

# Oral history – Sir Richard Doll

Christopher Cook

Richard Doll grew up in London the son of a general practitioner in the first decades of the twentieth century. Despite an evident admiration for his father's talents as a family doctor, Doll did not intend to choose medicine as a career. "I wanted to be a mathematician. That was really the only subject I enjoyed at school and I enjoyed it immensely.

My father would have liked me to have become a doctor and he gently suggested I might but, no, I wanted to do Mathematics. He wasn't a very wealthy general practitioner and I appreciate now there were problems about sending me to Cambridge financially. I needed to get an open scholarship and, of course, there comes the big turning point in my life.

So I went up to Caius Cambridge, put my name down for there and I went up to take the scholarship examination in Mathematics. And I did alright on the first three days but on the third night some 'friends' who had gone up the year before and were at Trinity took me out to dinner at Trinity College where I was treated to three pints of Trinity Audit Ale, 8 per cent alcohol, which for a 17-year-old was quite strong stuff. Anyway, the fourth day the paper was not very good and the examiners rang my father and said they would have given me the scholarship on the first 3 days, they couldn't on the fourth so would I accept an exhibition. Well I was so annoyed with myself that I said, 'Father, I will not go to Cambridge and read Mathematics I'll do what you wanted me to, I'll go to London and read Medicine instead!'"

## Medical education

Following in his father's professional footsteps Richard Doll did his medicine at St Thomas' Hospital in London. "He strongly recommended me to go to Thomas' rather than Guys because he said if I was going to spend 6 years of my life in that part of London it would be much nicer to spend it at St Thomas' on the river than at Guys. And by goodness was he right. It's a lovely place St Thomas'."

It was as a medical student at St Thomas' that Richard Doll first encountered the poor living conditions in which many working people lived in the inner city. "[Seeing this at first hand] is something that I think is so lacking in current medical education, the opportunities to visit patients in their own homes . . . . We had to deliver twenty children mostly in their homes in Lambeth. Home delivery. You didn't have to do 20

home deliveries, but 20 deliveries half of which had to be domiciliary. And, my goodness, did you discover how people were living then. But, of course, by that time I had also developed a concern about the effects of poverty generally on health. I was influenced by people like Janet Vaughan and I was very struck by the way the consultants would discharge a man from hospital with, let's say, a peptic ulcer and say, 'Well now you have to go on a diet of fish and eggs and milk', without paying the slightest attention or consideration as to whether he could afford these items. No enquiry was made about the home conditions and this rather upset me . . . . So quite a lot of my colleagues by the end of our clinical training were very concerned with the effect of social conditions on health and we had all, of course, become active socialists by then."

In the 1930s during the Depression Doll and his politically aware contemporaries would argue that there was a clear connection between living conditions and health. "[But] scientifically it's been much more difficult to prove in some cases. It wasn't difficult in relation to diet and iron deficiency but it was in relation to the effect of housing. For example, it was taken for granted that bad housing was bad for health but the actual scientific demonstration was difficult to prove. Of course in those days, and it's extraordinary how it's disappeared, one of the commonest diseases of the poor was rheumatic fever, which then left them with bad hearts very often later on. And this disease just disappeared with improving social conditions. It was one of the most remarkable medical phenomena of my time, the disappearance of rheumatic fever. I won't say wards were full of them but there was never a time when there weren't several cases of rheumatic fever, rheumatic heart disease in young people on the wards when I was a student in the thirties. And I don't suppose a modern student has ever seen a case."

Richard Doll's budding socialism was not exactly to the taste of the men who ran the Medical School. "We'd organized this thing called the St Thomas' Socialist Society. There was an Inter Hospital Socialist Society, there were groups in all the medical schools and I was sent for by the Dean on one occasion and told that I must not put up notices about the Society. There could be no such thing as a St Thomas' Hospital Socialist Society. This would antagonize the wealthy people whose contributions

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were, of course, essential for keeping St Thomas' going in those days. The Dean [was] a man called Dudgeon who had a ferocious bark but I think a lot of us learnt that if you stood up to him in fact he respected you and he treated you fairly. But he did try to frighten you. But, anyway, he told me that there could be no such thing as St Thomas' Hospital Socialist Society and I said 'Well, I was sorry but there is'. We parted on those terms but I wasn't able to put up any notices in the name of the society on the board. Of course, I have to say when we talk about the formation of things like the Socialist Society that, of course, was also against the background of the development of fascism and the Spanish Civil War in which many of us in one way or another got involved."

"Along with a number of my other colleagues, I had the experience of actually visiting Nazi Germany and seeing what was happening there. There was a St Thomas' man called Stephen Taylor (subsequently Lord Taylor) and he had the very sensible idea of arranging trips to foreign countries to study medicine and see how medicine was taught in those countries. And one year, I suppose it was 1935, we had a week in Amsterdam, which was a fascinating week because we went to lectures in the day time and sat up drinking with the students until 2 or 3 o'clock in the morning which the Dutch students used to do in those days. How we did it I don't know, but when you're young you can do these things... And then in 1936, we had a similar week in Frankfurt and we had some extraordinary experiences there of the effects of Nazism."

"One outstanding event was a lecture we were given on radiotherapy. And we were told that the radiotherapist was a keen Nazi and he would expect us all to stand up and say 'Heil Hitler' in response when he came in, which of course we didn't. But he came in and said 'Heil Hitler' and then, believe it or not, in the course of the lecture he showed slides in which the X-ray beams were illustrated as Nazi storm troopers and the cancer cells had all got Jewish emblems on them. So, we didn't require many experiences of that sort to realize that there was something evil that had to be eliminated from the world."

"As far as I was personally concerned the only other event that I remember was drinking with some of the German medical students in a café and my criticising the way the Jews were being treated and immediately being told that I must be a Jew myself, which I denied that I was, which in fact I'm not. And it sounds ridiculous now but I was made to stand up on a table whilst they measured my ankles because apparently thick ankles were one of the physical signs of being a Jew. As it happens I haven't got thick ankles so they had to drop the idea that I was Jewish. But that event stands out in my mind as to the way the students were behaving."

While at St Thomas' Richard Doll had already demonstrated an aptitude for research in a modest way. "I wrote two things that were published in the St Thomas Hospital Gazette and one was, I think, of some interest because it must have been quite an early example of the use of the chi-squared test ( $\chi^2$ ) in statistics. Because of my interest in mathematics I had always

been looking for a way in which you could apply mathematics in medicine and I read Fisher's book on Statistical Methods for Research Workers and in the course of this noticed the chi-squared test, which was about the only part of it which I could understand actually. It was an extremely complex book. About then one of our teachers drew our attention to a new treatment for undescended testes in boys by giving pituitary extracts which helped bring down the testes. He prescribed this for an outpatient and referred to a paper where its beneficial effect was reported. Well, I went and read the paper and the results were based on very small numbers. I did a chi-squared test and came to the conclusion that the results could have turned out by chance six times out of 10. And I wrote an article on the use of the chi-squared test in the St Thomas' Hospital Gazette illustrating it by this example, which I don't suppose was very much appreciated by the surgeon who'd told me about this wonderful new treatment. And then I wrote another one. Because as I said being interested in neurology with the intention of being a neurosurgeon I had gone and done some voluntary work for a man called Elkington who was a neurologist at, at St Thomas'. And I went out to Maida Vale in West London and saw the man who was just introducing electro encephalography and I wrote an article on the electro encephalogram for the Gazette also in 1938."

When he qualified in the late 1930s Richard Doll thought that he "would like somehow to marry neurology, neurosurgery and psychiatry to find out how the mind worked... [and] the best way to do this was to train as a neurosurgeon." Sensing that a war was imminent and the army would need neurosurgeons Doll offered his services to the War Office hoping that they might defray the cost of his training. It was an invitation that military authorities declined! Then having joined the army supplementary reserve Doll was called up in September 1939. He served in France, North Africa and on a hospital ship in the Mediterranean. When Doll was demobbed he resumed his civilian medical career in a health service that was about to change decisively.

## The coming of the NHS

"I was enthusiastic about a National Health Service and in fact I had spoken on a number of Labour platforms in the 1945 election in support of Labour candidates on the grounds that the Labour Government would introduce a National Health Service and this was needed. Of course, something had to be done; there was no question of going back to the old situation as far as the hospitals were concerned because all the voluntary hospitals had ceased to be voluntary hospitals. There was no money coming in for them, they were organized under the emergency bed service and there had to be some system to finance the hospitals. So there was no argument that some sort of nationally organized service had to be introduced. The question was whether it was going to be run by Local Authorities, which

the medical profession didn't like and whether it was going to include general practice, which the general practitioners didn't want. And Bevan annoyed a number of his colleagues by negotiating with the medical profession – and very cleverly he did it too – so that he turned around an absolute refusal to have anything to do with it into practically everybody joining it.”

The service came in on July the 6th, I think, 1948. And 6 weeks before that I happened to be a member of the St Marylebone Division of the British Medical Association. That's because I was living in a mews flat behind Wimpole Street, which I shared with a couple of other people. And so I was a member of this Marylebone Division. And in May 1948, that Division held a discussion, a debate in which there was a proposal that this division of the British Medical Association will have nothing to do with the health service when it comes in six weeks time. Well I spoke against that and there was a bit of an uproar but the Chairman said 'No, let this young man speak and hear what he has to say.' And they did. I spoke for a few minutes and then a vote was taken. Two hundred and twenty four votes were cast and the division was 220 in favour of the motion that they would have nothing to do with the health service, and four against. I've often wondered who the other three were!”

The new NHS, Doll believed like so many people, would lead to better health outcomes and to reduced service charges. “I didn't really think about the economics. I took Beveridge's word that it would happen. I did think that we would clear up a lot of disease and that there would be less medicine required rather than more as time went on because, of course, tuberculosis was still an important condition at that time. There would be a real attack on clearing up infectious tuberculosis and proper vaccination, the immunization of all the children, and medical treatment early in the course of disease so that it didn't have serious complications. I thought all these things would lead to a steadily improving state of health of the public, yes.”

### First steps in medical research

“It was quite clear that my early ambition of being a neurosurgeon was out after the war. I couldn't go in for another 7 or 8 years training I had to get on with life. So that was out. The obvious thing was to hope to get on the staff of a good hospital. But really this turned out to be so much a question of being supported by senior people, you had to be in the good books of the senior consultants that I just didn't like the atmosphere. It didn't suit me. And I decided I really didn't want to go in for that rat race. I had always wanted to do some research if possible. And then an opportunity presented itself to me which enabled me to start on research. And this actually was drawn to my attention by the lady that was to become my wife – Dr Faulkner – who was at the time on the staff of the Medical Research Council (MRC). She knew Dr Francis Avery Jones, the gastroenterologist at the Central Middlesex Hospital, had put in a plan to the MRC to do a study of the occupational factors that might cause peptic ulcer.”

“In those days it was thought, for example, that irregular meals might be a cause of peptic ulcer, shift work and that sort of thing. And he put in a proposal to do a survey of industrial workers. But the young person he got first to help him was a Czech refugee that the MRC didn't think much of and they told Avery Jones that they weren't prepared to fund him. Dr Faulkner knew about this and so she said to Dr Avery Jones, 'Well, you might do better if you asked Richard Doll to help you on your study. It might be more attractive to the MRC.' And so he renewed his application with me as his assistant. I had got my membership of the Royal College of Physicians at that time, and the MRC thought that was ok. So Avery Jones got a grant to do this study of occupational causes of peptic ulcer.”

“In the course of doing that I knew it would require some statistical analyses so I attended a short course at the London School of Hygiene on medical statistics and got to know Austin Bradford Hill there. Moreover Bradford Hill was also a member of the Committee which had been responsible for Avery Jones' study and he was very impressed by my having succeeded in getting 98.4 per cent of the workers to cooperate. There were a lot of occupational studies in those days based on interviews with 50 or 60 per cent and he thought my experience was very good. Here was somebody who could get 90, 98.4 per cent. I think it was, I think it was 98.4.”

In time Richard Doll came to know Bradford Hill as well as anyone working with him as a colleague at the London School of Hygiene. “Bradford Hill was a doctor manqué. That was the first thing. He'd always wanted to be a doctor and was unable to because of developing tuberculosis and so he was intensely interested in medicine. And because of not being a qualified doctor and able to treat patients I suppose his interests therefore focussed on preventive medicine because that was something which you didn't need a medical qualification to conduct. He was Dean of the School for a couple of years but that was just because the Dean had left, they hadn't got one and the other teachers voted him into it. He certainly never wanted to be Dean. I don't think he had a vision for the school, he wasn't the sort of person that would have thought about the role of the School of Hygiene and it's importance and building it up. He was concerned with his immediate work and what he could do, what he could tackle. What were the things that could be done to prevent disease. And so he was very much a practical man within the limits of his interests and of reality. He wasn't an empire builder by any means.”

“He was a quiet, unassuming person. His success, I think, largely came from the fact that he never tried to force his views on other people. He just set out very logically what he thought ought to be done. And I've seen him do this in committees a number of times. And he would say what he thought should be done but he never would argue about it. If people then accepted it, fine, if they didn't accept it, well he'd done what he could. He didn't try and bully people into doing what he thought was the right approach. And this was also very clear in his writings, he

was a master of English. He spoke very clearly and compellingly and people just tended to accept his advice.”

## Cancer and tobacco

One of the first research projects that Richard Doll worked on with Bradford Hill at the London School of Hygiene in the decade after the Second World War explored the links between the use of tobacco and the onset of cancer. This was to become Doll's most celebrated area of research and has continued in one form or another to the present day.

“Lung cancer mortality had been going up every year. People had been concerned about this even in the early 1930s. And the pathologists at a meeting of the Pathological Society in this country discussed the possible explanations for it and tobacco was thought of then. But the answer to test it was ‘Well, we’ll paint tobacco on the skin of mice’. And at least two English pathologists did that and didn’t produce cancers. And so they said, ‘Well, it’s not tobacco.’ But the disease went on, mortality from it went on increasing and they said, ‘Well, it’s probably an artefact, it’s just that diagnosis is getting so much better’, which, indeed, it was in a lot of ways. The diagnosis of chest disease was improving. But then, of course, people stopped thinking about this in the war and after the war the mortality had gone on going up and Percy Stocks who was the Chief Medical Statistician at the General Registrar Office wrote to the Department of Health saying, ‘Really you should do something about this to find out the cause and it’s probably due to atmospheric pollution’. That’s what he thought. And naturally they asked the MRC and the MRC had a conference to discuss it. And the conference concluded – this is back in 1947 now – that a lot of the increase was probably an artefact but it would be unwise to assume it was all an artefact because it was so great and also because the increase had affected one sex more than the other. So that really we ought to try to find out to see if you could find any cause for it.”

Bradford Hill and Sir Ernest Kennaway and Percy Stocks [were asked] to try and design a study to find out the cause. And, in fact, it was left to Bradford Hill and he asked me to help him. And we said, ‘Well, we’ll interview patients attending hospitals for lung cancer’, and we chose people also with a couple of other cancers so as to have a control for other types of cancer, it was stomach and large bowel. And the MRC wrote to the medical staff of twenty large hospitals and asked them to cooperate with us by letting us know when they admitted patients with a suspected diagnosis of these three diseases. And over the next couple of years we employed four social workers and we interviewed patients who were admitted to hospital with these diagnoses and control patients with other diseases matched to lung cancer patients by sex and age. And that turned out to be the very strength of the study because, clearly, a lot of the initial diagnoses were wrong because patients were admitted on the suspicion of the diagnosis. And my job was to go round after the patient was discharged, look at the hospital notes and

decide what the patient had actually got. And it very quickly became clear that if the person was a non-smoker the diagnosis nearly always turned out to be wrong, whereas if they were heavy smokers it didn’t turn out to be wrong. It did occasionally but nothing like so often. This was so striking when I kept a list on paper – we didn’t have computers in those days – that I gave up smoking at that stage, before we’d written the paper, just seeing how the non-smokers always turned out not to have lung cancer.”

The project investigated a largish sample of patients. “In the first report we had 649 men with lung cancer, with proved lung cancer, and a couple of hundred or so suspected and proven not to be and 60 women with known lung cancer. But eventually we had something over 1000, I think 1400 of men with lung cancer and, I think, 107 women. So we had a fairly big number.”

“An important part of our study was that from the beginning we had defined a non-smoker fairly precisely. Some of the early studies got confused with non-smoker and a long-term ex-smoker. We defined a non-smoker as someone who had never smoked as much as one cigarette a day for as long as a year, or 1 g of tobacco a day if a pipe smoker for as long as a year. It turned out not to be a very good criterion because we got landed with people that smoked 10 cigarettes a day for 3 months. Now, of course was this the equivalent of one a day for a year or not? I think on that particular one we just said that was smoking that amount for 3 months was enough to qualify as a smoker. But, there were a few people that needed some subjective decisions as to whether they were a non-smoker or not. Nowadays we have a much more precise definition of a life-long non-smoker, someone who has never smoked as many as 500 cigarettes in their life. And that you can determine pretty clearly.”

Medical records were the principal source of information for this project. “What we wanted the records for was the correct diagnosis. And that was the one thing which you could rely on finding in the notes. The X-ray report would be there, bronchoscopy if it had been done, that was there, the biopsy was there and the histology. So all those things were there. However, if one wanted to go into details of the past occupational history, for example, I wouldn’t have thought that they would have provided much help, any more than they did about the detailed smoking history.”

So it was necessary to augment the medical records with further research. “The social background either in hospital notes or in GP notes . . . would not be good. You would have to get that yourself [using field workers]. They were all qualified social workers, that’s all I know. One of them had been working with me earlier on the ulcer study. I can’t remember how we attracted the others. And, of course, we gave them very brief training but they were, they were all women who were interested in research and they were all extremely good. We had four and we had to compare the results obtained by the four. And, interestingly enough, they did obtain slightly different results. One tended to report more smoking than the others, one tended to report a little less smoking in quantity and two were intermediate.

So there were slight differences in the responses that they had obtained but they weren't big enough to affect materially the results which were in any case so absolutely clear."

The researchers were tracking three cancers through the project, large bowel and stomach cancer as well as lung cancer. "One of the objectives of having the three types of cancer was we hoped that the interviewers would not know which type the patient had when they interviewed them. And we had a little 'k' up in the right hand corner of the form, or a k and a u and they had to tick whether the diagnosis was known or unknown when they interviewed. But it turned out that in about 90 per cent of cases they knew because the sister on the ward would say, 'Oh, you've come to interview the man with lung cancer.' Or the gastric cancers would all be in one ward, the gastroenterological ward. So, it turned out not to be an effective way. We were able to eliminate bias on the part of the interviewer though because we were interviewing people with suspected diagnoses of these three conditions and they had no idea whether or not it was going to be proved to be cancer or not. And it wasn't until a month after they were discharged from hospital that we came to know this. And then we were able to find that the smoking habits of those that were suspected of having developed lung cancer but did not have lung cancer were quite different from the true lung cancer patients and were almost identical with our controls. So that eliminated any interviewer bias."

"Anyway, we had this paper based on the London data ready for publication in 1950 but then Wynder and Graham published their paper in America and so there was no longer any need to wait for our studies of people in other towns, which had in any case by then shown us that we were getting the same results. And we published the London data just a month or two after Wynder's paper and it created absolutely no attention at all. Just a very brief mention in a few lines in one or two newspapers. Himsworth's idea that the findings were going to have a tremendous impact on people just was wrong. I won't say it was entirely because of the tobacco industry but certainly they helped by persuading the media that when they made any announcement about it on the television they'd smoke a cigarette at the same time or they would always follow it by saying, 'Dr so and so, an acknowledged expert on the subject says this is all unproven and is controversial.' Similarly, the newspapers would have another little piece signed by some other doctor saying it was a lot of nonsense that you couldn't purely draw conclusions from statistics. And even the Cancer Advisory Committee to the Ministry of Health, as I think it was in those days, advised the Ministry not to do anything about it because they said it would worry people if they were told that cigarette smoking was dangerous and they weren't convinced that it was a cause."

"However there was a statistical association and there were one or two people on the committee, notably Horace Joules, who got very cross about this and said that it was certainly a cause as we had claimed and the public should be told. But the Department of Health decided that... ..it was essentially a

responsibility of the regional authorities, not central government. And they weren't convinced. And in fact, they set up a committee run by the Government Actuary to assess the significance of our findings which reported that 'Yes' they thought our findings were fine. And so it went on right up until till 1957 when pressure on the Department from a few individuals like Joules and the publicity they gave to it became so severe that the government formally decided they must ask the MRC whether this paper – and our subsequent paper on the mortality of doctors with known smoking habits – should be taken seriously, whether smoking was a factor in the production of the disease."

"So in 1957 the MRC had a committee to review it and formally informed the government that the increase in cigarette smoking was the cause of the increase in lung cancer. The Department of Health as it was until the end of the 1960s then held a press conference to say that the government had sought this advice, they'd been given this answer and this was what the MRC had said. The Minister of Health who chaired it was, generally speaking, a very good man but on this particular occasion when he announced the findings of the MRC he was smoking a cigarette whilst he did it."

It was not until 1957 after this proper MRC investigation at the request of the government that the links between the use of tobacco and the onset of cancer were publicly acknowledged, yet Richard Doll and his co-workers had known about this for 5 years previously. What then was the scientist's duty? To remain silent or to alert the public?"

"I think my view on this is, perhaps, different from that of a number of other people. My view is what Bradford Hill taught me and I think he was right and I've accepted it completely and built it into my own philosophy. As a scientist investigating something, the absolute essential is that you remain objective and you don't get prejudiced in favour of a particular finding or not. If you once start saying, 'Oh look, you should pay attention to this we've found something important', it's going to be very difficult for you to change your mind and say you were wrong. And you've always got to be prepared as a scientist to consider that you may have been wrong. And, indeed, we set up our cohort study of British doctors not to so much to confirm the findings of the case-control studies but to check that they were not wrong. As a scientist, as far as I'm concerned, if you've published your paper in a recognized journal so that it would be drawn to the attention of people who should know about it you've done your job. And it's not a sensible thing to go writing to the Minister and saying, 'Look here you're not paying attention to what we've said', because you would get prejudiced if you did that."

"I think you can best serve the purpose of public health by getting the right answer and to do that you must remain objective. I'm not saying that epidemiologists shouldn't be putting pressure on the government to do things, but not about their own research. For example, I have been very happy to write letters and support suggestions that we should add folate to

bread, which my colleague Nick Wald showed would prevent neural tube defects in women if they conceived after taking folate enriched food, because I can interpret the relevant epidemiology and I can tell the Department, ‘Yes, this is important work and this is true, it’s reliable.’ But that’s somebody else’s work. And so I’m perfectly happy to do that for other people, not only happy I *want* to do that for other people’s work, But I mustn’t do it for my own work.”

“Of course, a time does come [when you can take a public position on the results of your own work] and it has come with regard to smoking and ill health. I’ve held the view that I shouldn’t comment for, let’s say, 40 years, but it became ridiculous to continue with it when everybody else accepts the finding that smoking was the cause of a lot of mortality. And I have in the last 10 or 15 years actively supported programmes for discouraging smoking and have strongly supported proposals to ban the promotion of tobacco. I think it would, after 40 years it would have been silly not to. But I wouldn’t have done that in the first 10 years.”

By the time the ‘smoking’ Minister of Health acknowledged the risks associated with the use of tobacco Richard Doll was already deeply engaged in his most celebrated research project, about the links between the use of tobacco and the onset of cancer.

## The doctors project

“[We chose doctors because] we hoped that being scientifically trained they might be a little bit more accurate in their description of their smoking habits. But principally because being doctors they had to keep their names on the medical register and therefore they’d be easy to follow up. And we had no intention when we started of following them for 50 years but my goodness they have been easy to follow up. And that was the real reason and the important reason.”

“There were 40,000 [to begin with] of whom some six thousand were women. We have written one report on the smoking habits of women but they had taken up smoking so late and there really wasn’t very much to be gained from following them further. They were also much more difficult to follow because of changing their name and that sort of thing. And the numbers were not big enough. Also the variation in their smoking habits wasn’t big enough to make their data particularly useful. So, we really concentrated on the men, 34000 men. [And] There are about 6000 who are still alive at the end of the 50 years.”

“From the point of view of making use of the data it has been essential to keep in touch with them to get records of their changing smoking habits and seeing that so many have given up [smoking], this has provided some very valuable information about the effect of giving up at different ages, which was one of the last papers we published on the risks of lung cancer. But it also had the unintended benefits that when they saw the results on themselves or on their colleagues they gave up smoking much more quickly than the general public.

And the British doctors had been much more interested in encouraging their patients to stop smoking than doctors in other countries. Doctors in Spain, for example, have continued to be even heavier smokers than the general public up until very recently and have not taken it seriously. So it had this added and unintended advantage that they took the results seriously.”

“We intended [the project] to be for 5 years, which we reckoned was long enough to produce enough cases to confirm or refute our conclusions about smoking and lung cancer. But by the time we’d got 5 years data it was clear that smoking was likely to be related to a number of other diseases and therefore we continued the study in order to get enough information to see what other diseases were related to smoking.”

“The first one to become clear was coronary thrombosis or myocardial infarction because we had large numbers. And although the relationship isn’t very close as even heavy smoking only doubles the risk in late middle age it is a particularly important factor in the relatively young in whom myocardial infarctions occur. Nearly all of them are heavy smokers. But essentially it’s not very closely related but because myocardial infarction is so common that even doubling the risk, or increasing it by 50 per cent means a large number of cases are caused by smoking. And we had the association with myocardial infarction but it wasn’t clear then that it was necessarily causal. You hadn’t got this very sharp relationship you had with lung cancer. And it took some years for us to be convinced that it was actually causal, as more data were collected and the effect of stopping was seen and various other bits of evidence came through. But by then we were also finding that, that it was a cause of chronic obstructive lung disease.”

“Now it sounds ridiculous to say that one hadn’t thought of that but initially we actually had people with chronic bronchitis in our control group. And chest physicians did not think that smoking was a major factor in what was called the British disease at the time and which was attributed largely to atmospheric pollution. As it turns out now it was also largely due to the infectious diseases and respiratory diseases in infancy, in poor areas which predisposed people to develop this disease. It only become clear as the other social factors diminished in importance that now smoking is the central cause of the great majority of cases of emphysema and chronic obstructive lung disease.”

“Of course, it sounds silly now, now that we know so much but the complexity of tobacco smoke that hadn’t been taken into account. After it had been studied for a few years and one realized there were 4000 different chemicals in tobacco smoke it really wasn’t at all surprising that it might be responsible for a whole range of other diseases. And we now know, for example, that 2-naphthylamine is a potent cause of cancer of the bladder and is present in tobacco smoke. Then there’s benzene in it that causes myeloid leukaemia. So there are all those specific agents for a whole handful of diseases. Fascinatingly enough we still don’t really know what is the biochemical component of smoke that causes coronary thrombosis.”

## Research into occupational diseases

### Asbestosis

“I’d always from my student days been interested in the social environment as a cause of disease and, of course, there were a number of important occupational diseases that one met in those days – lead poisoning was the most characteristic one. But a couple of occupational causes of lung cancer had been suspected by the time we carried out our study and as most of these chemicals, the ones exposed to in occupations, entered the body through the respiratory tract it seemed that there might well be a very large number of other occupational causes of lung cancer. And I studied several but I have to say they were all studied on the basis of some suggestion that there might be a relationship. Asbestos, for example, had been suggested as being related to lung cancer before. Well, almost from the very beginning we made enquiries about employment as an asbestos worker but we hadn’t done any special studies of asbestos workers until it became increasingly suspicious and then we laid on a special study of asbestos workers. I actually tried to get the big firm in London – Cape Asbestos – to allow me to study their workers. They wouldn’t do it, they wouldn’t allow me to study their workers. Eventually Alice Stewart, I think, and Muriel Newhouse studied them but they had refused to allow me to do it.”

“I think it was [because they knew there might well be a link]. Whereas the ones I did study, Turner and Newall’s workers, I studied at the request of the industry because they had a suspicion that the reports of lung cancer in asbestos workers were an artefact due to them having a high proportion of post mortems. And I was actually asked by the industry to study their workers. And Turner and Newall as a result got a lot of the public thinking that they were the firm that was principally to blame because it was their firm with which we did our work. Whereas they actually were concerned to find out if there was any hazard to their workers, whereas Cape Asbestos had refused to allow their workers to be investigated and they avoided the public criticism which poor old Turner and Newall undeservedly got.”

Richard Doll’s findings were unequivocal. There was a clear link between workers who worked with asbestos and the onset of asbestosis. “We studied people who did not necessarily have asbestosis, but who had worked in what were called the scheduled areas, the areas where asbestosis was known to be produced and had been employed there for 20 years – that was our definition. So we chose heavily exposed workers and, not surprisingly therefore, we found a very substantial increase. We found in fact, I think, 11 deaths when on the national rates we should have expected less than one. And they nearly all had asbestosis. But, of course, asbestosis is a funny diagnosis. Its definition has changed continually over the years. When I first studied it, it was a recognized disease which carried substantial disability with it and had definite radiological changes. Gradually the definition of it widened and widened until people were said to have had asbestosis when you could hear a few crackles in their lung and they had no disability at all which has caused a certain

amount of trouble really for industry because it isn’t really asbestosis in any clinical sense.”

### Epidemiological research and the public response

Doll would argue that asbestosis has become culturally rather than medically constructed as a disease. Did his own investigation also play a part in a new construction of asbestosis? “It certainly focussed interest on asbestosis because most of the people with lung cancer had asbestosis and there was a question whether it was asbestosis that causes lung cancer or whether you could get lung cancer just from exposure to asbestos without a previous clinical disease. And this became an unreal question in the course of time, as the definition of asbestosis widened to such an extent that more or else everyone that was exposed to asbestos was regarded as having it.”

This would seem to raise a further issue. Do the popular media simplify the result of complex medical search to the point of near falsehood? “It is an enormous problem, particularly illustrated by the public reaction to ionising radiation. Because we know that ionising radiation causes cancer there are people that take the view that any cancer pretty well can be attributed to ionizing radiation. If you look sufficiently for exposure to it. And I think the public attitude to the risk of ionising radiation has completely got out of hand. It’s disproportionate to its characterization as a carcinogen, which it certainly is.”

“I think it’s all got tied up unfortunately with legal processes of compensation. It’s the desire to show that somebody else is responsible for my disease. People don’t like to accept responsibility for their own health and are always looking for some outside agent. Some of them with a view to compensation. I wouldn’t want to imply that everybody does that but too many do have that in mind.”

“It’s somehow got associated with the idea that disease is something that should be avoidable and that other people are responsible for, whereas, of course, every activity in life has some risk associated with it. And certainly many of the enjoyable physical activities are associated with risk. I mean, I, personally I find it quite appalling, that in the latest development the three-legged race and the sack race have been declared prohibited in primary schools because of the possible hazard to children. Well to me it’s stupidity carried to the nth degree. No, there’s no activity in life which doesn’t have some risk associated with it and most pleasurable activities certainly do. And to stop young people doing something just because there is the minutest hazard seems to me uncivilized.”

In Sir Richard’s experience Governments too are not always happy to face the truth. “I’d like to tell you a story about a Government Department because it really is quite revealing. Some years ago I was approached by an ENT surgeon in the North of England who was struck by the fact that he’d had two people with cancer of the larynx that had just attended his department both of whom had worked in a factory in North Wales which they said made mustard gas during the war. And

he got interested in this and he told me that the two men had also said that they knew of several other workers that had also developed cancer of the larynx. And he wrote to me, 'Well, look, I don't know how to investigate this, you might like to.' Well I did 'like to', I had a young New Zealander with me at the time who needed some new project and I gave him this project to investigate. And we did it using trade union records and showed that there was excess of cancer of the larynx amongst the workers. But I had nothing on paper to say that they had made mustard gas. It was just the men saying they thought that mustard gas had been made there during the war. So I found out that the company had been taken over by ICI and I wrote to ICI and asked them what this company had made. And ICI said well they'd taken the company over a long time ago and all the original records were destroyed and they really didn't know what the company had made during the war. Unlikely, but that's the story, [and] that was what they said. So I wrote to the Ministry of Supply, which I think was the Ministry responsible at the time, and said that we had done this work at a factory in North Wales where the men believed that mustard gas was made but could they confirm that it did make mustard gas. And I had a letter back from the Chief Scientist for the Department saying that they really had no records for this factory and they didn't know what was made there. So I thought, 'Now, where do I go from here?' So I said, 'I know what I'll do.' I wrote the paper and put at the bottom that I was very grateful to the Chief Scientist at the Ministry of Supply for the efforts he'd made to find out what had been made there during the war but the Ministry had no records and didn't know what had been made during the war and I sent him a copy of the paper. I was rung up 2 or 3 days later, 'Would I mind holding the paper up for a week or so?' They were going to make another search. And, shortly afterwards he rang back, 'Yes, you were quite right, we have found some records and they did make mustard gas.' So, that was fine. Well now that's only three-quarters of the story because, or rather only half of the story because a few months later I was visited by a representative of ICI and by a representative of the Ministry and they said they were interested in our results which had shown this excess of cancer of the larynx but they were a little worried that they were biased because it was based purely on the trade union records and perhaps we hadn't had all the records of all the employees and would I be interested in doing a bigger study in which I could make use of the records of all the employees in that factory over a period of years. So I said 'Well, yes I would be.' They said, 'Well here, here you are. Here's a list of all the employees. I did the study and, of course, it confirmed the excess of cancer of the larynx and it did actually show some other excesses as well – cancer of the pharynx and a little bit of cancer of the lung.'

"However, an even worse example of the difficulty of getting information out of Government Departments was with the epidemic of suicide we had from carbon monoxide gas just after the war. The Coal Gas that was used before the war had a lot of carbon monoxide in it and a favourite way of committing

suicide was putting your head in a gas oven and going to sleep and killing yourself. It was a simple and effective way. And when, of course, North Sea Gas came in without any carbon monoxide that disappeared. But in the few years immediately after the war there was a great demand for gas and the industry had to produce a lot more. And a friend of mine who was a Medical Officer in one of the Gas Boards said, 'You know, we're turning out gas with a much higher percentage of carbon monoxide. Instead I think of the 8 per cent it was before the war', he said, 'it's gone up 10 or 11 per cent'. And so I thought, 'Well, we had better look into this.' And I wrote to the Gas Board and they had no records of the amount of carbon monoxide in the gas, so it was quite impossible to tell how much there was. I even got the MRC to ask a question in Parliament of the Department as to the carbon monoxide content in the gas and the trend over the years. They were very sorry. They said there was no way in which a figure could be given, they had no records of it. Well, eventually it was displaced by North Sea Gas and fascinatingly enough suicide rates fell because people didn't substitute some other method. They couldn't do it with Coal Gas, but they didn't go and cut their throats instead. They didn't commit suicide. But some years later I was having dinner in an Oxford College where there was also the man who had been a Chief Scientist to the Gas Board at the time and I told him this story and he said, 'Oh, how ridiculous, of course we knew exactly how much carbon monoxide there was in the gas.'

### Investigation of the effects of radiation

"This came about because of my personal concern when the first hydrogen bomb was exploded. I think it was called the Bravo Explosion in the Pacific in 1954. It may have been the second explosion but it was very much more powerful than they anticipated and it caused fallout throughout the world. And at that time people really only were thinking of congenital abnormalities as resulting from small doses of radiation. The idea that small doses caused cancer was really not generally accepted. But I thought it was rather worrying having radioactive fallout throughout the world. The Americans were just developing information about the risks of leukaemia in the survivors of the atom bomb explosion in Japan. And this was suggesting the possibility of a proportional relationship. And I thought this was something I'd like really to study."

"So I took a course on radiological hazards at Sir John Cass Institute in London just initially to learn a little bit about radioactivity. And it was just as well I did because very soon after that the MRC was asked by the Government to write a report on the effects of nuclear radiation. I think that following Pacific explosion the top brass probably realized that they didn't know what advice to give the Government. They had said, 'Oh, there's no worry', but when they looked into it they found the evidence wasn't there. So the Government asked the MRC to provide a report."

"And the MRC for the purpose of doing that asked a young research worker called Court Brown, who was a radiobiologist,



and me to see if we could determine a dose response relationship for cancer and ionizing radiation. It was suggested that it might be possible to study the incidence of leukaemia in people who had had radiotherapy for ankylosing spondylitis; a form of rheumatism. You had to study people who had been irradiated for a benign condition because if they'd been irradiated for a cancer you would never know whether a subsequent one was really a relapse of the original cancer or what it was. So this condition of ankylosing spondylitis was ideal because thousands of people throughout the country had had widespread irradiation to their spine where, of course, a lot of the, the bone marrow was found and that had been going on for years."

"Court Brown and I consequently set up a study to provide the answer for the MRC. This was in July 1955, and the MRC said they wanted it by January 1956, the 1st of January. But to be fair to them they said, 'Look, you can have anything you want, just tell us what you need and you can have it because we need this information.' Well Court Brown and I designed a study in which we sought the cooperation of radiotherapists throughout the country who had records of all the patients that had been treated since 1935 and were able to make some estimate of the dose. There wouldn't be time to follow the people up but we were going to get copies of all death certificates from leukaemia and then we were going to try and match the death certificates with the cases. Anyway, we got an answer actually at about half past two in the morning of January 1st. And it showed what we would call a threshold relationship, no effect with a small dose and then a suddenly mounting up effect. But our estimate of the radiation dose was based on what one of the physicists on the committee had recommended, namely the total mass of the body irradiated."

"And when we presented these results one of the radiotherapists, Joey Mitchell who subsequently became Regius Professor of Physic at Cambridge, said, 'That's no good, you really have to measure the dose in the bone marrow.' So we started again. And at one time we had a 100 people working for us. We had an artificial man constructed and then had him irradiated in all the different ways that radiotherapists were using throughout the country. We put in three detectors in different parts in the spine and measured the dose received in the marrow from the different types of radiotherapy. And that took us all 1956 and the early part of 1957 to do. And we were rather keen to get it completed quickly as we knew the Americans were writing a report as well and we wanted to get ours out before their. We did, in fact, get a report out in the spring of 1957. And when we related the leukaemia incidence to the actual measured dose in the bone marrow then we found a linear relationship. And in our report we estimated how much radiation you needed to double the risk of leukaemia. And it wasn't, in fact, far from what our current estimate is."

"That experience got me interested in the subject and I've retained an interest ever since. In fact the very latest work in which I'm now co-operating is an attempt to estimate the effect of radon in people's houses. But I must tell you a bit more about our first radiation study. In 1956 whilst we were still working on this some of the very preliminary results were

coming through from Hiroshima and Nagasaki and also an American scientist had written a report on leukaemia in American radiologists which suggested they had an increased risk. And I made some very speculative calculations on the assumption of a linear relationship between the dose and the amount of leukaemia that would be produced by the fallout in America and in this country. And I sent the paper to Himsworth, the Secretary of the MRC and asked him if he thought it was worth publishing because it was very speculative. And I didn't get a reply for some time, but some weeks later he wrote back and said, 'Look, I think this is so speculative, I wouldn't publish this if I were you, it will only damage your reputation as a scientist.' Well, I respected Himsworth, I had asked his advice and he said, 'Don't publish'. I didn't publish it. I forgot all about it. Forty years later I was rung up by a journalist who said, 'Do you still think that the Bravo Explosion caused two hundred cases of leukaemia?'. I think it was in the United States. I can't remember now whether it was in the United States or in England. And I said, 'I never said anything like that.' He said, 'Oh yes you did, I've got it here in front of me.' And I said, 'Well, where did you get that from?' Well, of course under the 30 year rule, he'd got all the papers of the man who had been Director of the Atomic Energy Authority."

"Anyway, this journalist had got all the papers, which Himsworth had sent to [the AEA Director]. And the Atomic Energy Authority had looked at my papers and they had advised Himsworth that it really wasn't reliable and shouldn't be published. Well that was very interesting. But then I forgot about it again until a year or two later when I was involved in a legal case on behalf of British Nuclear Fuel in the Netherlands in which the other side said, 'Oh well, Sir Richard Doll is quite useless as a witness, he's made the most extraordinary ridiculous statements about the effects of radiation and claimed that the fallout from the Bravo Explosion caused so many cases of leukaemia, which shows what an incompetent epidemiologist he is.' So I said to our lawyers, 'Look, I've got to get hold of a copy of that paper.' And, of course, they were able to get hold of a copy because the other side had cited it. I got the paper, I read it and I thought, 'This is bloody good.' The estimate really wasn't far from what we would make nowadays and, and to cut a long story short I published it 40 years later. I published it in 1996 in the *Journal of Radiological Protection*."

### Regius Professorship of Medicine at Oxford

In 1969 Richard Doll was appointed to the Regius Professorship of Medicine at Oxford University. And while he was principally preoccupied with establishing an enlarged medical school within the University he continued to undertake research projects.

"I was continuing to do work on tobacco and I was continuing to do work on radiation studies – both were projects that I'd brought with me. And we'd just started to work on oral contraceptives which Martin Vessey was specializing in association with me. And this was the main thing I brought. And after a year or

two Martin Vessey took over the responsibility for that wholly. So we had the contraceptives, radiation and tobacco studies and I had a few occupational studies. I continued doing some work on asbestos, and one or two other occupational hazards.

### **Projects on community hospitals and returning patients to the community from psychiatric hospitals**

“[This] came about through a conversation with Oddie of the Oxford Regional Health Authority who was the Regional Medical Officer. We realized that we just know didn’t what use to make of them. And Oddie thought that they might have a real place for treating certain simple conditions or looking after people when they were convalescing from operations. Things that didn’t need acute medical attention and where people could be treated close to their relatives and easily visited and run at a much more economic level with a less specialized staff. So, as I told you, we designed this study with real random allocation of patients of a defined sort to either remain in the acute general hospital or to go to Wallingford where there was a large community hospital. We had an economist who was working out the cost of providing the services and, as I’ve said, after it had been running for a about a year, we had a Minister who said, ‘Oh this is nonsense, community hospitals are excellent things, we’re not going to waste money on doing research into them.’ And the Department of Health’s support was stopped. We hadn’t got enough data to reach any conclusions at all. Subsequently, of course, the ministry decided, without any evidence, that they were useless and started to close them.”

“[I also had a] desire to do a controlled study of the effect of turning people out of the long-term psychiatric hospitals. Just before I came to Oxford which was in the late 1960s, a policy was being adopted by the Department of Health to close the big mental hospitals and send patients back for treatment in the community. I thought this was something that really needed testing to see what the economics of it were going to be and how medically and socially effective it was going to be. So I put up a proposal to the MRC for a grant with a plan that appropriate patients would either continue to be kept in the psychiatric hospital or sent out in the community with random allocation of patients to one or other treatment. But I was told there was no money for that. The Department of Health had decided to close the psychiatric hospitals and that was that. Those really are the only two attempts I’ve made to tackle administrative NHS problems and both of them were prevented by the Department of Health, in both cases saying they knew the answer. Neither of which, in fact, they did know.”

### **The Faculty of Public Health medicine**

Richard Doll was a founding member of the Faculty of Public Health medicine in 1972. “I thought it was very important it should be within the College of Physicians and not try to be an

independent organization because it needed to influence medicine and to be influenced by medicine, to know what were the important medical problems. So I was very keen for it just to be a Faculty and not an independent College. But at the time it was set up there was still this bitterness between the old Medical Officers of Health and the Departments of Social Medicine. When Social Medicine began as an academic subject in the Universities there were not generally Departments of Public Health, but there were senior public health people who gave some lectures and were attached to the medical schools. By law students had to be taught about vaccinations against smallpox and one or two other aspects of preventative medicine. And they were taught often very boringly about drains and the need for pure water supply which had all been laid down in the nineteenth century. And then along come these new people who were called specialists in social medicine who started worrying about cancer and heart disease and quite different things from what the Medical Officers of Health were concerned with. And they got called Professors, whereas the Medical Officers of Health were often just invited by to give some lectures at the medical school without being he wasn’t given any status within it. The Medical Officers of Health thought that specialists in social medicine were upstarts and getting all the academic credit and the social medicine people thought the Medical Officers of Health were doing routine work and not doing any research. And there was really a coldness between the two, which was felt more strongly on the side of the Medical Officers of Health.”

“Consequently there was no way when you came to set up this Faculty that you could have used the name social medicine or the name public health because there were these two sides. And Jerry Morris came along with his idea for community medicine, and his idea of what the community physician was, which was in fact essentially that of the old fashioned MOH. And so when we met and I was on the committees which set it up, this name of community medicine was a godsend because it avoided using either social medicine or public health. And so we had this construct of community medicine and it became a Faculty of Community Medicine. But then community medicine got heavily involved with hospital administration and people in other countries didn’t know what it meant. In America they thought it meant general practice! Eventually the old antagonism disappeared. Those who felt it most strongly have themselves disappeared and so we are able to go back to the old terms of public health and preventive medicine. And I think the Departments are now nearly all called departments of Preventive Medicine and that’s the name of the Faculty”

“I think all of us who were on the committee were concerned that it should come into being. I think some people were not convinced that needed to be a Faculty, thinking that it could have been a separate organization. But . . . . the only serious discussions we had were about its name. As you know making decisions about names is always a problem in any committee. No, it was a good committee, a friendly committee.”