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SMOKING AND HEALTH

A study of the effects of a
reduction in cigarette smoking on
mortality and morbidity rates, on health
care and social security expenditure
and on productive potential

DEPARTMENT OF HEALTH AND SOCIAL SECURITY

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A. EFFECTS OF A REDUCTION IN CIGARETTE SMOKING ON MORTALITY AND MORBIDITY RATES AND ON HEALTH CARE AND SOCIAL SECURITY EXPENDITURE

1. Research studies into the health effects of smoking have almost entirely been concerned with the association between smoking and mortality. The principal studies have been made in Great Britain, the United States and Canada; the findings from them are much in line and all show a significantly higher rate of mortality among cigarette smokers compared with non-smokers. The most important study in this country is that made by Doll and Hill begun in 1951 into the smoking habits and death rates of British doctors.

2. All the major studies show that cigarette smoking is associated with increased mortality from a range of medical conditions and that the three main conditions are lung cancer, bronchitis and coronary heart disease which together account for about four-fifths of the excess mortality of smokers compared with non smokers.

3. In order to calculate the number of deaths in any period which are caused by cigarette smoking the extent to which the total deaths from the main smoking related conditions are attributable to the habit must be known. The research studies referred to above provide the data from which such attributability factors have been derived. These do not enable precise figures to be calculated and this paper draws attention to factors that it has not been possible to take into account. Nevertheless the figures in the following paragraphs give a broad indication of the health consequences of cigarette smoking and the benefits that would follow a substantial reduction in cigarette consumption.

4. The Report of the Royal College of Physicians "Smoking and Health Now" presents figures on the extent to which deaths among persons aged 35 to 64 from cancer of the lung, bronchitis and coronary heart disease are caused by cigarette smoking. No specific figures are given for older persons although it was recognised that the number of deaths certified as due to the main smoking related diseases is much greater than at younger ages and that many thousands of old people who are cigarette smokers die a year or two earlier than they would have done had they not smoked.

5. The attributability factors used in the present calculations are shown in Table 1 and were agreed between representatives of the Department of Health and Social Security, the Office of Population Censuses and Surveys (Medical Statistics Division) and the Government Actuary's Department. Those up to the age of 64 are the same as given

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in "Smoking and Health Now". The representatives of the Departments thought it reasonable to assume a cut-off point at the age of 75 despite the sudden transition from the age group 65 to 74 to that of 75 and over; the main reason for this was the difficulty in quantifying the number of deaths attributable to smoking among such elderly persons.

TABLE 1. PERCENTAGE OF DEATHS FROM CERTAIN CAUSES ATTRIBUTABLE TO CIGARETTE SMOKING

Cause of death *	Age at death		
	35 to 64	65 to 74	75 and over
	per cent		
ICD 162.1, 163.0			
Cancer of lung			
Males	90	90	Nil
Females	40	40	Nil
ICD 491, 492			
Bronchitis			
Males	75	75	Nil
Females	60	60	Nil
ICD 410, 414			
Coronary heart disease			
Males	25	10	Nil
Females	20	10	Nil

(*ICD numbers taken from the International Classification of Diseases, 8th Revision).

6. It should be noted that only the three main smoking related conditions are included in Table 1. The other conditions are excluded because of the difficulty of quantifying the extent to which they cause excess deaths among cigarette smokers. Their exclusion and the ignoring of any deaths among persons aged 75 and over means that the number of deaths when calculated on the basis of Table 1 is understated.

7. The importance of the assumptions of attributability is shown by the following illustration. The number of deaths due to cigarette smoking in 1968 in England and Wales among persons aged under 75 calculated on the factors in Table 1 was 45.5 thousand. If the factors at age 65 to 74 are extended to the age of 75 and over the number of deaths would be 63.5 thousand. If only the factors for cancer of the lung are extended the number of deaths would be 49.2 thousand. Studies on the economic effects of smoking have been made in Canada and attributability factors were used to estimate the number of deaths caused in that country by smoking. The application of the Canadian factors to data for England and Wales for 1968 gives 46.8 thousand deaths under age 75 compared with 45.5 thousand based on the factors in Table 1.

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8. Another factor which has been ignored in the present calculation is any effects on health of the introduction and growing use since the Doll and Hill study commenced of cigarettes with a lower tar delivery. It is reasonable to assume that lower tar cigarettes have some further effect in reducing the incidence of lung cancer but it is not known what allowance should be made for this. However, the calculations in paragraph 10 below are based on known deaths and will thus have implicitly taken some account of the effect of the use of lower tar cigarettes and filters over the past 10 to 20 years.

9. The above relates to mortality. As for morbidity there is a paucity of research data on its association with smoking and attributability factors cannot be calculated in the same way as for mortality. It seems reasonable to assume that the same factors would apply for morbidity as for mortality, that is the factors in Table 1.

10. Based on the factors in Table 1 (which do not take account of deaths among those aged 75 and over) the estimated number of deaths which will occur in 1971 in Great Britain due to cigarette smoking is 52,000. This is one every 10 minutes of the night and day. Figures for 1968 show that among persons under the age of 75 about one in seven of all deaths and one in five of all male deaths were due to cigarette smoking. Among men aged 35 to 44 one in eight of all deaths were due to cigarette smoking, among those aged 45 to 64 one quarter, and those 65 to 74 one fifth.

11. The magnitude of the health hazards of smoking can be underlined by a comparison of the number of deaths due to cigarette smoking and those from various other conditions which give rise to public concern. In 1968 some seven times as many people died because of cigarette smoking than were killed in all motor accidents (although it has to be noted that the latter included a higher proportion of younger persons than the former and also persons of 75 and over). For every five deaths among persons aged under 75 caused by cigarette smoking there were seven from all forms of cancer other than those due to smoking. Again, deaths due to smoking were almost twice the number from all respiratory conditions other than those caused by smoking.

12. A further hazard of cigarette smoking is that expectant mothers who smoke regularly have smaller babies than do those who do not smoke and in consequence there is a higher rate of mortality of the infant at birth and in early life. It has been estimated from survey research data that in 1971 some 1,500 perinatal deaths will occur because of smoking.

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Current health care costs due to smoking

13. The only health service costs which have been brought directly into the calculation are those of the hospital and general practitioner and general pharmaceutical services. Obviously all services will be affected in some degree and allowance has been made indirectly for this as described in paragraph 16.

14. The number of hospital beds occupied by patients with the three main smoking conditions listed in Table 1 were derived from the Hospital In-patient Enquiry and the factors in the same table enabled the number occupied on account of cigarette smoking to be calculated. These were reckoned as acute beds and their cost was taken as the equivalent proportion of the total cost of beds in acute hospitals. On that basis the estimated cost in 1970-71 was £25 million.

15. There are but few data on the use of the general practitioner services to assist in the estimation of the proportion of the total cost of that service and the associated pharmaceutical service which is incurred in the treatment of conditions induced by smoking. What data are available are derived from surveys, and the validity of these in reflecting the number of consultations due to particular conditions is open to question especially in the case of those conditions which in the early stages gave rise to non-specific symptoms.

16. Three sets of survey findings have been used in arriving at estimated costs. The first is that from a survey over the period May 1955 to April 1956 covering 106 general practices in England and Wales; the second from a survey of 35 practices in Exeter from 1 November, 1966, to 31 October, 1967; and the third from a short-term survey of one group practice in Bristol and another in Smethwick in early 1971. The three surveys produced different results and the figure of £11 million for 1970-71 which is taken as the cost of the general practitioner and pharmaceutical services due to smoking is based on the findings from the largest and widest spread survey (made 15 years ago) which revealed the largest proportion of consultations due to illness associated with smoking. This figure is subject to wide error but any overstatements will be offset by those health care costs, for example on home nursing, which have not been brought into the calculation.

17. The total annual current health care costs incurred by the hospital, family doctor and general pharmaceutical services in the treatment of smoking-induced disease is thus £36 million.

Changes in mortality and health care costs due to reductions of 20 per cent and 40 per cent in cigarette smoking

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Time lag in changes in mortality and morbidity

18. An assumption in the present exercise is that the reductions in cigarette smoking of 20 per cent and 40 per cent will occur over a five-year period and that thereafter the proportion of cigarette smokers among the population will fall no further. On the basis of the available research findings on the time lag between a fall in cigarette smoking and a fall in mortality due to smoking it has been assumed that whatever reduction in smoking is effected a reduction of similar proportion in mortality attributable to smoking and in corresponding morbidity will occur 10 years later. Thus, for the purposes of this study, if a fall in smoking is achieved in five years the assumption is that the full health consequences will occur 15 years after the start of the fall in smoking.

Reduction in the number of deaths caused by cigarette smoking

19. On the basis of the factors in Table 1 the estimated number of deaths in Great Britain caused by smoking, with no reduction and with 20 per cent and 40 per cent reductions in smoking achieved evenly over the five years commencing April 1972, are shown in Table 2. These figures take account of the projected changes in population structure and the general improvement in mortality over the period to 2001; the effect of these can most clearly be seen in the number of deaths estimated to occur with no reduction in smoking – a fall from 52,000 in 1971 to 46,000 in 2001.

TABLE 2. ESTIMATED NUMBER OF DEATHS IN GREAT BRITAIN CAUSED BY CIGARETTE SMOKING

	(In '000s)				
	If no fall in smoking	If fall in smoking of 20 per cent	Reduction in the number of deaths if fall in smoking		
			40 per cent	20 per cent	40 per cent
1971 . . .	52	52	52	–	–
1981 . . .	52	44	36	8	16
1991 . . .	48	38	28	10	20
2001 . . .	46	37	28	9	18

20. Table 2 shows that in 1981 8,000 less people will die from smoking causes if smoking is reduced by 20 per cent compared with the number who would die were there no reduction, while with a 40 per cent reduction the saving in such deaths would be doubled. The savings would increase to about 10,000 and 20,000 a year, respectively, after 15 years, although these numbers would fall slightly by the end of the century.

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21. It must be emphasised that the savings of deaths referred to in paragraph 20 relate only to deaths from smoking causes in selected years. If the increased number of deaths from causes other than cigarette smoking is taken into account the deaths saved are considerably fewer, viz. 7,000, 5,000 and 2,000, respectively, in the three selected years on a reduction of 20 per cent and double these numbers on a reduction of 40 per cent. The total number of persons saved from dying over the 10 years 1972 to 1981 because of a 20 per cent cut in smoking would be 25,000; over the 20 years to 1991 it would be 90,000; and over the 30 years to 2001 it would be 150,000. Of the latter, about 50,000 would die below the age of 50. Corresponding figures for a 40 per cent cut are 50,000, 150,000, 260,000 and 100,000.

Changes in health care costs

22. In estimating the effects of reductions in smoking on health care costs in 1981, 1991 and 2001, account has to be taken of the lesser morbidity resulting from a lower level of smoking and of any changes in the size and make up (in terms of sex and age) of the population consequential to the lower mortality from smoking. A reduction in mortality due to smoking means in practice a postponement of death; some people who are saved from dying from smoking related conditions in, say, 1972 will die in that year from non related conditions. Up to 2001 (and indeed later) the saving in deaths attributable to smoking will exceed the increase in the number not attributable to smoking and thus the projected population will be larger than if there had been no reduction in smoking.

23. The lower morbidity resulting from the fall in smoking will tend towards a saving in health care costs but the larger population will tend towards an increase.

24. The assumption has already been made that, in relation to smoking, morbidity will change in the same way as mortality. A further assumption is that health care costs will change in the same way as morbidity. Changes in mortality are thus taken as an index of changes in health care costs. This means that if the number of deaths caused by a lower level of smoking in a particular year was one-tenth less than the number which would occur with no reduction in smoking then attributable health care costs would fall by one-tenth.

25. Health care costs in 1970-71 due to smoking were £36 million (see paragraph 17). The number of deaths caused by cigarette smoking estimated to occur in 1981, 1991 and 2001 with 20 per cent and 40 per cent reductions in smoking are given in Table 2. The reductions in

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health care costs due to reduced morbidity are given in the second column of Table 3 (below).

26. Calculations of the Government Actuary's Department show that the extra populations in 1981, 1991 and 2001 which would result from the reduced mortality due to a reduction in smoking would have a much higher proportion of elderly persons than has the 1971 population. The extra health care costs of the enlarged populations have been calculated pro rata the 1971 costs per head of population with allowance (in broad terms) for the larger proportion of the elderly. The extra costs are given in the third column of Table 3. The fourth column of the table shows the net changes in health care costs.

TABLE 3. EFFECTS ON HEALTH CARE COSTS OF REDUCTIONS OF 20 PER CENT AND 40 PER CENT IN CIGARETTE SMOKING

	<i>Reduction in costs due to reduction in morbidity</i> (£ million)	<i>Increase in costs due to increase in population</i> (£ million)	<i>Net changes in costs</i> (£ million)
20 per cent reduction in smoking			
1981	6	2	4 less
1991	10	6	4 less
2001	10	12	2 more
40 per cent reduction in smoking			
1981	11	4	7 less
1991	17	16	1 less
2001	17	22	5 more

Effects in human terms

27. What a reduction in ill-health and premature death would mean in terms of reduced suffering and distress cannot be quantified and must largely be a matter only for imagination and individual judgement. But in factual terms if smoking were reduced by 40 per cent there would 20 years later be more than 100,000 fewer widows and widowers (many would have dependent children) and nearly 2,000 fewer people in hospital. In descriptive terms, carcinoma of the bronchus can cause pain that may not respond even to the most powerful pain relieving drugs and coronary heart disease too can cause intense pain. Also distressing is the limitation of activity and the anticipation of further attacks or of sudden death. Death from chronic bronchitis is very long drawn out and the lung damage may make almost any activity impossible without

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severe breathlessness until finally, even when completely bedridden, the patient has to struggle for every breath.

Current sickness absence and social security payments due to smoking

28. When the attributability factors in Table 1 are applied to sickness absence records for the 12 months ending May 1969 it is estimated that 26 million days absence were caused by cigarette smoking. For the purposes of this calculation all spells of sickness certified as chronic bronchitis together with all spells certified as bronchitis (unqualified) lasting 30 or more days were included as chronic bronchitis, that is, as a main smoking related condition. Any shorter spells were not included.

29. On the basis of the rates of payment in 1970-71 the cost of sickness benefit paid for these 26 million days was £30 million. A further debit is the sum of £8 million (excluding S.I.T) for national insurance contributions not paid. The sum of these two items is thus £38 million. In addition to the cost of sickness absence from work attributed to smoking there is the cost of widows pensions paid to widows of those who have died as a result of smoking, and it is likely that this constitutes an amount similar to the cost of sickness absence. Offset against these costs, however, is the amount of retirement pension that would have been paid had those who have died over the last 30 or so years due to smoking survived to enjoy a period of retirement. It is not possible to estimate with any reliability the cost of retirement pensions to those who have already died, but it is likely that it would exceed the combined cost of sickness absence from work and the benefits paid to widows of smokers.

Changes in social security payments due to reductions of 20 per cent and 40 per cent in smoking

30. The reductions in smoking will result in less sickness absence and hence less sickness benefit paid and more national insurance contributions received. The net result of these factors is shown in Table 4. The extra population will result in enlarged payments for sickness benefits and retirement pensions but more national insurance contributions received and smaller payments for widows pensions. The third column of Table 4 shows the net result of these and the fourth column the overall changes in expenditure.

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TABLE 4. EFFECT ON SOCIAL SECURITY PAYMENTS OF REDUCTIONS OF 20 PER CENT AND 40 PER CENT IN CIGARETTE SMOKING

	<i>Net change in expenditure due to reduction in sickness absence</i> (£ million)	<i>Net change in expenditure due to increase in population</i> (£ million)	<i>Total net change in payments</i> (£ million)
20 per cent reduction in smoking			
1981	6 less	2 more	4 less
1991	10 less	11 more	1 more
2001	11 less	21 more	10 more
40 per cent reduction in smoking			
1981	12 less	3 more	9 less
1991	18 less	23 more	5 more
2001	18 less	42 more	24 more

Combined effect on health and social security costs

31. Paragraph 17 shows that expenditure on health care due to smoking is currently £36 million a year; in paragraph 29 it is said that social security payments cannot be estimated with any reliability but that the payments that are not made because of smoking probably exceed the extra payments that are made.

32. The effects of 20 per cent and 40 per cent reductions in cigarette smoking on overall health care and social security costs are shown in Table 5 (below).

TABLE 5. NET EFFECT ON HEALTH CARE AND SOCIAL SECURITY COSTS

	<i>Health care costs</i> (Table 3) (£ million)	<i>Social security payments</i> (Table 4) (£ million)	<i>Net changes in costs</i> (£ million)
20 per cent reduction in smoking			
1981	4 less	4 less	8 less
1991	4 less	1 more	3 less
2001	2 more	10 more	12 more
40 per cent reduction in smoking			
1981	7 less	9 less	16 less
1991	1 less	5 more	4 more
2001	5 more	24 more	29 more

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B. EFFECTS OF A REDUCTION IN CIGARETTE SMOKING ON PRODUCTIVE POTENTIAL

Increase in the population of working age

33. The current working population of Great Britain is approximately 25 million, of which 14 million are male and 9 million female.

34. It is estimated that the following increases in the population of males under 65 years of age and of females under 60 years old would result from reductions in cigarette smoking of 20 per cent and 40 per cent:

		<i>As percentage of current working population</i>	
With 20 per cent reduction in smoking	1981	7,000	0.07
	1991	21,000	0.08
With 40 per cent reduction in smoking	1981	16,000	0.06
	1991	47,000	0.12

35. Almost all the addition to the labour force would be males in the 45 to 64 age group, and the potential addition to GDP might therefore be somewhat more than pro rata on this account.

Reductions in sickness absence from work

36. Paragraph 28 estimates that a total of 26 million days were lost in the 12 months June 1988 to May 1990 as a result of sickness which was attributable to smoking. This is an average of almost precisely 1 day per head of working population, made up of 1½ days per man and ¾ day per woman. On the basis of an effective 230 days per head per year at work this represents an equivalent of 0.43 per cent of the total of all working days.

37. It has been assumed that the 20 per cent and 40 per cent reductions in smoking would have 70 per cent of their effect in reducing sickness absence by 1981 and 100 per cent by 1991. On this basis:

20 per cent reduction would save 3.6 million days of sickness in 1981.
5.2 million days of sickness in 1991.

40 per cent reduction would save 7.3 million days of sickness in 1981.
10.4 million days of sickness in 1991.

38. If these amounts are applied to the total number of working days as indicated above a proportionate increase in GDP is achieved as follows:

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		<i>Per cent</i>	
20 per cent reduction	1981	.	0.062
	1991	.	0.09
40 per cent reduction	1981	.	0.127
	1991	.	0.181

39. The two sets of estimates together give the following increase in productive potential:

		<i>Population effect</i>	<i>Sickness absence effect</i>	<i>Total effect</i>
20 per cent reduction	1981	0.03	0.06	0.1
	1991	0.08	0.09	0.2
40 per cent reduction	1981	0.06	0.13	0.2
	1991	0.19	0.18	0.4

Applied to the 1970 GDP of £42,000 million, 0.1 per cent amounts to £42 million.

40. Assuming no further reduction in cigarette smoking, the whole of the "sickness absence effect" would have been reaped by 1991. There would be some small further population effect after 1991 taking the additional productive potential up to perhaps ¼ per cent on the 20 per cent reduction and ½ per cent on the 40 per cent reduction by the year 2006.

41. As already pointed out, the assumed reductions in smoking would reduce some health care and social security costs, but others would be increased because the increased population would require more services and benefits, particularly in old age. The small net gain during the first 15 to 20 years would, however, allow an increase in resources to be devoted to improving the Health Service or to increasing GDP in other forms. The substantial increase in the total of pensions payments would represent in real resource terms a charge upon the higher level of GDP that may be attained.

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