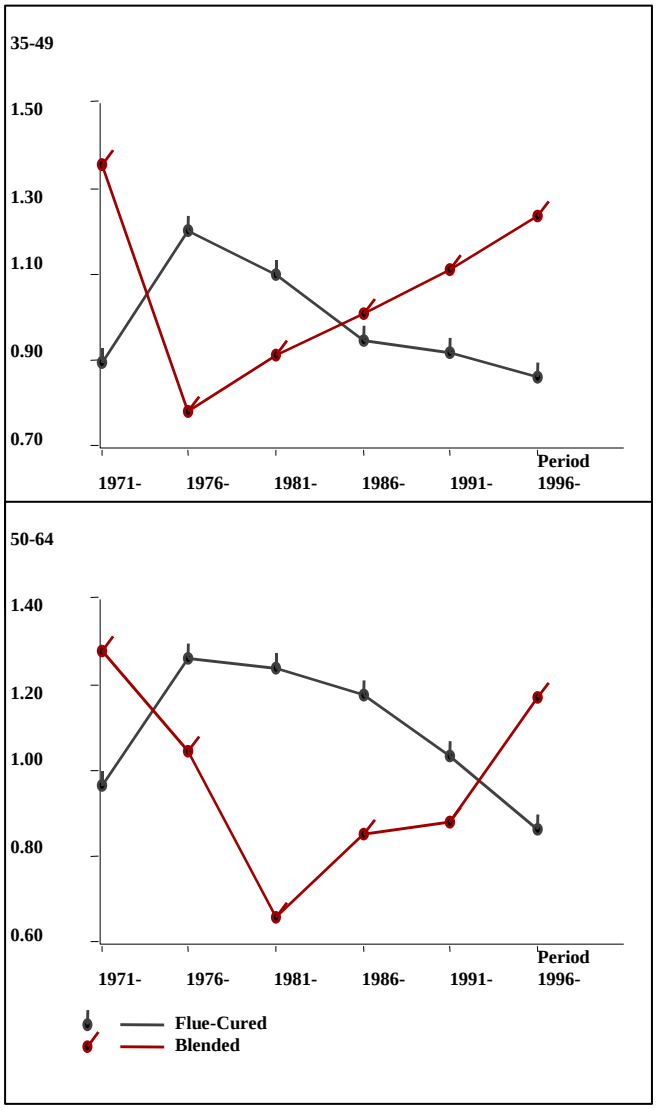
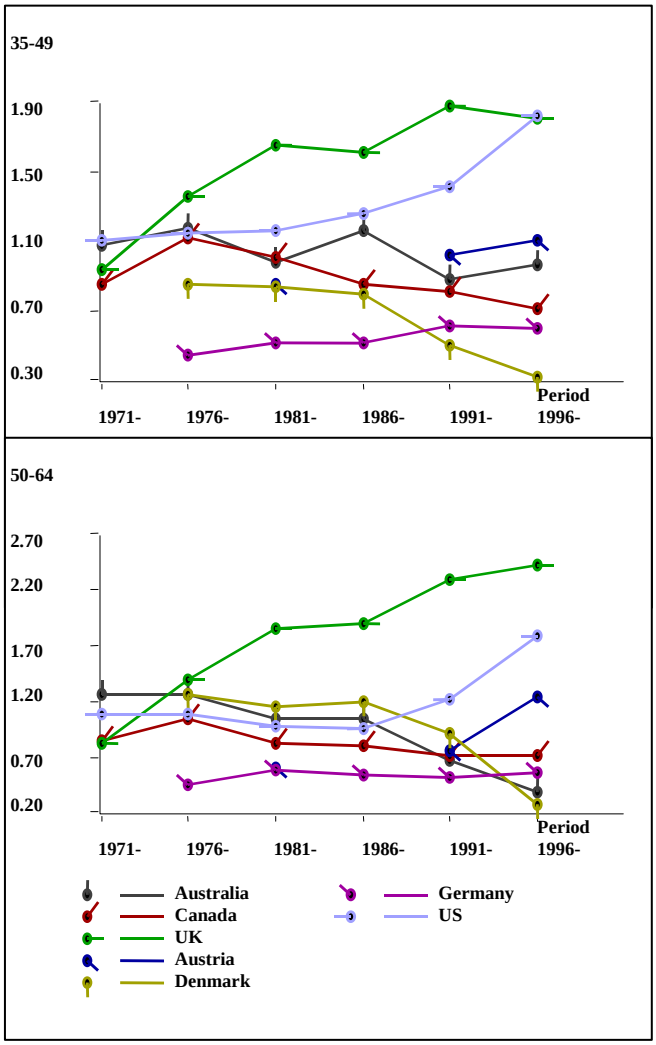


Figure 9/4H
IHD G factors
Comparison of the seven countries

Males



Females

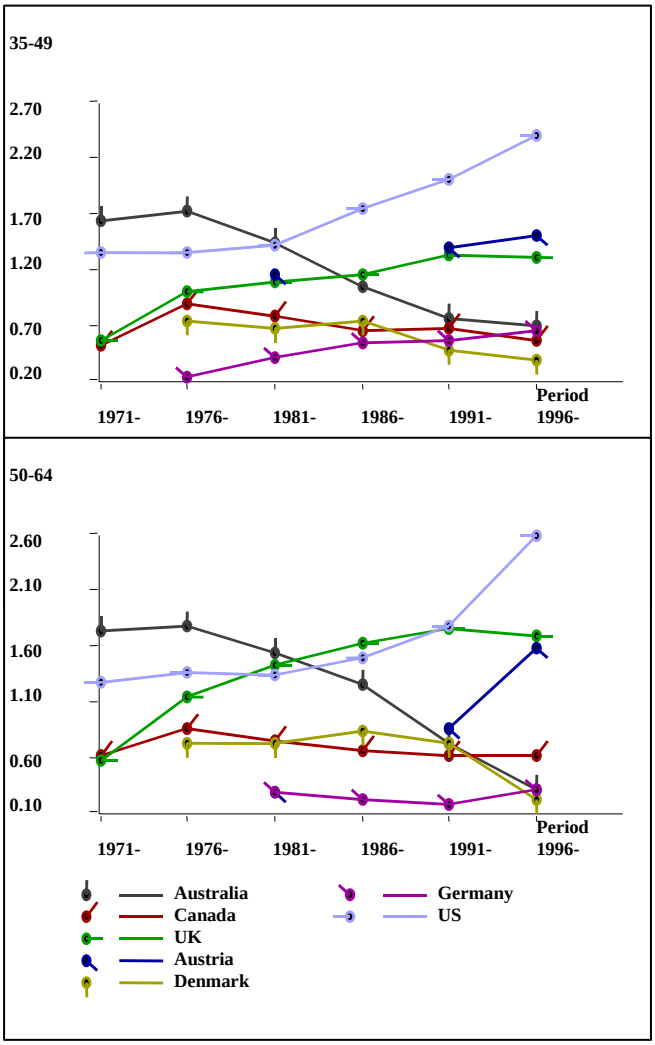


Table 9/2C
COPD G factors

Males

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	1.17	0.85	1.26	1.09	-	-	-	0.75	0.75
1976-80	1.15	0.73	1.22	1.03	-	1.28	1.16	0.65	1.03
1981-85	1.24	0.47	1.26	0.99	1.36	1.47	0.95	0.56	1.08
1986-90	1.55	0.49	1.25	1.10	-	1.06	0.82	0.90	0.93
1991-95	0.97	0.43	1.28	0.89	0.91	1.19	1.11	1.17	1.10
1996-2000	0.83	0.33	1.30	0.82	0.96	1.10	1.09	1.52	1.17
Age 50 - 64									
1971-75	1.22	0.72	1.33	1.09	-	-	-	0.73	0.73
1976-80	1.16	0.75	1.28	1.06	-	1.62	1.10	0.75	1.16
1981-85	1.16	0.56	1.36	1.02	0.79	1.60	0.95	0.79	1.03
1986-90	1.24	0.54	1.16	0.98	-	1.59	0.91	0.92	1.14
1991-95	1.07	0.51	1.25	0.94	0.72	1.31	1.06	1.15	1.06
1996-2000	0.88	0.43	1.39	0.90	0.86	1.11	1.05	1.38	1.10
Age 65 - 79									
1971-75	1.26	0.68	1.35	1.10	-	-	-	0.65	0.65
1976-80	1.28	0.74	1.29	1.11	-	1.27	1.30	0.69	1.09
1981-85	1.22	0.80	1.36	1.13	0.58	1.72	0.89	0.72	0.98
1986-90	1.34	0.78	1.29	1.13	-	1.53	0.83	0.79	1.05
1991-95	1.13	0.69	1.30	1.04	0.63	1.50	0.97	0.90	1.00
1996-2000	0.94	0.70	1.32	0.99	0.64	1.52	0.86	1.05	1.02

[1] Significant differences are coded as follows: +++ $p<0.001$, ++ $p<0.01$, + $p<0.05$, (+) $p<0.1$ where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Table 9/2C (continued)
COPD G factors

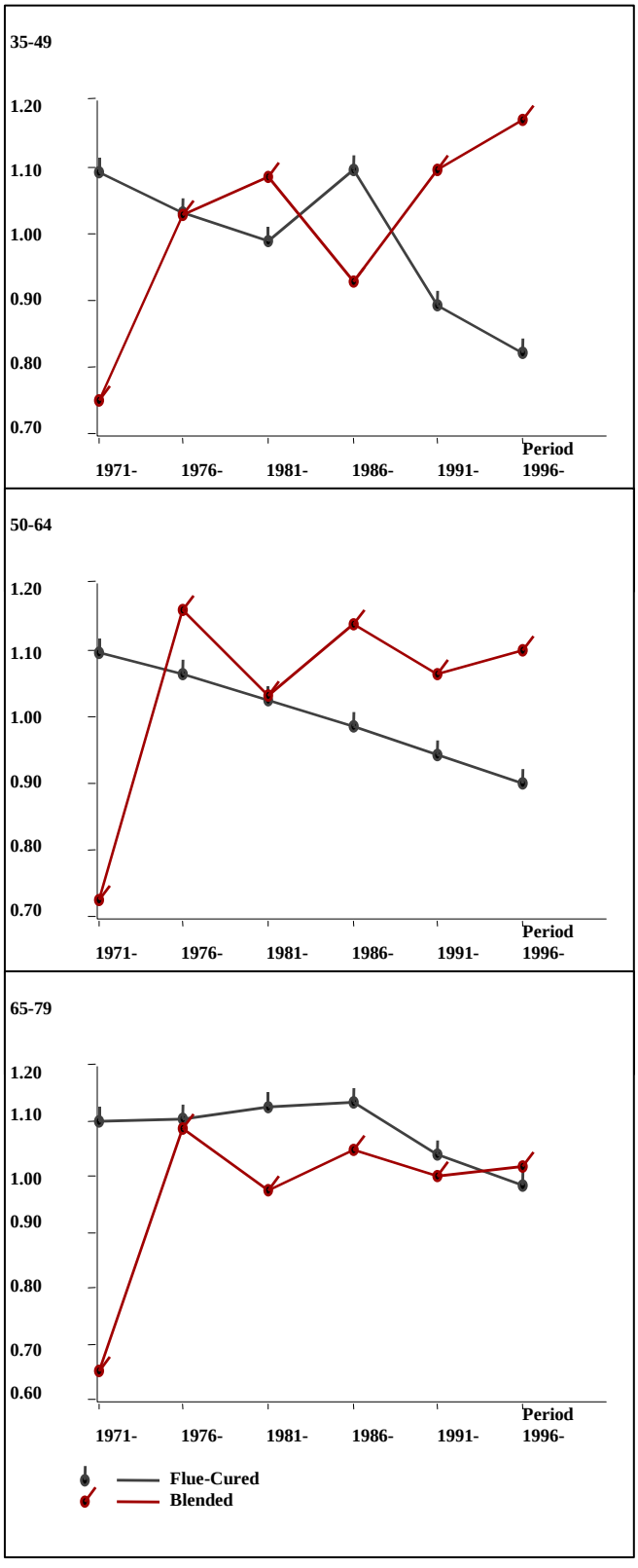
Females

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1971-75	1.50	0.63	1.25	1.13	-	-	-	0.72	0.72
1976-80	1.42	0.63	1.08	1.04	-	1.04	1.51	0.59	1.04
1981-85	1.57	0.42	1.11	1.03	1.10	1.13	1.35	0.63	1.05
1986-90	1.91	0.33	0.95	1.07	-	1.38	0.83	0.84	1.02
1991-95	1.28	0.48	1.23	0.99	0.88	0.82	0.97	1.41	1.02
1996-2000	1.00	0.34	1.26	0.87	0.48	1.28	0.85	1.89	1.12
Age 50 - 64									
1971-75	1.31	0.75	1.29	1.12	-	-	-	0.73	0.73
1976-80	1.26	0.58	1.12	0.99	-	1.46	1.10	0.73	1.10
1981-85	1.33	0.43	1.12	0.96	0.47	1.74	0.91	0.77	0.97
1986-90	1.32	0.37	1.05	0.91	-	1.81	0.57	0.96	1.11
1991-95	1.03	0.40	1.01	0.81	0.41	1.86	0.68	1.16	1.03
1996-2000	0.94	0.42	1.14	0.83	0.40	1.69	0.59	1.38	1.02
Age 65 - 79									
1971-75	1.13	0.69	1.43	1.08	-	-	-	0.74	0.74
1976-80	1.09	0.74	0.95	0.93	-	1.21	1.87	0.66	1.25
1981-85	1.40	0.65	0.88	0.98	1.49	1.22	1.16	0.81	1.17
1986-90	1.34	0.61	1.04	1.00	-	1.30	0.84	1.01	1.05
1991-95	1.10	0.52	1.08	0.90	0.37	1.65	0.98	1.03	1.01
1996-2000	0.78	0.51	1.06	0.78	0.17	1.89	0.57	1.13	0.94

[1] Significant differences are coded as follows: +++ $p<0.001$, ++ $p<0.01$, + $p<0.05$, (+) $p<0.1$ where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Figure 9/3C
COPD G factors
Flue-cured versus Blended Cigarettes

Males



Females

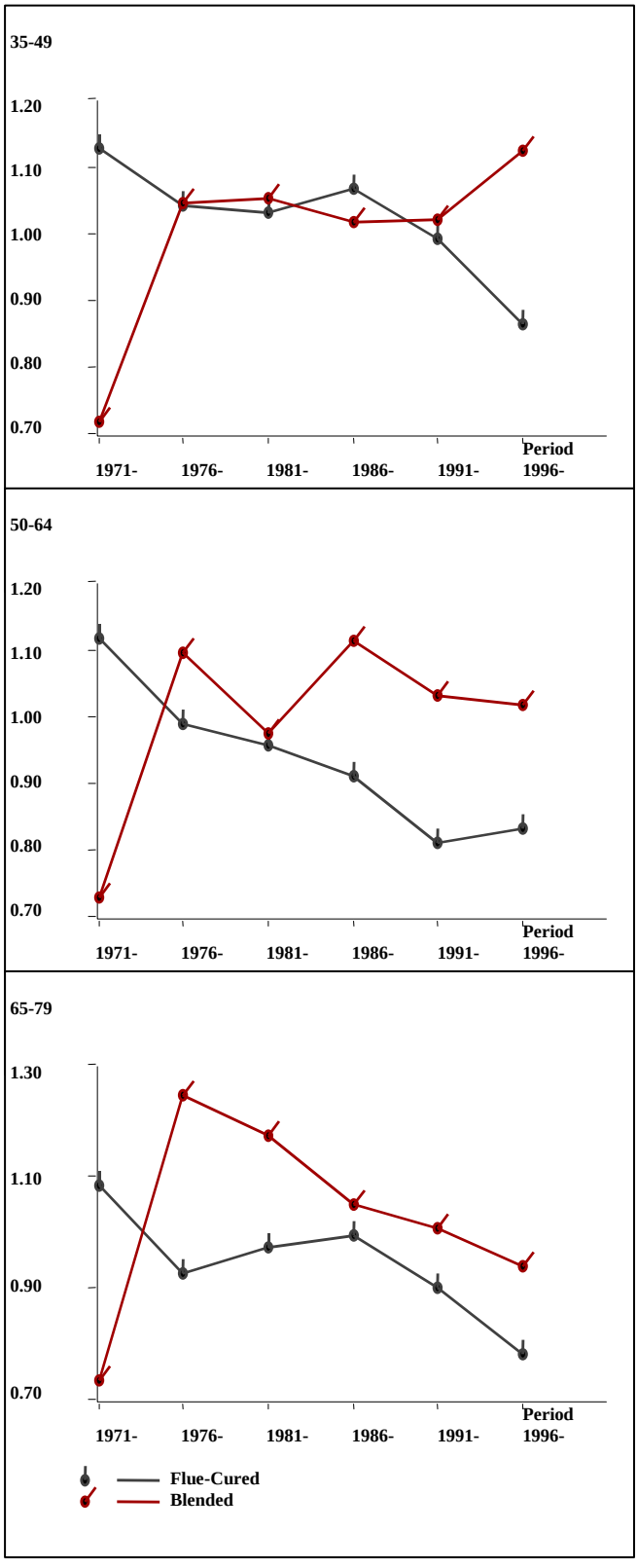
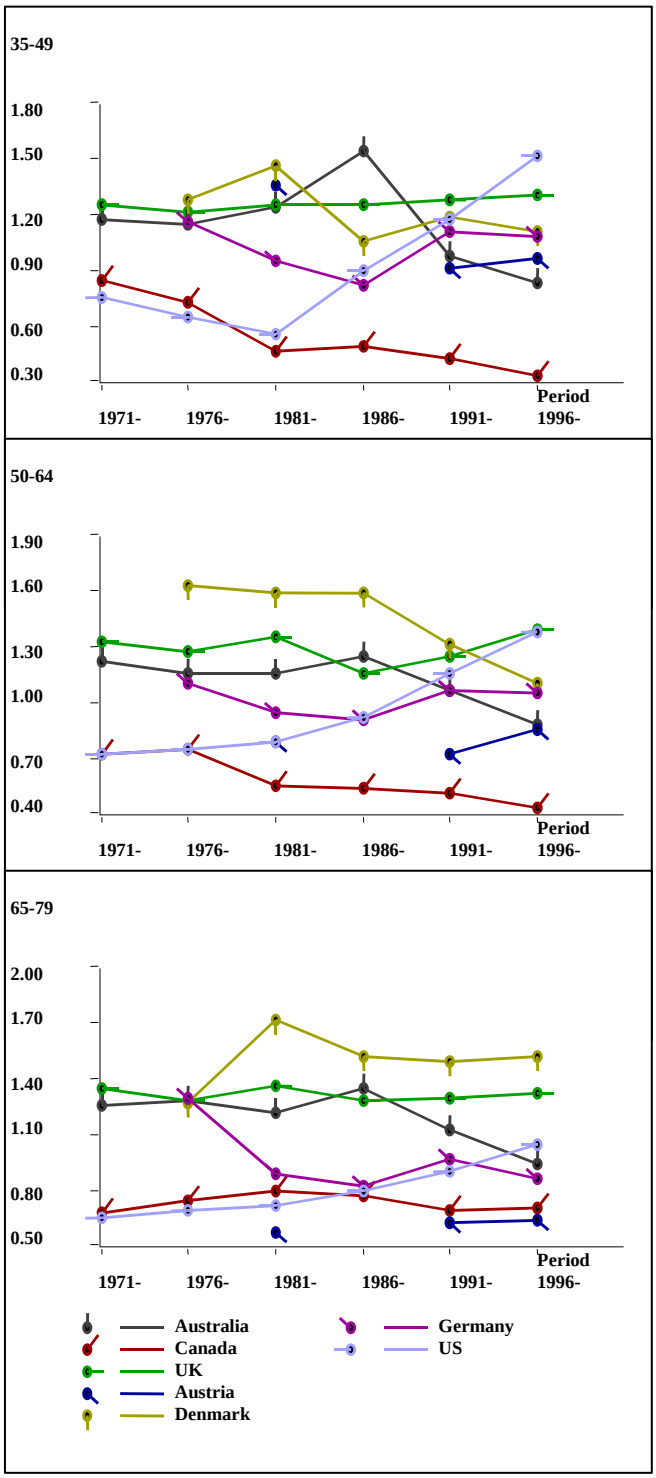
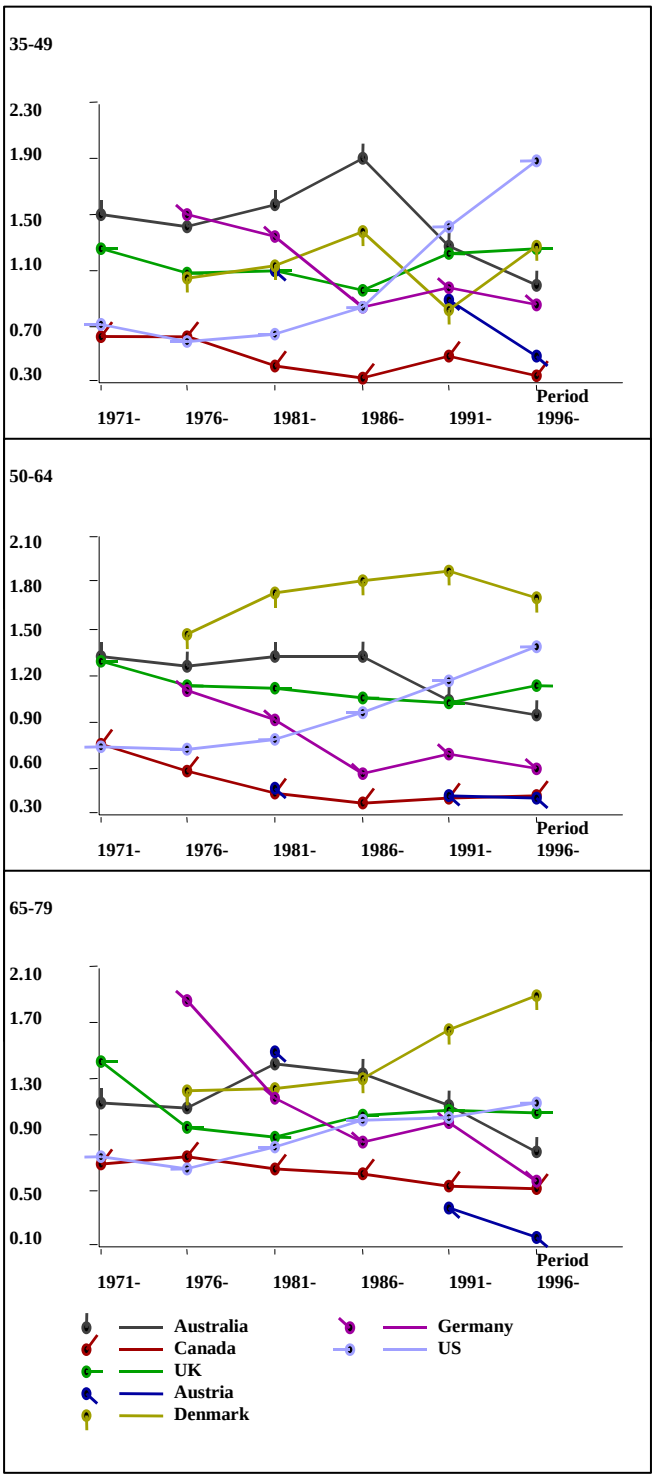


Figure 9/4C
COPD G factors
Comparison of the seven countries

Males



Females



10. Quit rates

As described in section 2.6, five-year quit rates were derived for periods 1976-1980 to 1996-2000 for each of broad age group for both sexes and all countries.

Table 10/1 presents the data, while Figure 10/1 and Figure 10/2 gives them in graphical form.

It should be noted that some of the quit rate estimates were negative, due to the estimated current smoking prevalence for a given age group and period being higher than that for the age group five years younger and the period five years earlier. This may be due to taking up of smoking at older ages, sampling variation of estimates, or differences between the surveys providing the prevalence data. Negative values are most common for Austria, where the current smoking prevalence estimates are based on considerably fewer surveys than is the case for other countries. Nevertheless, in most countries quit rates are consistently positive as are the means for flue-cured and blended countries.

Mean quit rates in the blended countries are, with three minor exceptions (males, age 35-49 and 50-64, 1981-1985, and females, age 35-49, 1986-1990), always lower than those in the flue-cured countries. However, with only two exceptions (females, age 35-49 and age 50-64, 1996-2000), this difference is never statistically significant at $p<0.05$.

Table 10/1
Five-year quit rates

Males

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1976-80	9.69	9.22	14.15	11.02	10.21	6.71	9.34	6.62	8.22
1981-85	10.35	9.85	21.21	13.80	21.05	5.38	20.89	17.67	16.25
1986-90	21.30	14.74	-8.63	9.14	-22.30	8.51	1.50	14.41	0.53
1991-95	2.38	9.32	10.02	7.24	0.90	7.89	10.11	1.18	5.02
1996-2000	11.84	9.55	13.29	11.56	14.73	4.47	7.14	11.23	9.39
Age 50 - 64									
1976-80	15.43	15.32	12.03	14.26	6.73	5.21	12.54	15.79	10.07
1981-85	16.57	14.22	23.76	18.18	23.29	-0.11	28.96	21.79	18.48
1986-90	26.21	23.69	-3.73	15.39	-10.42	8.17	4.81	15.69	4.56
1991-95	13.11	21.35	21.94	18.80	6.47	11.04	14.51	14.99	11.75 (-)
1996-2000	18.86	19.80	27.33	21.99	31.70	8.70	15.48	20.35	19.06
Age 65 - 79									
1976-80	23.58	18.42	25.36	22.45	15.40	11.28	19.61	26.78	18.27
1981-85	11.56	26.71	31.57	23.28	12.49	20.70	30.52	20.99	21.17
1986-90	32.15	32.69	8.95	24.60	4.81	13.67	12.55	22.54	13.39
1991-95	27.24	27.10	29.51	27.95	18.79	17.15	27.22	25.59	22.19
1996-2000	17.96	23.25	38.71	26.64	42.05	13.60	21.90	27.43	26.25

[1] Significant differences are coded as follows: +++ p<0.001, ++ p<0.01, + p<0.05, (+) p<0.1 where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Table 10/1 (continued)
Five-year quit rates

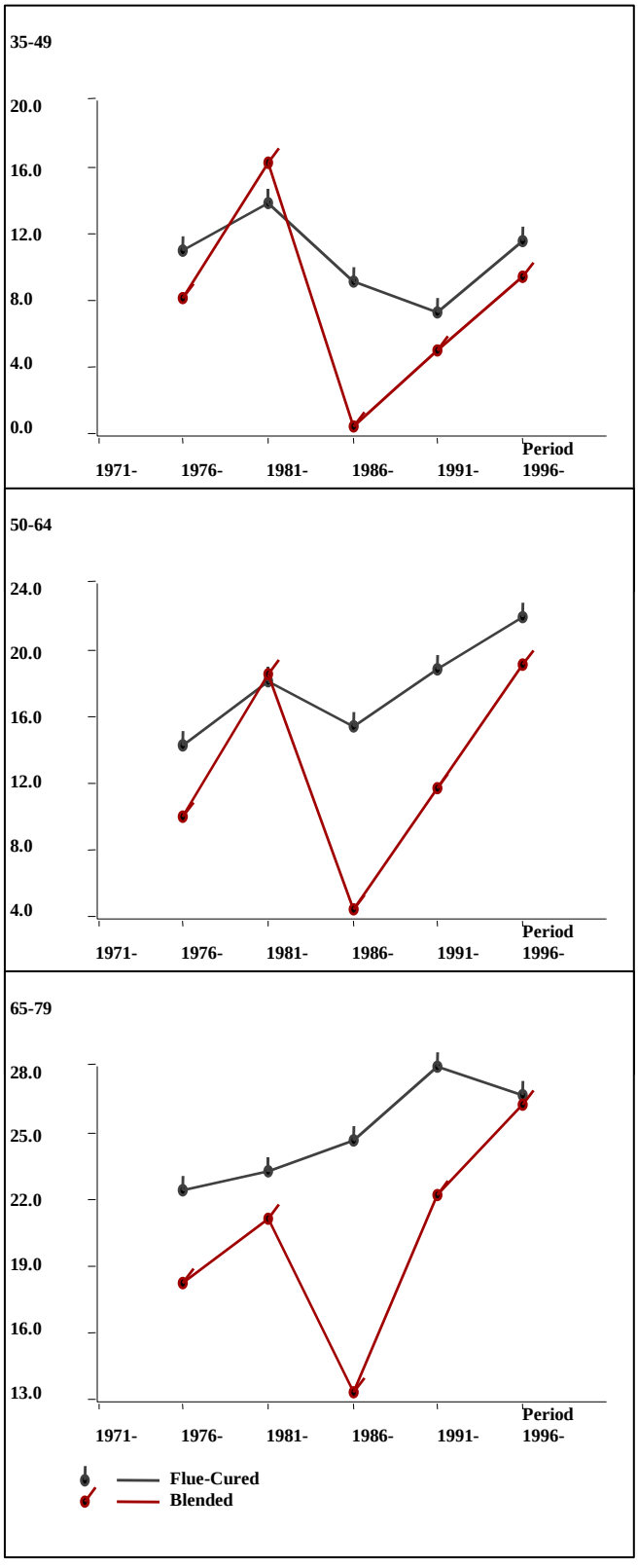
Females

	Country								
	Flue-cured				Blended				
	Australia	Canada	UK	Mean	Austria	Denmark	Germany	US	Mean[1]
Age 35 - 49									
1976-80	10.45	1.80	10.84	7.70	-21.07	4.22	18.15	-0.43	0.22
1981-85	11.97	10.05	19.60	13.87	-7.90	-1.27	23.81	19.30	8.49
1986-90	16.99	9.80	-6.69	6.70	8.24	9.97	4.46	14.82	9.37
1991-95	2.39	12.76	14.59	9.91	-8.22	9.93	10.62	-0.42	2.98
1996-2000	13.70	11.05	17.86	14.20	7.71	7.89	6.43	11.98	8.50 -
Age 50 - 64									
1976-80	15.73	5.02	13.12	11.29	-15.78	5.75	16.51	8.43	3.73
1981-85	23.44	14.86	17.08	18.46	-22.69	1.49	30.54	26.03	8.84
1986-90	20.71	17.85	3.04	13.87	30.57	-1.62	3.50	17.66	12.53
1991-95	22.36	19.65	16.67	19.56	6.80	13.06	23.91	10.22	13.50
1996-2000	24.54	16.36	23.23	21.38	15.77	12.51	7.70	18.10	13.52 -
Age 65 - 79									
1976-80	20.66	15.08	20.65	18.80	-3.75	20.84	23.72	3.50	11.08
1981-85	41.79	24.69	16.08	27.52	2.11	15.14	32.61	32.14	20.50
1986-90	22.63	24.48	20.53	22.55	31.58	8.42	22.25	25.46	21.93
1991-95	34.13	25.27	28.10	29.17	1.89	24.59	38.06	20.64	21.30
1996-2000	34.92	26.14	27.14	29.40	26.77	25.45	12.68	25.13	22.51

[1] Significant differences are coded as follows: +++ $p<0.001$, ++ $p<0.01$, + $p<0.05$, (+) $p<0.1$ where Blended > Flue-cured. Minus signs are shown where Blended < Flue-cured.

Figure 10/1
Five-year quit rates
Flue-cured versus Blended Cigarettes

Males



Females

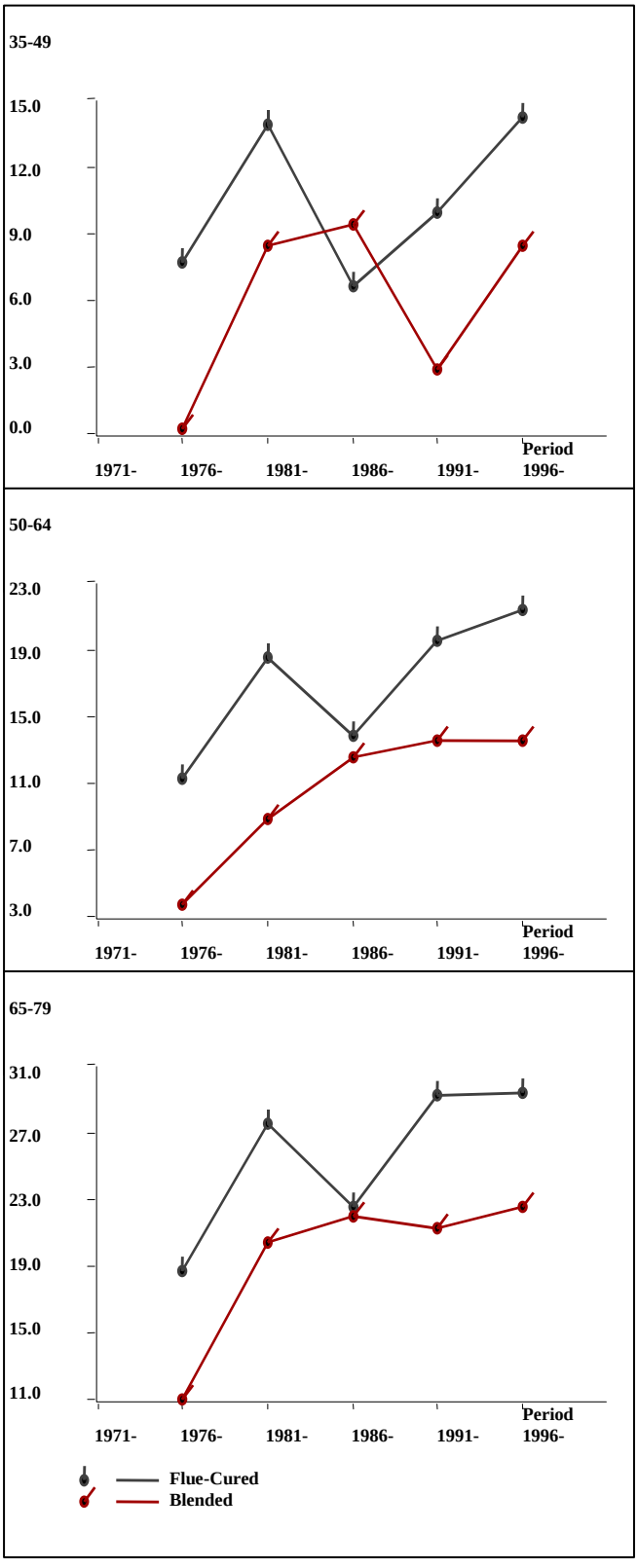
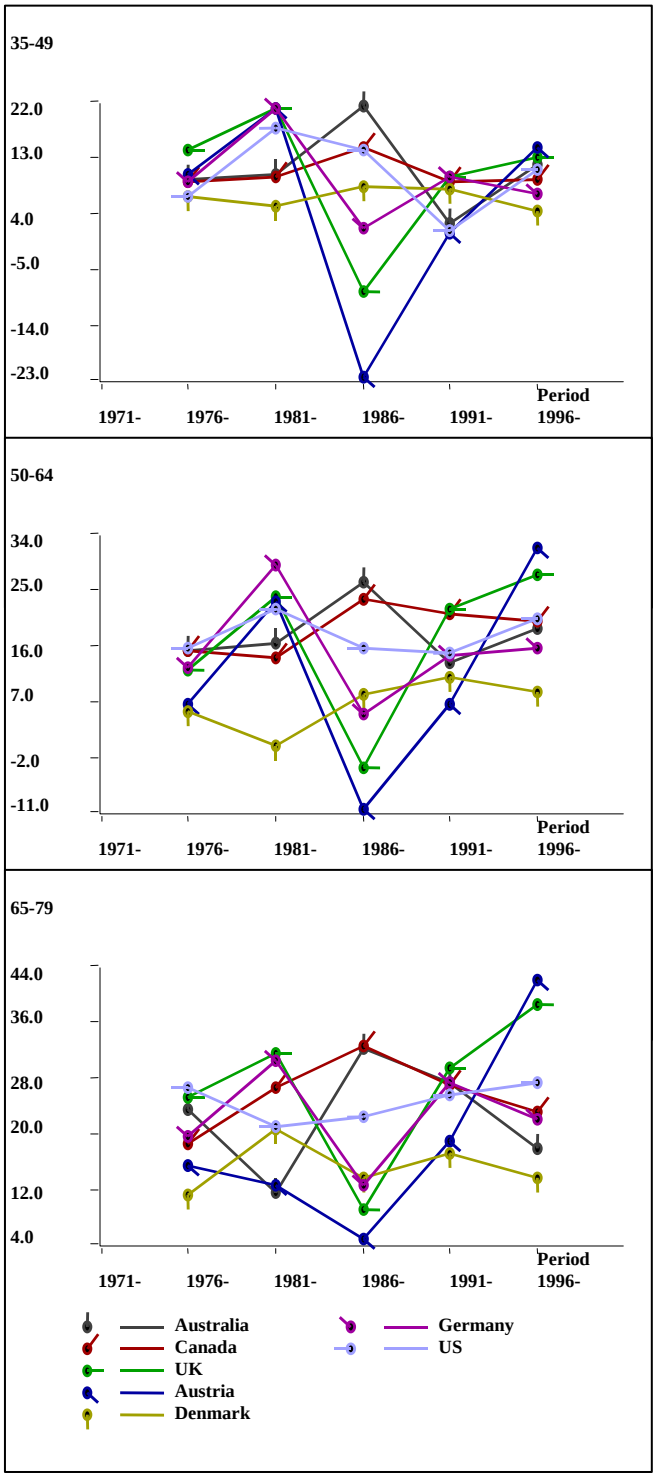
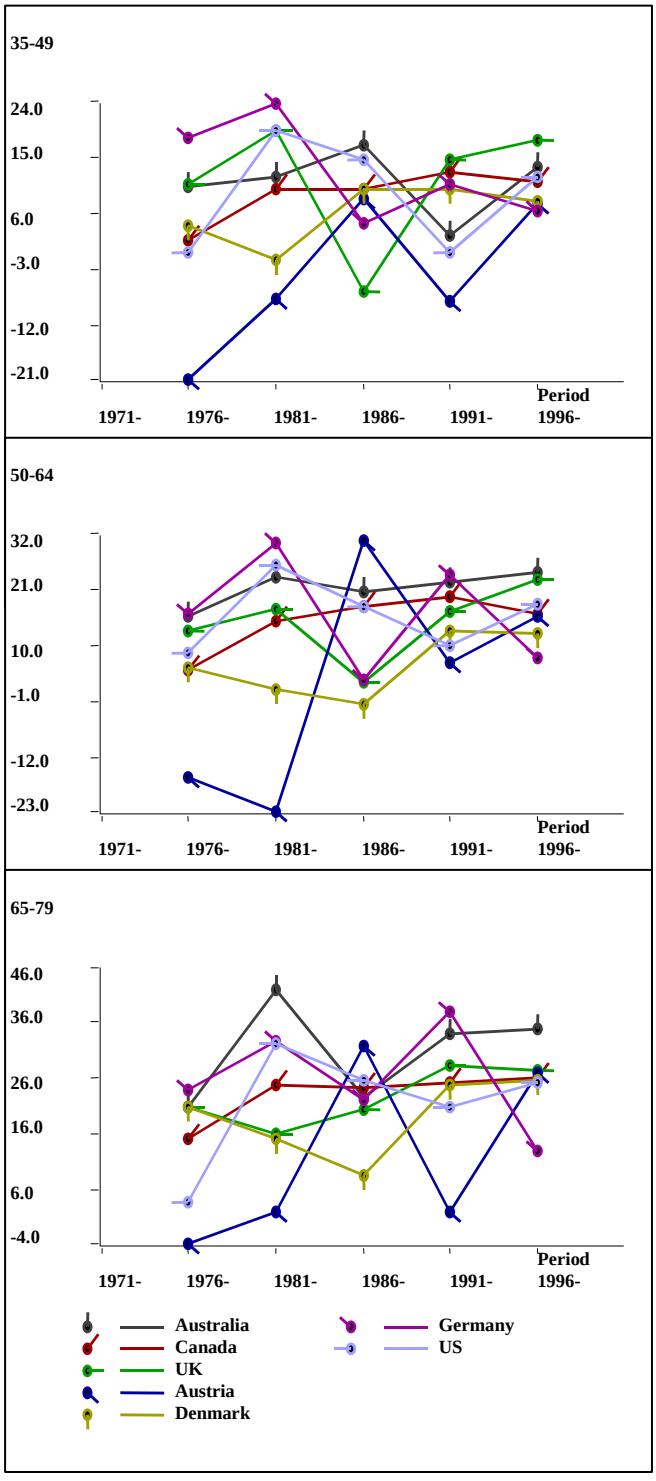


Figure 10/2
Five-year quit rates
Comparison of the seven countries

Males



Females



11. Discussion

There are considerable difficulties in attempting to assess whether flue-cured and blended cigarettes differ in their propensity to cause smoking related diseases or to affect the likelihood of quitting smoking. No epidemiological studies have been conducted comparing groups of smokers of the two types of cigarette with adjustment for a range of potential confounding variables. While studies have been conducted comparing, for example, smokers of filter and plain cigarettes, smokers of cigarettes of different tar levels, smokers of black and blond cigarettes, and smokers of mentholated and unmentholated cigarettes, these studies have been possible because adequate numbers of smokers of the types of cigarettes being compared exist within a given country. This is often not the case for flue-cured and blended cigarettes, as in many countries virtually all smokers smoke cigarettes cured in the same way. While it might be possible in some countries to conduct an appropriate epidemiological study, such studies are not available currently and an alternative approach was required.

This involved comparison of countries which use only (or virtually only) flue-cured cigarettes (Australia, Canada, UK) and countries which used only (or virtually only) blended cigarettes (Austria, Denmark, Germany, US). Netherlands was also considered as a blended cigarette country and though some data were marshalled together for it, the comparisons presented do not include any results for the Netherlands due to their high proportion of smoking of products other than cigarettes.

We were able to derive quite complete estimates by sex, five-year period and five-year age group for all the countries of mortality rates from lung cancer, IHD and COPD and of the prevalence of current and ex-smoking, and also data for age 35+ for daily cigarette consumption per smoker. However any comparison between countries suffers from various inherent weaknesses. Firstly, it is ecological – based on populations – rather than epidemiological – based on individuals. Second, it does not take into account potential confounding variables. Third, each comparison is based on a statistical test using only seven data points, the estimate for each country.

Fourth, the data used may suffer from various sources of inconsistency by time period and country. Finally, the estimates being compared will each be subject to sampling variation.

Attempting to collect data on potential confounding variables for each country, even if not age-specific, would have been a monumental task, especially for IHD, where there are such a large number of associated variables. We have not done so, and for lung cancer and COPD at least we take comfort from the fact that the diseases are largely caused by smoking. However, though for lung cancer the evidence suggests that variation in never smoker rates between Western populations is relatively small,[18,19] this may be less true for COPD, and seems certainly unlikely to be true for IHD (as indeed became evident from our analyses – see section 9). Certainly, any comparison between countries in mortality rates (or in rates adjusted for smoking habits) is inevitably limited by possible differences in potential confounding variables between countries. This is likely to be most relevant for IHD and least relevant for lung cancer.

It is relevant to consider various sources of inconsistency according to the type of data collected. For the mortality data some of the issues are considered in more detail elsewhere.[2] The mortality data over the period 1971-1980 were largely coded by the 8th revision of ICD, while those in the period 1981-2000 were largely coded by the 9th revision, though the 10th revision was introduced in some countries towards the end of the 1990s. The definitions for lung cancer are essentially identical in the three ICD revisions, and those for IHD very similar. Though there are systematic differences for COPD between the 8th revision and the 9th and 10th revisions (which themselves are comparable) any bias is likely to be minimized by all the countries switching from the 8th to the 9th revision at about the same time and comparison being within period. Perhaps more important, though less easy to quantify, are differences in diagnosis between countries. This would probably be of least importance for lung cancer and perhaps of most importance for COPD.

Comparison of smoking data over country and over period is also subject to some uncertainties. Surveys vary in the precise definition of a smoker, and are conducted using different designs. However, in general quite consistent estimates are obtained between surveys conducted in the same country at different times (see ISS2[3] and Appendix 5/1). There are also problems in deriving appropriate five-year age and five-year period averages, based on surveys conducted in various years presenting results by a variety of age groups. These issues are discussed elsewhere (see Supplement 1 to ISS2[9] and Appendix 5/1). We believe that the estimates used are a reasonably reliable indication of sex- and age-specific smoking habits in the different countries in the different periods.

The analyses in sections 4, 5 and 6 in respect of current smoking prevalence, ex-smoking prevalence and daily cigarette consumption per smoker are intended to give insight into differences between countries in relevant smoking statistics, and do not answer the objectives of the study directly. The analyses suggested that in flue-cured countries, current smoking prevalence in the 1970s was somewhat higher than in blended countries, but declined faster, and that daily cigarette consumption per smoker was also somewhat higher. However differences between flue-cured and blended at any time point were rarely significant, due to between-country variation, particularly in blended countries. No attempt has been made to compare countries in terms of tar yield of cigarettes, partly due to lack of available data over the whole period for some countries and partly because declines in tar yield have in any case been quite similar in all the countries.[3]

The analyses in section 3 comparing mortality rates from lung cancer, IHD and COPD in the different countries are also not directly relevant to the objectives of the study, but provide useful background detail. They highlight the large differences between countries, particularly as regards IHD.

Two approaches were tried to compare the effect of smoking flue-cured or blended cigarettes on the mortality rates from lung cancer, IHD and COPD. One was to collect together data from epidemiological studies

conducted in the countries of interest over the relevant period. Such data were available already for lung cancer from the IESLC project but had to be extracted from relevant publications for IHD and COPD. For COPD few studies were available, but for IHD quite a large number were and the considerable work involved has led to a database being produced that will be of use in future projects. Even though for lung cancer and IHD the numbers of studies were relatively large, there were still rather few for some countries and it was not possible to produce useful estimates of relative risk by country. Analysis suggested that relative risks for flue-cured and blended cigarettes did not vary materially, but this was largely based on a US/UK comparison where epidemiological studies are much more common.

Instead, the approach used was to attempt to produce relative risk estimates for current smoking and ex-smoking that are common for all the countries considered, which could then be used to compare national mortality rates adjusted for smoking. We have attempted, as described more fully in the IESLC documentation[4,5] for lung cancer and in the relevant appendices (7/1 and 7/2) for IHD and COPD, to use relative risk estimates from each epidemiological study with as consistent a definition of numerator and denominator as possible. Though there are inevitably differences between studies, the overall relative risk estimates derived seem reasonable, and slight variations in these would not have affected the conclusions. These estimates were sex, age and period specific (IHD), period specific (lung cancer) or not specific at all (COPD), depending partly on the outcome of modelling and partly on previous work indicating that the relationship of age to the relative risk was clear for IHD but only minor for lung cancer and COPD.

The method of comparing mortality rates adjusted for prevalence of current smoking and ex-smoking was dependent on the rate for never smokers not varying across country. For lung cancer, this is not an unreasonable assumption for Western countries based on other work.[18,19] The method involved comparison of an estimate of what might be termed “observed” and “expected” excess risks due to smoking, the ratio of observed to expected being what we call an F factor. An estimate of the never smoker risk common

to all countries is first made, with the “observed” excess risk being obtained by subtracting the common never smoker risk from the overall mortality rate, and the “expected” excess risk being derived from the common never smoking risk, the common relative risk estimates and the prevalences of current smoking and ex-smoking for that country. Provided the relative risk estimates are reasonable and the assumption of invariance of never smoking risk is correct, this seems to provide a reasonable way of comparing mortality rates across country adjusted for the prevalence of current smoking and ex-smoking. If the never smoking risk is quite small relative to the risk in smokers, the actual magnitude of the estimated never smoking risk is not crucial to the comparison.

For lung cancer and for COPD the method appears to work well and the comparisons of F factors lead to quite similar conclusions to the comparisons of the total mortality rates, though particularly for COPD in females they emphasize that there are large differences in rates between countries that cannot be explained by smoking. For IHD the method does not work well, producing negative F factors in some situations, particularly for age 65-79 where estimated relative risks for current smokers are quite low. It is clear that IHD rates for never smokers do vary between the countries, inconsistent with the assumption of the method; also that variations between countries depend materially on factors other than smoking. The conclusions regarding a lack of marked difference between flue-cured and blended cigarettes are clearly most reliable for lung cancer, and are not reliable for IHD due to the lack of control for relevant confounders.

Analyses are also included correcting also for daily cigarette consumption per smokers (G factors). While the method, which depends on the additional assumption that excess risk is linearly related to daily cigarette consumption, seems not unreasonable, the same problems arise as with using F factors.

Ideally, of course, correction for smoking should be based on detailed smoking history data, which are not readily available and not considered in

this quite simple approach. Part of the differences in rates between countries may be due to differences in age of starting to smoke and its consequent effect on duration. Differences in rates may also be due to variation between countries in other smoking characteristics such as tar yield, butt length, etc. Nevertheless, we feel that it is unlikely that any more sophisticated approach would be worthwhile, particularly for IHD and COPD, where very large variations exist between country that would seem unlikely to be explained by smoking.

Our final analyses, in section 10, were of quit rates. The method used was based on current smoking prevalences at the time and five years earlier in the same birth cohort. Though simple, this should be reasonably robust.

Generally, it must be considered that the power to detect moderate differences between flue-cured and blended cigarettes in their effect on either the quit rate or the risk of lung cancer, IHD or COPD is quite limited using the methodology available. The analyses do, however, strongly suggest that any differences that do exist are not substantial.

12. Summary

The objective of the study was to determine possible differences between flue-cured and blended cigarettes in their effect on the major smoking-related diseases (lung cancer, IHD and COPD) and on the likelihood of quitting.

Data were collected for 1971-2000 by sex, five-year age group and five-year period for three countries with virtually a 100% flue-cured market (Australia, Canada, UK) and for four with virtually a 100% blended market (Austria, Denmark, Germany, USA).

National mortality (and population) data were obtained from WHO[1], and national estimates of current smoking prevalence and daily cigarette consumption per smoker were obtained from appropriate surveys, these data being an extension to the year 2000 of the data currently available on IMASS.[2] National estimates of ex-smoking prevalence were extracted from available surveys, using methods similar to those used in ISS2.[3] Relative risk estimates for current and ex-smoking were obtained from relevant epidemiological studies. These were already available for lung cancer from the IESLC project,[4,5] but for IHD and COPD had to be extracted. Summary relative risk estimates were derived by period, sex and age as appropriate.

Comparisons were made between the flue-cured and blended countries of current and ex-smoking prevalence, of daily cigarette consumption per smoker and of quit rates. Comparisons were also made of mortality rates from lung cancer, IHD and COPD, both unadjusted and adjusted for smoking habits. The results are summarized below.

Mortality rates unadjusted for smoking habits

Except for lung cancer for men aged 35-49 in 1996-2000, where rates were lower in flue-cured countries, no statistically significant ($p<0.05$) difference was seen between the flue-cured and blended countries in mortality rates from lung cancer, IHD and COPD in any sex, period or age group combination. For all three diseases the general tendency was for the mean rate

in the flue-cured countries to be somewhat higher than the mean rate for the blended countries in the 1970s, with the difference diminishing or reversing by the 1990s. However, differences between rates within countries smoking the same type of cigarette were often large, so that little could be reliably inferred from the smaller differences between the means.

Prevalence of current smoking

The mean prevalence of current smoking was higher in the flue-cured than in the blended countries in 1971-1975 for all age groups and both sexes. Over time, the difference reduced (and usually reversed in direction), but was never statistically significant due to variation between countries, particularly those using blended cigarettes.

Prevalence of ex-smoking and quit rates

The mean prevalence of ex-smoking generally increased over time and was higher for flue-cured than blended countries. However, the difference was only significant for men aged 35-49 and aged 50-64 in 1996-2000.

Essentially the same conclusions could be drawn from an analysis of quit rates, based on changes in current smoking prevalence over a five-year period within a birth cohort.

Daily cigarette consumption per smoker

The tendency is for daily cigarette consumption per smoker for both sexes to be somewhat higher in the flue-cured countries, but the difference was not statistically significant at any time point.

Relative risks

Limitations of available epidemiological data meant that it was not possible to obtain reliable relative risk estimates for current or ex-smoking for some of the countries, with relevant studies being predominantly conducted in the US and UK. There was no clear evidence that the relative risk estimates differed markedly for studies conducted in the flue-cured and blended countries.

Combined relative risk estimates were derived based on data for all the countries. For lung cancer, estimates did not vary materially by sex, so combined sex estimates were obtained for each period. For the period 1990-1999, they were 11.47 for current smoking and 4.72 for ex-smoking. Variation by age in the relative risk was not considered specifically, but has previously been shown to be minor.

For IHD, sex, age and period were all found to be predictors of relative risk and separate estimates were derived by modelling for all 18 combinations of sex by 15-year age group by 10-year period. For current smoking for the final 10 year period, relative risks for males were 3.03, 2.37 and 1.56 for ages 35-49, 50-64 and 65-79 respectively. For ex-smoking the corresponding relative risks were 1.44, 1.17 and 0.91. For females, estimates were higher by a factor of about 1.1 for current smoking and 1.2 for ex-smoking.

For COPD, there were far fewer study-specific estimates available (e.g. 12 for current smoking vs. 80 for lung cancer and 60 for IHD). Overall estimates of 11.59 for current smoking and 7.05 for ex-smoking were derived.

Adjustment of mortality rates for smoking habits

Based on the relative risks derived, it was possible, assuming that rates in never smokers did not vary by country, to compare the observed smoking-related excess risk in a given country with that expected based on a common estimate of excess risk for all the countries combined. The ratio of observed to expected, the "F factor," was then compared over countries, as a means of comparing mortality rates, taking into account any differences in their prevalence of current and ex-smoking. For lung cancer and COPD there was no difference in the conclusions comparing F factors and comparing simple mortality rates, with the only significant difference between flue-cured and blended being the higher rates in blended countries for lung cancer in men aged 35-49 in 1996-2000. For IHD it became apparent that the assumption of similarity of never smoker rates by country did not hold. In any case it was clear that differences between flue-cured and blended cigarettes could not

explain the differences in IHD rates between country, which seem too large to have arisen only from differences in smoking habits.

Analyses adjusting also for daily cigarette consumption (G factors) did not affect the situation materially.

Conclusions

The analyses provide little indication that there is any substantial difference between flue-cured and blended cigarettes in their propensity to cause the major smoking-related diseases or to affect the likelihood of quitting smoking. However the power to detect small or even moderate differences using this ecological approach is limited.

The extensive data collected for the project, particularly the data not previously available in a convenient format for ex-smoking prevalence and for IHD relative risk, may be valuable for other projects.

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