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Report No. TN.12.....

Transmitted on.....ITV....."World in Action"

Length.....30. mins

Date.....14th. October, 1974.....

Time.....8.30. p.m.

Short Title.....Killer Dust - A Standard Mistake

Narrator: Acre Mill, Yorkshire: three years ago "World in Action" reported that men working with asbestos in this factory had contracted asbestosis, a disease which scars the lungs and is often fatal. The factory was closed in 1970. Doctors now know that the disease that killed many workers at Acre Mill was caused by asbestos dust particles in the air. If the concentration of asbestos dust is too high, it can seriously damage the lung tissues.

Concern at the mounting casualty rate, led the asbestos industry to agree on a British asbestos standard, a safe level of concentration for asbestos workers to breathe. The British standard was taken up and copied all over the world.

But today there's mounting evidence that the so-called safety level doesn't after all prevent asbestosis, even in factories where dust concentrations have been reduced to conform with the British standard, workers are still contracting lung disease. Tonight "World in Action" reports on a bitter controversy which has broken out between scientists, who say the safety level isn't safe at all, and the asbestos industry which defends the British standard.

Turner Brothers Asbestos Limited at Rochdale, a textile asbestos factory which employs three thousand people, part of the giant Turner & Newall Group, in an industry with twenty thousand workers. Here raw asbestos is spun and woven ready to be processed for industrial and domestic use. Back in 1951 it was this Rochdale factory which pioneered the study



of asbestos dust and its effect on the health of workers. They began to measure the level of dust in the factory, they took regular dust counts and began to see the effects on workers by x-raying them. The study went on for more than twenty years, for the first time it was thought possible to work out what level of asbestos dust was causing asbestosis.

The two pioneers in this study were Turner Brothers' Chief Medical Officer, Dr. John Knox, who's now dead and the company's Industrial Hygienist, Dr. Stephen Holmes.

Dr. Holmes: We were trying to record the dust levels which were the result of the engineering improvements taking place in the factory and at the same time, Dr. Knox was trying to record the changes in the health of the employees as a result of the improvements in working conditions.

Interviewer: And this was done together?

Dr. Holmes: This was done as a joint exercise. I was monitoring the factory. Dr. Knox was monitoring the health of the workers.

Narrator: In 1966, fifteen years after Dr. Knox and Dr. Holmes had begun their Rochdale experiments, the British occupational hygiene Society set up a sub-committee to work out a safety level for asbestos exposure. Dr. Holmes and Dr. Knox were invited to sit on the sub-committee, along with industry and other experts and a Government representative.

The results of the Rochdale study were offered to the Committee as evidence for a safety standard. Dr. Knox selected 290 men who'd worked for Turner Brothers for at least ten years, if any had got asbestosis it was appear on the x-rays and medical tests. First he reviewed their x-rays, then he measured their breathing. The noisy crackles heard through the stethoscope were a major indicator of lung damage due to asbestosis.

In 1968 Dr. Holmes and Dr. Knox were ready to present their conclusions to the sub-committee. Of the 290 men studied, only eight showed evidence of asbestosis, less than 3% of the group. More encouragingly in a section of eighty men who'd been exposed to low levels of asbestos dust, that is $3\frac{1}{2}$ to 6 fibres per cubic centimetre of air, only one man had asbestosis.

The British Occupational Hygiene Society used this data to settle on a safety level. They decided that if only one man in eighty had asbestosis at the $3\frac{1}{2}$ to 6 fibre level, then practically no-one would contract it if levels could be brought as low as 2 fibres. So a new British standard safety level was agreed - 2 fibres of asbestos dust per cubic centimetre of air, a cubic centimetre is roughly a thimbleful. But over a working day those 2 fibres add up to sixteen million fibres breathed in over an eight-hour shift. In 1969 the 2 fibre standard became the guideline for factory inspectors in new Government regulations for the industry. Some factories which couldn't reduce their dust levels closed down. Others were prosecuted for allowing concentrations of dust more than six times higher than the 2 fibre standard. But the standard itself was based only on a single study in this one factory, no other doctor had checked Dr. Knox's x-rays and the method of taking the dust counts was known to be difficult and inaccurate. The British Occupational Hygiene Society hadn't done an independent check on the figures. We put these criticisms to Dr. Holmes of Turner Brothers.

Dr. Holmes: At that time the Committee did not examine the clinical evidence. As far as I am aware the x-rays were examined by Dr. Knox himself and his data from the x-rays was given to the Committee.

Interviewer: So in fact we are now talking about just the evidence of one company where not even the clinical data was examined by the Committee?

Dr. Holmes: That is so.

Interviewer: And on this a whole standard was based?

Dr. Holmes: Yes.

Interviewer: In looking back on the data, why didn't the Committee publish the fact that dust counts can be notoriously inaccurate by as much as 30% either way?

Dr. Holmes: At that time we did not know just what the situation was regarding the accuracy of dust counts. The plus or minus 30% which is quoted today, is based on experience with fibre counting, since 1961 or thereabouts.

Interviewer: So that in fact the dust counting may have been even more inaccurate?

Dr. Holmes: Dust counts are notoriously difficult to do and inaccuracies are accepted - in dust counts, just as they are in many other similar situations.

Narrator: In 1969 Dr. Knox was succeeded by a new Chief Medical Officer at Turner Brothers, Dr. Hilton Lewinsohn. The study started by Dr. Knox was continued by his successor. The original medical records had been kept so had the x-rays. In 1970 Dr. Lewinsohn re-examined the 290 men who had been studied by Dr. Knox four years earlier. Knox had found only 3% with signs of asbestosis, signs like swollen fingers, and on that figure the 2 fibre standard had been based, but Dr. Lewinsohn's re-examination of the same men four years later, provided a result that was startlingly different. On the study where Knox had found that only 3% had the disease, Dr. Lewinsohn found that nearly 50% of the group had developed significant lung changes which could lead to asbestosis, this was a much bigger increase than could be accounted for by an interval of four years, or by improved x-ray technology. If Dr. Lewinsohn's

x-rays were right, Dr. Knox's must be wrong and so it seemed was the safety standard.

The results of the new study were first disclosed in 1972, when Dr. Lewinsohn gave a talk to a local medical group.

Dr. Lewinsohn: My talk was to illustrate the way in which we at this factory kept our asbestos workers under observation. As part of that paper I presented a graph and some figures of a preliminary nature to illustrate what we hoped to do with the information which we were collecting at the time.

Interviewer: And how did that data become public?

Dr. Lewinsohn: The talk which I gave was subsequently published in the journal of the Royal Society of Health as is their custom.

Narrator: But the results failed to cause any stir, they were presented in a series of complex graphs and no-one in Britain spotted their significance. But they were picked up in America: at New York's Mount Sinai Hospital, Professor Irving Selikoff has been studying asbestos diseases for twenty-five years, at his clinic in Paterson, New Jersey, he's been following his own group of asbestos workers for the past sixteen years. Selikoff knew of Knox's study in 1966 and spotted Lewinsohn's paper which had re-examined the original data.

Prof. Selikoff: We have a computer programme that reviews all the world's literature on asbestos disease and my computer told me that here was an article written on asbestosis and we obtained the article and read it. Dr. Knox reported that only eight people of the 290 working at 2 fibre level or 4 fibre or 5 fibre levels had x-rays that could be interpreted as asbestosis and, therefore, we could say that this was a safe set of working conditions and the second set of data indicated that there was a fair amount of lung scarring which would suggest that these were

not safe working conditions for the prevention of asbestosis. I think we all owe a debt of gratitude to Dr. Lewinsohn for having re-evaluated these data. This is very important because the standards that had been set around the world have largely been based upon this experience in Great Britain and if there is a hazard in this plant then we've made a mistake in many parts of the world.

Interviewer: When you say a mistake - mistakes can be large or small.

Prof. Selikoff: Oh, a large mistake, we have told hundreds of thousands of workers that it's safe to work under these conditions, that if you are inhaling air that contains two million fibres for every cubic metre, for every hour of breathing that it's safe and if we are wrong then we have told these workers something which was totally unwarranted and may result in serious disease among them.

Narrator: Professor Selikoff wrote to Dr. Lewinsohn for more information.

Dr. Lewinsohn: Professor Selikoff first wrote to me in 1972 and on receiving his letter I sent to him all the information that I possibly could upon .. giving him all the data upon which my graph and figures had been based.

Prof. Selikoff: I was confused, we had been under the impression based upon the original reports that in this factory very few people showed any lung scarring on x-ray. I think out of 290 people who had worked for more than ten years, only about eight had abnormal x-rays of a type that could be asbestosis and the new report indicated that, oh, in some groups 50/60% had evidence of lung scarring, this didn't seem to jell.

Narrator: Professor Selikoff raised the matter at a public meeting the following year and openly questioned the British

safety standard at a conference in Boston. His decision to go public was attacked by Dr. Lewinsohn's colleague at Turner Brothers, Dr. Holmes.

Dr. Holmes: We felt at the time that he would have been better to discuss his differences on the scientific level, rather than making a public pronouncement in a conference without consulting Dr. Lewinsohn or myself.

Prof. Selikoff: What was not known to me was that some people in the asbestos industry were taping the lecture and later sent this taped copy to Dr. Lewinsohn.

Narrator: When Dr. Lewinsohn received the tape, a furious correspondence broke out between the two scientists. The doubts raised about the safety level were now in the open.

Dr. Lewinsohn wrote to Professor Selikoff in July, 1973 -

Reader: "We cannot accept the implication that the publication allows doubt to be cast on the validity of the standard and are of the opinion that such a conclusion is unwarranted. You have used the information we provided in order to launch what seems to us to be a political campaign in the U.S.A. aimed at discrediting a hygiene standard for asbestos."

Narrator: To which Selikoff replied -

Reader: "I requested that you send me numbers to translate to figures and you did. My references were then made only to what you reported in your published paper. You suggest that the information is being used to launch what seems to be a political campaign in the U.S.A. aimed at discrediting our hygiene standard for asbestos. I note you sent your letter to the Asbestos Information Association of North America."

Narrator: Lewinsohn hit out by arguing that his study was incomplete, no conclusions could yet be drawn.

Reader: "The results presented in the paper were preliminary results and in the discussion section it was clearly stated that from the information currently available only tentative opinions can be expressed."

Narrator: Selikoff replied -

Reader: "I fail to see the relevance of the implied complaint. Nowhere did I quote your opinions, I was interested only in your data. The problem is a serious one, if the x-ray surveys have been inaccurately evaluated, then the standards are wrong and these workers are at serious risk of irreversible, often fatal, disease."

Narrator: We asked Professor Selikoff about the difference between the first study which produced the safety standard and the second which raises doubts about it.

Prof. Selikoff: Generally the progression of asbestosis - scarring of the lungs on x-ray isn't that rapid. There would have been in the normal course of events in four years, some additional scarring, but not that much. I think part of the problem has got to be that two different people read the x-rays and perhaps two different people are giving two different results.

Interviewer: Or somebody made a mistake?

Prof. Selikoff: That's also possible. It may be that one or the other has read the x-rays in a peculiar way and didn't come to results that the other one came to.

Dr. Lewinsolin: I wouldn't disagree with Dr. Selikoff that I saw more x-ray changes using the technique that I employed for reading x-rays, than would have been described in 1966 before this classification was available. I'm not certain that I would accept a tenfold increase because we differ on interpretation of the results.

Narrator: It's the interpretation of the two sets of x-rays taken by two doctors at different times which is at the heart of the dispute. Professor Selikoff says that the big increase in lung changes must mean a big increase in asbestosis. Dr. Lewinsohn says the lung changes he's observed may have nothing at all to do with asbestosis.

Dr. Lewinsohn: The x-rays which I had interpreted did not necessarily mean that because there were changes present on them, these people suffered from any form of disease. X-ray changes can be caused by many things, some of which have nothing to do with the person's occupational exposure. For example, living in an industrial environment, the effects of ageing, the effects of other diseases, previous occupations, smoking habits etc.

Prof. Selikoff: When lung scarring occurs among workers in an asbestos factory, I think until we prove otherwise we've got to say that that's asbestosis. If it's not asbestosis then it would be a striking new discovery that workers in asbestos factories have lung scarring from some other cause and I certainly think we ought to look to it.

Narrator: One reason for the dispute was that Dr. Lewinsohn's x-ray survey, although it showed the increase in lung changes didn't show how many of these changes had been confirmed as cases of asbestosis. Last month Turner Brothers released these figures to "World in Action".

By December, 1972, of the group of 290 men, 285 had been traced: 26 confirmed cases of asbestosis were found, three had died of it.

Prof. Selikoff: That would be about 10% -

Interviewer: 9.5.

Prof. Selikoff: That's three or four times as much as we had originally been told. In the United States if we knew now about this, that 10% would within the relatively short period of time, because some of these people had only worked for ten years, we would not be allowed to use that as a standard. In the United States - and I can only speak for the United States - most excess deaths among asbestos workers are no longer due to asbestosis, they're due to cancer.

Narrator: Lung cancer, a new and deadly complication in the tangled dispute over the figures, yet when the 2 fibre safety standard was set up in 1968, it deliberately excluded the cancer risk, it was a safety standard only against the lesser disease of asbestosis. The Committee explained -

Reader: "The quantitative relationship between asbestos and cancer risk is not known, consequently it is not possible at this time to specify an air concentration which is known will be free of risk in this respect."

Interviewer: Is cancer a major consideration with asbestos workers?

Dr. Lewinsohn: I believe that - I don't know what the exact figures are at the present time, but 50% of persons who suffer from the disease asbestosis are likely to die from lung cancer.

Interviewer: So at the moment of the 26 cases of asbestos that came through from Knox's group, you expect 13 of them to die of cancer?

Dr. Lewinsohn: I hope they don't, but on the basis of statistics available, they have a very much higher risk of dying of cancer.

Narrator: One of the deadliest forms of cancer attacks the chest walls, doctors call it meso thelioma. The safety standard is no protection, even at very low dust levels workers can contract it. Worst still new reports indicate that the families of

asbestos workers are getting this cancer.

Prof. Selikoff: These reports originally originated from you people in the United Kingdom. Some brilliant research was done by a number of your scientists, they reported that mesothelioma, this extraordinary tumour, was being found among wives and children who lived in the same households with asbestos workers, or in residence about asbestos plants. Presumably this was due to the workers coming home with the dust on their clothes, in their hair, on their shoes and it became part of the household dust.

Narrator: We asked Turner Brothers how many of the 290 workers whose cases Dr. Lewinsohn had studied, had now died of cancer. Dr. Lewinsohn's latest updating of Knox's original group released to "World in Action" shows that by the end of 1972 no fewer than seven of the group died of cancer of the lung and three from mesothelioma, out of a total of twenty-eight dead. We put these figures to Professor Selikoff.

Prof. Selikoff: Seven out of twenty-eight would suggest that almost one out of every four - 25% - had died of lung cancer, this is generally more than we see in the States. We see one out of five, or 20% dying of lung cancer and about 5% dying of mesothelioma in contrast to the 10% here. However these numbers are small and I wouldn't conclude yet that the experience in the factory that you mentioned is going to be worse than that of the United States, but I'm certainly concerned to hear this.

Narrator: But once again Dr. Lewinsohn disagrees.

Dr. Lewinsohn: I would think that that is a misleading way of quoting these statistics. If one looks at the lung cancer deaths as a proportion of the total 285 men in the group, then I would say that they are about the same as one would expect as a medical

statistician would expect to find in the general population. It's, therefore, wrong, I believe, to give the impression that 25% of the 285 men died of lung cancer, or that 10% of the 285 men died of mesothelioma.

Narrator: Scientists will continue to argue about the interpretation of the Turner Brothers' study, but none will disagree that more could be done to lessen the risk to the health of asbestos workers and their families. Studies now show that quite low levels of dust can cause mesothelioma among wives and children, because particles of asbestos can be taken home on clothing and especially in the hair, workers have been urged to take precautions to protect themselves with special clothing provided.

Dr. Lewinsohn: We have been unsuccessfully attempting to influence people working with asbestos, particularly women and long-haired men, in the use of headgear. This has been unsuccessful and as the regulations, the present regulations, do not demand the use of headgear in the levels of exposure where these women are working, there is no legal means of enforcing the use of headgear. Furthermore it is not a condition of employment by the company.

Interviewer: Why isn't it made a mandatory condition, like matches down a mine?

Dr. Lewinsohn: I completely agree with you. However I do not decide company policy. I merely advise the company and I have repeatedly on many occasions offered this advice to the company. We have in fact got a sub-committee of our Health and Safety Committee at the present time under the chairmanship of our chief Shop Steward attempting to find ways and means of encouraging the use of headgear in our factory.

Interviewer: You could simply make it mandatory.

Dr. Lewinsohn: I couldn't, the company could.

Narrator: But critics of the industry, like Professor Selikoff believe that the enforcement of safety regulations won't be enough.

Interviewer: To prevent diseases would mean massive sums of money to change working conditions, it might totally ruin the industry.

Prof. Selikoff: There will be some products and some operations which would require the vast expenditures that you detail and which would therefore be uneconomic. I think in those circumstances we probably will have to abandon those products and those processes.

Narrator: Concern in the asbestos industry is running high. The British Occupational Hygiene Society has now undertaken yet another review of Turner Brothers' data. This time four doctors, three of them independent of the asbestos industry, will re-examine all the x-rays. On their findings, which are expected early next year, will depend the future of the British asbestos standard and perhaps of the asbestos industry.

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SEP 23 1974
Internal Correspondence

To: Dr. Paul Kotin

Date: September 23, 1974

From: George W. Wright, M. D.

Copies: File

Subject: TELEPHONE CONVERSATION WITH HILTON LEWINSOHN, 9/19/74

- (1) The Turner Brother's cohort has now been enlarged to 391 by bringing in those individuals employed since 1933 who have 10 or more years exposure and increasing the period of observation from the late '60's to 1972. They have followed not only the employees still on the job but also those who have left employment.

In this cohort of employees who started work since 1933, they have now recorded 26 cases of asbestosis diagnosed by the more liberal criteria proposed by the Workmen's Compensation Board of Great Britain. These criteria are considerably more liberal than those originally utilized by Dr. Knox in his previous observations on the original cohort of 291. In my judgement the finding of these cases is reasonably good evidence that there has been a substantial exposure for this population especially during that period between 1933 and perhaps 1960. When I spoke about this with Dr. Lewinsohn and he agrees with me that there must have been a transition period during which the fiber count dropped following the institution of the regulations in 1933. I have no certain way of knowing what these counts may have been but on the basis of what I know about other observations I would expect that the counts at the beginning of 1933 might have been in the range of 50-100 fibers per cc and I would expect that even as recently as late 1950's it would have been something of the order of 25 fibers per cc. We know that in the middle 1960's when membrane filters were beginning to be used and fiber counts be made by the Turner Brother's Hygienists the counts were in the neighborhood of 10 fibers per cc. Moreover, it has really only been in the period subsequent to 1968 or 1969 when they had a fairly high proportion of their operation going at below 5 fibers per cc. I make these points because I would anticipate that those individuals who are showing any evidences of asbestosis or of bronchogenic cancer and possibly even mesothelioma were those

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persons who were exposed in that period prior to 1950 or 1955 when the fiber counts were much higher than our current standard of 5 and the projected standard of 2.

- (2) At present there have been 29 deaths in the cohort of 391 persons. On the basis of the British National Statistics for a population of this size having the age distribution that this population has they would have anticipated 40 deaths during the period of observation. This indicates clearly that, as has been observed in other industrial populations, the working population is a selected group and have a lower mortality experience during their working ages than is true of the general public. For this reason it is somewhat lacking in validity to compare the patterns of mortality in any working population to what are called the National Statistics which is a population having a vastly different mortality pattern.

When the causes of death are broken down it shows that out of the 391, 7 lung cancers were observed whereas 4.8 were expected on the basis of National Statistics. Subjected to statistical analysis this difference is not significant. There were 3 mesotheliomas, and of course this is obviously a statistically significant difference. If one makes an adjustment and looks at this experience in terms of 40 expected deaths rather than 29 then the portion caused by lung cancer is not abnormal, although of course the mesothelioma deaths do constitute a larger than expected group. It would appear then that on the basis of proportion of total deaths or those observed compared to the expected there is no statistically valid difference between the working population and the general public in Great Britain from this cohort of 391 persons. My own impression would be that if they had large enough numbers there would be some statistically different findings but they would be rather small. I say this because I am convinced in my own mind that they did not overnight diminish their exposure by the amount that I think is necessary to get a completely safe working place. On the other hand, I feel very strongly that their experience thus far cannot be used to promote the contention that somewhere between 5 and 2 fibers per cc is an unsafe level. Dr. Lewinsohn is sending me this material

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in greater detail as soon as he can. I asked specifically whether or not the cancer deaths and the mesothelioma deaths had been in those people who had been employed prior to 1955 and he indicated that his recollection is that this was the case but he will look into this and make certain that he is correct.

- (3) Dr. Lewinsohn explained to me how this renewed interest in the Turner Brothers experience came about. He says that Granada Television has a program call World Action and in this they had interviewed Dr. Selikoff on the subject of Vinyl Chloride. At that time he told them about the controversy between Lewinsohn and himself and suggested that they look into the Turner Brother's story. Granada Television has done so and they plan to have a television show on this subject. They have already filmed Turner Brother's operations, Lewinsohn's examining of patients and Holmes doing hygiene studies. They plan to interview Selikoff on this specific subject sometime in the very near future and they have promised to interview Lewinsohn after they have interviewed Selikoff. The Turner Brother's people felt that in any case they were obligated to say exactly what the circumstances were and furthermore they do not believe the circumstances are indicative of a need to set a standard lower than already exists in Great Britain. For these reasons they have been completely open in telling any inquirers what the circumstances are.

George W. Wright, M. D.
GWW/bem

George W.

Since I have had the details of the cohort to hand I have made a reappraisal of the situation.

I have taken the ages of the cohort at the mid-point of the period under review and used the Chester Beatty Research Institute Tables to calculate the expected deaths from various causes for a sample of 391 with this age distribution drawn from the national population. The results are as follows together with the observed number of deaths within the cohort.

	Observed	Expected
Death from lung cancer	7	4.80
Death from other cancer	6	5.37
Death from all other causes	16	29.91
Survivors	362	350.92

If we take each class individually it is easy to show that in the first two classes i.e. lung cancer and other cancer there is no evidence that deaths from these two causes differ significantly from the national average. The point of interest is that deaths from all other causes are significantly lower within the cohort than the national average.

One of the arguments that could be used to support the hypothesis that the incidence of lung cancer is significantly greater in the cohort goes like this. With 7 deaths out of 29 due to lung cancer the proportion of deaths due to lung cancer is 24%. But the national proportion is 12% therefore the incidence of lung cancer in the cohort is twice the national average. It can easily be seen that this argument is entirely fallacious. The proportion is inflated to 24%, not by a significant increase in lung cancer deaths but by a significant decrease in the total number of deaths. The recorded number of deaths was 29 the expected number 40.

I must reiterate that there is no evidence from this cohort that the incidence of lung cancer is substantially greater than the national average in spite of the considerable exposure of all members of the cohort.

H. R. Williams

TABLE I

	<u>1966 Cohort</u> <u>as at</u> <u>31.12.72</u>	<u>Up-dated</u> <u>Cohort as</u> <u>at 31.12.72</u>	<u>Current</u> <u>figures</u> <u>(Total)</u>	<u>Asbestosis Cases</u> <u>as at 31.12.72</u> <u>1966 Cohort</u> <u>1972 Cohort</u> <u>Additions</u> <u>to Cohort</u>	<u>TOTAL</u>
Still employed	162	81	243	12 2	14
Left	95	24	119	11 1	12
Deceased	28	1	29	3 0	3
<u>TOTAL</u>	285	105	391	26 3	29

TABLE 1 (a)

Deaths - 30.6.66 - 31.12.72

	<u>Asbestosis Contributory</u>	<u>Asbestosis not contributory</u>	
1. Cancer of lung/pleura	2	5	Total
2. Cancer of gastro- intestinal tract (oesophagus, stomach, intestines, rectum, liver, bladder, pancreas, peritoneum)	-	1	" 1
3. Mesothelioma	2	1	" 3
4. Other cancer	-	2	" 2
5. Asbestosis	-	-	" -
6. Respiratory disease	-	3	" 3
7. Cardiovascular disease	-	10	" 10
8. Other causes	-	3	" 3
Total	<u>4</u>	<u>25</u>	<u>29</u>

TABLE 2

Comparisons between Doll 1955 and Table 1(a)

	Asbestosis Present	Asbestosis not present	Total
(Doll) 1933-52	75	30	105
(HCL) 1966-72	4	25	29

An illustration of the declining incidence of asbestosis as a contributory cause of death.

TABLE 3

Unconfirmed Preliminary Information on Present Up-dating of Knox, Holmes,
Doll and Hill (1968)

(Observed and expected deaths from all types of cancer 1966-1972 in men
with 10 years or more exposure since 1.1.33).

Total	Deaths observed	Deaths Expected
659	19	19.8

Observed and expected deaths from all cancers in the up-dated total
population (i.e. anybody with 10 years or more exposure (including
women) irrespective of year of first exposure), between 1966-1972.

Total	Deaths observed	Deaths Expected
1103	27	27.1

Date first exposed	Job Group	Years of service	Date left	Date of death	Cause of Death									
					Asbestosis Contributory					Asbestosis not contributory				
mm/yy			mm/yy	mm/yy	1	2	3	4	5	6	7	8	9	10
(25) 12/39		26yrs 7mths		07/66										
(25) 04/40		26yrs 9mths	01/67	10/70										
(25) 03/41	1	26yrs 6mths		01/68										
(25) 11/52	1	14yrs 5mths		04/67										
(25) 04/57	1	30yrs 4mths	09/66	08/67										
(25) 03/57	1	25yrs 9mths		07/68										
(25) 05/55	2	16yrs 10mths	04/72	11/72										
(25) 12/50	1	18yrs 11mths		07/72										
(25) 10/49	1	20yrs 3mths		01/69										
(25) 02/57	1	26yrs 5mths		05/70										
(25) 07/48	1	19yrs 10mths	05/68	04/69										
(25) 12/49	2	23yrs 5mths	07/71	01/72										
(25) 09/39	2	29yrs 2mths		11/68										
(25) 10/45	1	24yrs 0mths		10/69										
(25) 4/40	2	21yrs 1mth		07/67										
(25) 03/54	1	16yrs 8mths		11/70										
(25) 02/43	1	24yrs 1mth	03/67	03/71										
(25) 06/40	1	30yrs 6mths		08/70										
(25) 05/52	1	18yrs 3mths		04/71										
(25) 04/54	1	14yrs 10mths		02/69										
(25) 03/57	1	25yrs 5mths		11/68										
(25) 04/41	2	26yrs 6mths	11/67	12/68										
(25) 08/54	1	12yrs 2mths		10/66										
(25) 03/59	1	28yrs 2mths		11/68										
(25) 05/56	1	12yrs 11mths	04/69	01/70										
(25) 04/57	1	23yrs -	01/65	02/69										
(25) 06/47	1	23yrs 9mths		03/71										
(25) 03/42	1	26yrs 8mths	11/68	11/70										
(25) 11/56	1	12yrs 7mths	04/69	01/70										
TOTALS =					2	2	2	2	2	2	2	2	2	2

• = smoker
+ = ex-smoker

Group 1 as described in Appendix (i) to BOHS standard
Group 2 as described in Appendix (ii) to BOHS standard

Causes of death

- 1 Cancer of lung/pleura
- 2 Cancer of gastro-intestinal tract (oesophagus, stomach, intestines, rectum, liver, bladder, pancreas, peritoneum)
- 3 Mesothelioma
- 4 Other cancer
- 5 Asbestosis
- 6 Respiratory disease
- 7 Cardiovascular disease
- 8 Other causes