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THE MORTALITY OF DOCTORS IN RELATION TO THEIR SMOKING HABITS

A PRELIMINARY REPORT

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In the last five years a number of studies have been made of the smoking habits of patients with and without lung cancer (Doll and Hill, 1950, 1952; Levin, Goldstein, and Gerhardt, 1950; Mills and Porter, 1950; Schrek, Baker, Ballard, and Dolgoff, 1950; Wynder and Graham, 1950; McConnell, Gordon, and Jones, 1952; Koulumies, 1953; Sadowsky, Gilliam, and Cornfield, 1953; Wynder and Cornfield, 1953; Breslow, Hoaglin, Rasmussen, and Abrams, 1954; Watson and Conte, 1954). All these studies agree in showing that there are more heavy smokers and fewer non-smokers among patients with lung cancer than among patients with other diseases. With one exception (the difference between the proportions of non-smokers found by McConnell, Gordon, and Jones) these differences are large enough to be important. While, therefore, the various authors have all shown that there is an "association" between lung cancer and the amount of tobacco smoked, they have differed in their interpretation. Some have considered that the only reasonable explanation is that smoking is a factor in the production of the disease; others have not been prepared to deduce causation and have left the association unexplained.

Further retrospective studies of that same kind would seem to us unlikely to advance our knowledge materially or to throw any new light upon the nature of the association. If, too, there were any undetected flaw in the evidence that such studies have produced, it would be exposed only by some entirely new approach. That approach we considered should be "prospective."* It should determine the frequency with which the disease appeared, in the future, among groups of persons whose smoking habits were already known.

Method of Investigation

To derive such groups of persons with different smoking habits we wrote in October, 1951, to the members of the medical profession in the United Kingdom and asked them to fill in a simple questionary. In addition to giving their name, address, and age, the doctors were asked to classify themselves into one of three groups—namely, (*a*) whether they were, at that time, smoking; (*b*) whether they had smoked but had given up; or (*c*) whether they had never smoked regularly (that is, had never smoked as much as one cigarette a day, or its equivalent in pipe tobacco, for as long as one year). All present smokers and ex-smokers were asked additional questions. The former were asked the ages at which they had started smoking and the amount of tobacco that they were smoking, and the method by which it was consumed, at the time of replying to the questionary. The ex-smokers were asked similar questions but relating to the time at which they had last given up smoking.

The questionary was intentionally kept short and simple in the hope of encouraging a high proportion of replies, without which the inquiry must have failed. In a covering letter the doctors were invited to give any information on their smoking habits or history which might be of interest, but, apart from that, no information was asked for about previous changes in habit (other than the amount smoked prior to last giving up, if smoking had been abandoned). It was, of course, realized that the habits of early adult life might well be more relevant to the development of a disease with a long induction period than the most recent habits. On the other hand, we regarded the procedure adopted as justified, not only because of the extreme difficulty of obtaining sufficiently accurate records of past smoking habits, but also because of the experience of our previous retrospective investigation (Doll and Hill, 1952). This investigation, in which nearly 5,000 patients were interviewed, had shown that the classification of smokers according to the amount that they had most recently smoked gave almost as sharp a differentiation between the groups of patients with and without lung cancer as the use of smoking histories over many years—theoretically more relevant statistics, but clearly based on less accurate data.

From their replies to the questionary the doctors were classified into broad groups according to age, the amount

O.E.D. Characterized by looking forward into the future. (Leigh Hunt: "He was a retrospective rather than a prospective man.")

of tobacco smoked, the method of smoking, and whether smoking had been continued or abandoned. These groups, based upon smoking habits at the end of 1951, form the "exposed to risk."

To complete the investigation it was necessary to obtain information about the causes of death of all those doctors who had replied to the questionary and who subsequently died. Through the courtesy of the Registrars-General in the United Kingdom a form showing particulars of the cause of death has been provided for every death of a doctor registered since the questionary was sent out. Each form relating to a doctor who had completed the questionary has been extracted and allocated to the smoking group in which that doctor had previously been placed. Hence it has been possible to calculate the death rates from different causes within each of the main smoking categories.

The Exposed to Risk

The questionary was sent out on October 31, 1951, to 59,600 men and women on the *Medical Register*. Of the 41,024 replies received, 40,564 were sufficiently complete to be utilized. Of this total, however, 10,017 related to men under the age of 35 and 6,158 to women of all ages. Since lung cancer is relatively uncommon in women and rare in men under 35, useful figures are unlikely to be obtained in these groups for some years to come. In this preliminary report we have therefore confined our attention to men aged 35 and above. The numbers of them who had (*a*) never smoked regularly, (*b*) smoked greater or less amounts of tobacco, or (*c*) smoked cigarettes or pipes or both cigarettes and pipes are shown in Tables I and II. It will be seen that in this population the distribution of

TABLE I.—*Amount of Tobacco Smoked. Male Doctors Aged 35 Years and Above*

Age in Years	No. of Non-smokers	No. of Men Smoking† a Daily Average of:			Total No. of Men
		1 g.–‡	15 g.–	25 g.+	
35–44	1,457 (16·3%)	2,864 (32·1%)	2,888 (32·4%)	1,716 (19·2%)	8,925 (100·0%)
45–54	835 (11·7%)	2,087 (29·2%)	2,332 (32·7%)	1,886 (26·4%)	7,140 (100·0%)
55–64	377 (9·3%)	1,376 (33·9%)	1,283 (31·6%)	1,027 (25·3%)	4,063 (100·1%)
65–74	231 (8·6%)	1,218 (45·2%)	807 (30·0%)	438 (16·3%)	2,694 (100·1%)
75–84	164 (11·8%)	768 (55·3%)	326 (23·5%)	132 (9·5%)	1,390 (100·1%)
85 and above	29 (16·4%)	118 (66·7%)	26 (14·7%)	4 (2·3%)	177 (100·1%)
All ages (Crude %)	3,093 (12·7%)	8,431 (34·6%)	7,662 (31·4%)	5,203 (21·3%)	24,389 (100·0%)

† The figures include (*a*) men smoking the given amounts at the end of 1951, and (*b*) ex-smokers smoking the given amounts at the time they gave up smoking.

‡ 1 cigarette equals 1 g.; 1 oz. of tobacco a week taken to equal 4 g. a day.

TABLE II.—*Method of Smoking. Male Doctors Aged 35 Years and Above*

Age in Years	No. of Men Smoking			Total No. of Smokers
	Pipes	Pipes and Cigarettes§	Cigarettes	
35–44	1,001 (13·4%)	1,240 (16·6%)	5,227 (70·0%)	7,468 (100·0%)
45–54	843 (13·4%)	1,301 (20·6%)	4,161 (66·0%)	6,305 (100·0%)
55–64	630 (17·1%)	991 (26·9%)	2,065 (56·0%)	3,686 (100·0%)
65–74	601 (24·4%)	661 (26·8%)	1,201 (48·8%)	2,463 (100·0%)
75–84	411 (33·5%)	288 (23·5%)	527 (43·0%)	1,226 (100·0%)
85 and above	72 (48·6%)	23 (15·5%)	53 (35·8%)	148 (99·9%)
All ages (Crude %)	3,558 (16·7%)	4,504 (21·2%)	13,234 (62·1%)	21,296 (100·0%)

§ The few men who smoked cigars have been classed as mixed pipe and cigarette smokers.

*The Registrars-General of England and Wales, Scotland, Northern Ireland, the Isle of Man, Jersey, and Guernsey.

smoking habits varies considerably with age. Since cancer incidence also varies greatly with age it will be necessary to use death rates at specific ages, or a rate standardized for age, when comparing the mortality among the men in the different smoking categories.

It may well be that the smoking habits of the 40,564 doctors who replied to us are not representative of the smoking habits of all doctors. One category may have tended to reply more readily than another. We shall not, however, need to use the replies in total but always separately within the four smoking divisions. All that we require are sufficient numbers within each of those divisions.

The Deaths

In the 29 months that have elapsed since the questionaries were sent out (November, 1951, to March, 1954, inclusive), 789 deaths have been reported among the male doctors who were aged 35 years and above at the time that they completed the questionary. Of these deaths, 35 were certified as due to lung cancer; in one further case lung cancer was reported as contributing to death without being the direct cause. We wrote to the doctor certifying the cause of death in each of these 36 cases and asked him to tell us the nature of the evidence upon which his diagnosis was based. The information received is analysed in Table III. There were firm grounds for the diagnosis in at least 33 of the cases, and in only three was the evidence limited to clinical examination.

TABLE III.—*Criteria on Which Diagnosis of Primary Lung Cancer was Established*

Diagnostic Criteria	No. of Cases	% of Total
I. Histological evidence of carcinoma, plus evidence of the site of the primary tumour from necropsy, operation, bronchoscopy, or radiological examination	21*	58
II. Evidence of the site of the primary tumour from operation (2), bronchoscopy (3), or radiological examination (7), without histological evidence	12	33
III. Evidence from clinical examination only	3	9
All cases	36	100

* 7 squamous-cell carcinoma, 9 oat-cell and anaplastic carcinoma, 3 adenocarcinoma, and 2 cell type undetermined.

Preliminary Results

Amount of Smoking

Death rates from six groups of diseases have been calculated for each of the categories of men classified as non-smokers or as having smoked greater or smaller amounts of tobacco. The rates have been standardized for age (by the direct method), using the total male population of the United Kingdom on December 31, 1951, as the standard population.† The resulting annual rates for each smoking category from all causes of death and from six causes separately are shown in Table IV. It will be seen that the death rate from lung cancer increased steadily from 0.00 per 1,000 in non-smokers to 1.14 per 1,000 among the men recorded as having smoked 25 or more grammes of tobacco daily. A similar but less steep rise is also seen in the death rate from coronary thrombosis (from 3.89 per 1,000 in non-smokers to 5.15 in the heaviest smokers). In the other disease groups the changes in mortality are irregular and, for the most part, small.

The statistical significance of these differences in the death rates can be more easily assessed from the actual numbers of deaths recorded; that is, by comparing them with the numbers which would have been expected to occur in each smoking category if smoking were quite unrelated to the chance of dying of lung cancer. For example, 13 men aged

†Thus for each of the four smoking categories in Table I death rates were separately calculated, for each age group. These age rates were then applied to the corresponding U.K. populations in 1951 to reach the death rate at all ages that would have prevailed in the U.K. population if it had experienced the various rates at ages of a particular smoking group.

TABLE IV.—*Standardized Death Rate Per Annum Per 1,000 Men Aged 35 Years and Above in Relation to the Most Recent Amount of Tobacco Smoked*

Cause of Death	No. of Deaths Recorded	Death Rates of Non-smokers	Death Rates of Men Smoking a Daily Average of			Death Rate of All Men
			1 g.–	15 g.–	25 g. +	
Lung cancer	36*	0·00	0·48	0·67	1·14	0·66
Other cancers	92	2·32	1·41	1·50	1·91	1·65
Respiratory disease (other than cancer)	54	0·86	0·88	1·01	0·77	0·94
Coronary thrombosis	235	3·89	3·91	4·71	5·15	4·27
Other cardiovascular diseases	126*	2·23	2·07	1·58	2·78	2·14
Other diseases	247	4·27	4·67	3·91	4·52	4·36
All causes	789	13·61	13·42	13·38	16·30	14·00

* 1 case in which lung cancer was recorded as a contributory but not a direct cause of death has been entered in both groups.

55–64 when the questionary was completed subsequently died of lung cancer. The proportions of all the men in this age group who were non-smokers, smoked 1–14 g. a day, 15–24 g. a day, or 25 or more g. a day were 9.3%, 33.9%, 31.6%, and 25.3%. If the mortality from lung cancer is unrelated to smoking, then the 13 deaths should be distributed to the smoking groups in these ratios. Similar calculations have been made for the numbers of men dying of lung cancer in the other age groups—namely, 1 at ages 35–44, 8 at ages 45–54, 6 at ages 65–74, and 8 at ages 75–84. The total numbers of deaths expected in each smoking category were then obtained by adding the numbers for the separate age groups. The results were as follows :

	Non-smokers	Smokers of a daily average of			Total
		1 g.–	15 g.–	25 g. +	
Observed deaths	0	12	11	13	36
Expected deaths	3·77	14·20	10·73	7·33	36·03

These differences between the observed and expected deaths are statistically significant ($\chi^2=8.5$, n=3, P=0.04). We may note, too, that the ordinary χ^2 test of significance fails to take into account the biologically important finding that there is a continuous increase in the proportion of observed to expected deaths as the amount of tobacco smoked increases—a finding which makes it possible to attach a simple interpretation to the results.†

In none of the other disease groups are the differences between the observed and expected number of deaths found to be significant. The continuous change in the ratio between the observed and expected deaths from coronary thrombosis is, however, suggestive.‡ For all causes of death taken together, there is an excess mortality among smokers of 25 or more g. a day and a corresponding deficiency of deaths, almost equally divided, among the non-smokers and the men in the less heavy smoking categories. The differences are statistically significant ($\chi^2=8.8$, n=3, P=0.03). When, however, the lung cancer deaths are omitted, the differences are no longer significant ($\chi^2=6.5$, n=3, P=0.09).

The distinction between the systematic variation in the mortality from lung cancer with the amount smoked and the irregular (or small) variation observed in the other disease groups studied is perhaps shown more clearly in the Chart.

Method of Smoking

With the very simple form of questionary that we deliberately employed we can distinguish the different types of smokers only according to whether they were smokers of cigarettes, of pipes, or of both cigarettes and pipes, at a given point of time—that is, for smokers at the time they filled in the questionary and for ex-smokers at the time that they had previously given up smoking. It is clear, therefore, that the real numbers of "pure" cigarette smokers and of "pure pipe smokers must be less, and, almost certainly, appreciably less, than those we have allocated to those groups. Evidence of this was, in fact, provided by some doctors who volunteered additional information that they had in previous years smoked their tobacco by different methods and in different amounts. Any real difference between the risks associated with cigarette and with pipe smoking must therefore be blurred in our figures, since each group will contain men who have also been exposed, in part, to whatever risks may be associated with the other type of smoking.

With that very material proviso in mind, we note that, of the 36 men with lung cancer, 25 had reported themselves as cigarette smokers, 4 as pipe smokers, and 7 as smokers of both cigarettes and pipes. If the method of smoking were entirely unassociated with the risks of lung cancer we would have expected (by the method of calculation described above) these 36 cases to be subdivided in the following proportions : 19.6 cigarette smokers, 7.6 pipe smokers, 8.8 cigarette and pipe smokers. While there is an observed excess of cigarette smokers and a deficit of pipe smokers amongst the deaths, the differences are not statistically significant ($\chi^2=3.5$, n=2, P>0.10), and with the present number of deaths it has not been possible to allow adequately for differences in the amount smoked.

In none of the other five disease groups studied was there a significant difference between the observed and expected deaths for the different types of smokers, and the actual differences were, in fact, smaller than those we have reported above for the deaths from lung cancer.

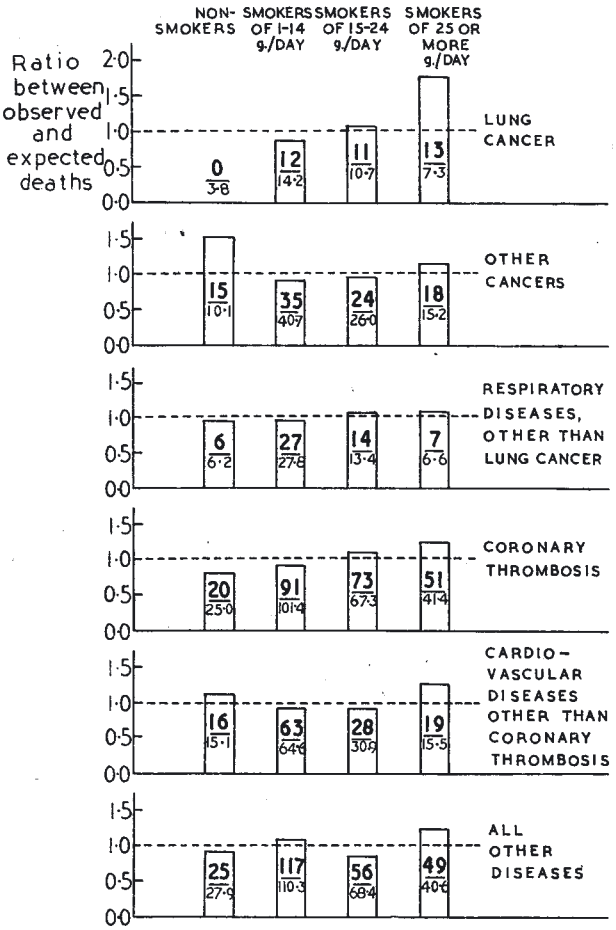

Chart showing variation in mortality with amount smoked. The ordinate shows the ratio between the number of deaths observed and the number expected (as entered in each column).

†The present data provide a special case of the general problem of assessing the significance of a trend, considered by Yates (1948). By his method we obtain $\chi^2=7.7$, n=1, P<0.01.

‡By Yates's method it is statistically significant. $\chi^2=4.6$, n=1, P=0.03.

Comparison Between the Results of the Retrospective and Prospective Inquiries

The relative excess of cigarette smokers and the corresponding deficit of pipe smokers in the 36 cancer of the lung deaths amongst the doctors, though not formally significant, at least does not run counter to the tentative conclusion of a lower risk to pipe smokers that we drew from the data obtained from hospital patients. More striking, however, is the similarity we find in the two inquiries in the upward trend of the death rate from cancer of the lung that accompanies increased *amount* of smoking. In our previous "backward" inquiry we made estimates of the death rates among residents in Greater London in 1950 who had smoked different quantities of tobacco. These estimates we have now recalculated to bring them into line with the slightly different methodology of our present analysis—that is, we have limited the rates to ages 45–74, we have standardized them on the total male population of the U.K. at December 31, 1951, and we have based them upon the most recent smoking history of the patient instead of upon a longer-term history. The results, together with the corresponding figures for doctors, are set out in Table V.

TABLE V.—*Standardized Death Rates from Cancer of the Lung Per 1,000 Men Aged 45–74 Years in Relation to the Most Recent Amount of Tobacco Smoked, Estimated from (a) the "Backward" Inquiry into the Histories of Patients with Cancer of the Lung and Other Diseases in London* (1952), *and (b) from the Present "Forward" Inquiry into the Mortality of Doctors* (1954)

	Non-smokers	Smokers of: 1–14 g./day	15–24 g./day	25 g. +/day	All Groups*
Standardized rates					
"Backward" study of patients' histories	0·11	1·56	2·20	4·00	1·97
"Forward" study of mortality of doctors	0·00	0·50	0·97	1·45	0·73
Each rate as % of the rate for all groups					
"Backward" study of patients' histories	6%	79%	112%	203%	100%
"Forward" study of mortality of doctors	0%	68%	133%	199%	100%

* The unweighted average of the four rates.

The actual rates for the doctors are, it will be seen, very materially less than those we have estimated for the males of Greater London. On the other hand, there is a remarkable similarity in the increases in mortality from non-smokers to "light" smokers, from "light" smokers to "medium" smokers, and, finally, from "medium" smokers to "heavy" smokers. In the "backward" group the percentages of the average rate are 6, 79, 112, and 203; in the "forward" group they are 0, 68, 133, and 199. Remembering that at these ages we have only 27 deaths of doctors to analyse, the similarity is perhaps too good to be true; it may well be due partly to chance. We would, however, suggest that it is at least reasonable to conclude that there is no incompatibility between the results of the two inquiries in their measurements of the increase of mortality from lung cancer in relation to the increases in smoking.

The incompatibility lies, as observed above, in the actual level of the rates in the two inquiries. Why should the rates for the doctors be so much lower? One important reason—and one which applies to all causes of death and not only to lung cancer—is, we believe, that doctors who were already ill of a disease likely to prove fatal within a short space of time would have been disinclined, or indeed unable, to answer our inquiries. In other words, we should learn of their deaths, but we would have no corresponding completed questionary on our files. That this may well be true is shown (*a*) by the relatively low death rate from all causes that we have recorded—namely, 14.0 per 1,000 per annum, against 24.6 per 1,000 for men of all social classes in the same age group in the U.K. in 1951, and (*b*) by the fact that over the 29 months of the investigation there has been a rise in the proportion of the deaths sent to us by the Registrars-General for which we have been able to find a completed questionary. If persons sick of a fatal illness were unwilling to reply, or, indeed, never saw our communication, that bias would tend to wear off with the passage of time—as it shows signs of doing.

The question is whether such a bias would differentially affect the mortality of the smoking group. Could it artificially produce the gradient that we have observed with cancer of the lung, and probably with coronary thrombosis, whilst not producing any gradient with other causes of death? For such an effect we should have to suppose that the heavier smokers who already knew that they had cancer of the lung tended to reply more often than non-smokers, or lighter smokers, in a similar situation. That would not seem probable to us. As evidence to the contrary we would also add (*a*) that, although the numbers of deaths are admittedly very small, we have not seen any obvious change in the lung cancer gradient over the 29 months of the inquiry, and (*b*) that it would be surprising if a gradient produced in this way so closely resembled the gradient we obtained in our retrospective inquiry.

Other factors than this may have contributed to the lower death rates from cancer of the lung recorded for the doctors. There may well be differences between them and our male London patients in methods of smoking (use of pipes as against cigarettes), and there may be differences in the age of starting to smoke. The London rates are, too, we know, higher than the rates for the country as a whole, and it was from the latter that the doctors were drawn.

The Diagnoses

It might perhaps be argued that physicians in reaching a diagnosis of cancer of the lung have been biased by the patient's smoking history. We have, however, already shown in Table III that there was little doubt of the diagnosis in the great majority of the deaths. That would not, of course, meet the point that the physician might take more active steps to make a diagnosis in a heavy smoker than in a light or non-smoker, but, if that were the case, deaths from other causes would have to be proportionately less in the groups of heavier smokers. There is certainly no sign of that in our present figures, and the steadiness of the upward gradient among smokers would seem to make such a bias very unlikely.

Conclusion

If, as we think, the association between smoking and the disease is real and not due to some such bias as we have discussed, it is likely that the increase in mortality with the amount smoked is, in fact, greater than that indicated by our present figures. The rates we give were calculated from the limited data obtained in reply to a simple questionary, and related (apart from non-smokers) to smoking habits at a single point of time. No attention was paid to the changes in smoking history that many men experience—even when we had evidence of such changes. Consequently the group of doctors classified by us as light smokers (smokers of 1–14 g. a day) may well contain an appreciable proportion of persons who have for many years—and possibly for the more relevant years—smoked larger amounts of tobacco; and (perhaps to a less extent) the group of heavy smokers (smokers of 25 or more g. a day) may contain men who for the most part of their lives have smoked much less.

Evidence of these changes was provided, as pointed out previously in relation to the relative risks of cigarette and pipe smoking, by some doctors who volunteered statements on their forms that they had previously smoked different amounts of tobacco. We know, for instance, that among those who subsequently developed lung cancer one had been smoking 25 cigarettes a day and 1 oz. of pipe tobacco a week until he cut down to 12 cigarettes a day on his retirement in 1945. Another had changed from 25 to 30 cigarettes a day to 5 oz. of pipe tobacco a week (equivalent

to 20 cigarettes a day) in September, 1951. In another instance, the doctor had described himself as smoking 3½ oz. of pipe tobacco a week, but a friend, who signed the death certificate and had known him for 25 years, stated he had previously been one of the heaviest smokers of both cigarettes and pipe he had ever known. Such factors not only could not produce an exaggeration of the true relationship but must lead to an understatement of it by inflating the mortality among light smokers and reducing the mortality among heavy smokers.

The investigation has not, as yet, continued long enough to show whether there is a relationship between smoking and the mortality from any other disease, but from the preliminary figures it would seem unlikely that there is any as close as that observed with lung cancer. The numbers of deaths, however, from some potentially interesting diseases are as yet small (for example, from cancer of the buccal cavity and larynx and from duodenal ulcer). There have, on the other hand, been a large number of deaths attributable to coronary thrombosis. It seems clear that smoking cannot be a major factor in their production, but the steady increase in mortality with the amount of tobacco smoking recorded suggests that there is a subgroup of these cases in which tobacco has a significant adjuvant effect.

Summary

At the end of 1951 some 40,000 men and women on the British *Medical Register* replied to a simple questionary relating to their smoking habits. On that basis they were divided into non-smokers and three groups of smokers (including ex-smokers) according to the amount they smoked at that time (or when they gave up).

The certified causes of death of those men and women who have since died have been supplied by the Registrars-General of the U.K. over the ensuing 29 months. This preliminary report is confined to the deaths among the 24,389 men over the age of 35.

Though the numbers of deaths at present available are small the resulting rates reveal a significant and steadily rising mortality from deaths due to cancer of the lung as the amount of tobacco smoked increases. There is also a rise in the mortality from deaths attributed to coronary thrombosis as the amount smoked increases, but the gradient is much less steep than that revealed by cancer of the lung. The other groups of deaths so far analysed reveal no gradient (other forms of cancer, other forms of cardiovascular disease, respiratory diseases, all other causes).

The figures for cancer of the lung are in conformity with those found previously in an extensive inquiry into the smoking histories of patients with cancer of the lung and with other diseases.

The death rates of doctors here reported are, almost certainly, artificially low. There is evidence that this is due to a reluctance, or inability, of persons suffering from a fatal illness to reply to the questionary. In spite of this defect and the present small numbers of deaths, we thought it necessary, in view of the nature of the results, to lay these preliminary observations before the survivors of the 40,000 men and women who made them possible.

We are most grateful to the British Medical Association for having dispatched the questionaries and letters to the doctors on our behalf; to the individual doctors for having completed the questionaries; and to those practitioners and consultants to whom we wrote for details of the evidence on which the diagnosis of lung cancer was made. We are deeply indebted to the Registrars-General of the United Kingdom for information about the deaths of doctors. We also offer our thanks to Dr. P. Armitage, who suggested the use of Yates's method of assessing the significance of a trend, and to Mrs. Joan Bodington, Miss Muriel Greening, and Miss Keena Jones for the onerous work of filing, coding, and enumerating the questionaries.

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Commentary: scientific articles have hardly changed in 50 years

Richard Smith

The simultaneous publication of a scientific study from 50 years ago and its current update provides an opportunity for observing changes in presentation. The over-riding impression is of little change. In the 50 years during which men have landed on the moon, computers and the internet have appeared, television and cars have been transformed, the scientific article has changed hardly at all. Does this reflect the robustness of the form or a failure of imagination? I suspect the latter.

The 1954 article was shorter, had fewer references, slightly fewer statistical tests, more basic descriptive data, and crudely drawn figures, but the 2004 article is unusually long and resists the current temptation of statistical overkill.

Both articles have something close to the traditional IMRaD (introduction, methods, results, and discussion) structure, but the 1954 article is more casual in mixing comments that strictly ought to be in the discussion of the results. Both papers are clearly written, but the older paper seems easier to read. In part this might be because it uses the active voice and contains slightly less jargon. The word "prospective" appears in the older paper, perhaps for the first time, and is accompanied by the largely unhelpful quote from Leigh Hunt that "He was a retrospective rather than a prospective man." The old word for questionnaire—questionary—surprises.

The biggest changes are in what might be called the furniture of the article. The older article has no structured abstract and no contributor, guarantor, and competing interest statements. The 2004 article includes our "what this study adds" box, one of our most popular innovations. Both papers include extensive thanks, but only the older paper gives the degrees and honours of the authors. The older paper says nothing about ethics committee approval, but the new paper tells us that there were no ethics committees in 1951. Some, I know, pine for such a time.

Competing interests: RS is editor of the BMJ and accountable for all it contains.

1 Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking: 50 years' observations on male British doctors. BMJ 2004;328:1519-33.

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