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Co. Fo... Industrial Hygiene

McGILL UNIVERSITY,
MONTREAL.

FACULTY OF MEDICINE
OFFICE OF THE DEAN.

JANUARY
Nineteenth
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File
20 Jan 1926

Augustus S. Knight, Esq., M.D.
Medical Director - Metropolitan Life Insurance Co.,
N E W Y O R K C I T Y.-

Dear Dr. Knight,

I have just returned from California, and find your good letter of January 7th awaiting me.

It was extremely good of you to write me such a nice note, and I quite understand your position. We are more than delighted at the generosity of the Board of Directors in appropriating the money for our survey, and will look forward with a great deal of interest to such work as we can carry out. I hope it will be the means of ever more and more pleasant relations between the Canadian medical work and the Metropolitan Life Insurance Company.

With every good wish for the New Year and renewed thanks for your kindness, believe me

Very cordially yours,

C. F. Martin
DEAN.

PRODUCED BY IMAGING MET 0394

K.C

January 7,1926

Dr.Charles F. Martin
660 Sherbrooke Street W.,
Montreal, Canada

My dear Doctor Martin

For quite a long time I was chagrined at my inability to keep the verbal promise that I made to you when you were here in my office, namely, that I would try to tell you during the following week what our Company was likely to do with reference to the appropriation that was hoped for. I neither forgot nor neglected the matter, but the stone walls that I ran against showed there was absolutely nothing to be said or done at that time. I am very glad to tell you now, however, that the Board of Directors passed a resolution at their meeting yesterday that authorized the Officers of this Company to appropriate $5,000 a year for five years for the proposed survey to be made under the terms and conditions approved by the Medical Division of the Metropolitan.

I have no doubt that you may already have heard about this through the letter that our President wrote to Sir Arthur W. Currie yesterday, but nevertheless I myself feel like having a word with you about it.

With kindest personal regards to you and trusting that you will come to see us whenever you are here in New York, I am,

Yours very truly,

MET 0395

MEDICAL DIRECTOR

PRODUCED S/C/M/Ms

It is suggested that we approach the Dean of the Faculty of Medicine of McGill University with a proposal that upon the establishment of an adequate Department of Industrial Hygiene in the McGill Medical School the Metropolitan enter into an agreement with McGill to secure for the Company certain services and information relating to the health of industrial workers in Canada.

With the establishment of a Canadian Home Office and the extension of the Company's operations in the Dominion it becomes increasingly important that the Company have accurate knowledge of conditions attending industrial activity in Canada. It is, further, most desirable that the Company's program for the betterment of the health of industrial workers and their families be advanced in Canada where industrial hygiene as a phase of public health work is notably backward.

It would be of great value to the Company to have specific information regarding such matters as:

1. The distribution of industrial establishments, mines and lumbering operations with data concerning the number of employees in each establishment and district.
2. Studies of hazardous processes.
3. Studies of morbidity and mortality in relation to the major industrial pursuits.
4. Studies of extent and character of medical service available in the "unorganized territory" wherein are conducted the great mining and lumbering operations.
5. Observations regarding opportunities for educational work by the Company.

To secure such information directly would be difficult and very expensive. If it could be obtained from a department of industrial hygiene in Canada's leading university in return for a moderate annual fee the Company would undoubtedly benefit. If the Company could incidentally through its relation with the University extend its own influence in the field of public health the benefit would be still greater.

It would mean an adherence to the Company's established policy of utilizing when possible Canadian personnel and operating through Canadian agencies. It would bring the Company and its activities in contact with many highly influential individuals and industrial groups.

Though legal obstacles may stand in the way of a contribution by the Company to an educational institution they are not concerned with the plan proposed. Such a plan involves a definite quid pro quo, payments specifically conditioned upon a commensurate return, the adequacy of such return to be determined by the President or those to whom he may delegate the decision.

PRODUCED ... SUITS

MET 0396

Should the proposal be made by the Company to the University our participation would be vastly more valuable and stimulating in its effect upon Canadian industrial organizations than it would be were such participation to be solicited.

It is accordingly recommended that with proper legal safeguards and in the event of the fulfillment of suitable conditions the Company in consideration of certain services rendered pay to McGill University the sum of five thousand dollars annually during a period of [redacted] years.

WR

Wade Wright.

PRODUCED S/C IS

Nov. 4, 1923.

Dear Doctor Knight:

I do not know whether or not the President is still interested in establsihing some sort of relation with McGill or not. Neither can I recall just when the Ottawa corner-stone laying takes place but if that event is still in the offing it would be a grand time to do the graceful and announce our proposed relations withthe University.

Within the past two weeks or so there have been two important and urgent calls for help from Canadian firms. One is the most active of the big paper companies, from the standpoint of labor relations and one of the very largest. They are finally starting on an extensive reorganization of their whole medical program with periodic annual physicals, at the recommendation of the union employees. This is the Spanish River Pulp and Paper Company. The other outfit is a printing plant near Montreal which is launching a wild scheme to examine everybody in their employ and also the members of the families of employees. Both these groups need close watching and a lot of help. It is work which we can do only with difficulty and great expense and work which a Canadian could do better than we could. On such a job the contemplated department of industrial hygiene at McGill would be able to render most valuable service.

If you think well of mentioning these matters Mr. Bruere could give you all details. As you know I did not pursue the matter of the Met's relations with McGill with Mr. Bruere, letting the whole question rest where it was on Mr. Fiske's visit here. If you wish to secure further information from Mr. Bruere please tell him of the plot at the time of Dr. Martin's visit for he knows nothing of it.

Sincerely yours,

Wade Wright

PROPOSED SIGNING

MET 0398

Dr. Wade Wright, p. 443

"THE THING I WANT YOU TO TAKE HOME AND THINK ABOUT"

Business Session of the Managers' Annual Convention, January 29, 1925

HALEY FISKE, *President*

My dear friends, I have left for myself but a very few minutes to say something to you at the conclusion of this exhibit of the year's business. I don't like merely to read this record and dismiss you. I won't see you again to be able to talk to you for another year, except as I hope to be able to meet many of you in the Field during the current year. (Applause.) I don't count Saturday night, because in making way for other speeches, I cut my own down to the shortest possible limit, and what I shall have to say there will not be directed entirely to you, but also to the listeners-in, who, this year, will be millions and millions of people. I understand that we have engaged all the systems for a certain length of time, and that everybody who has any kind of a radio at all, will be under the necessity of hearing me speak and have the delight of hearing the other speakers.

I like to confine my remarks sometimes to a text. I don't know but that before I get through today I may preach a sermon. I am very much stirred up. The Reverend Father BULL is one of the most distinguished men in England. He is a member of the Community of the Resurrection. That Community consists of learned men whose occupation is writing books and preaching sermons and also doing mission work. Father BULL is known all over the world. One of the vows of the Community, as in other religious orders, is poverty. When a man enters a religious order, he has a vow not only of chastity, of obedience, but of poverty. All that he has is surrendered, and thereafter he lives the Community life.

Father Bull's Visit to Home Office

Father BULL was in this country delivering a course of lectures at the General Theological Seminary. He became much beloved. I was privileged to meet him. He came to the Home Office. Later, he had a conversation with my daughter which was rather illuminating. With that notion of poverty and that idea that this material life of ours is temporary and that eternal life is the only thing worth considering, he said he never liked to meet or know rich men or the officers of rich corporations. You can see his idea. He was good enough to add to my daughter that he made an exception in my case.

And why? It was no merit of mine. He came here to the Home Office. He lunched. Then we showed him around. I thought he would never get through. He said he thought he had walked ten

miles. Then he wrote me a note saying: "I thoroughly enjoyed my visit to you and what I saw of your wonderful work. The vast astronomical millions made me giddy. I really believe GOD is training some of you men of big business for use in His Kingdom, as a union of the human race in a cooperative commonwealth of nations beneath the Fatherhood of GOD which is clearly His will, and He needs men who habitually think in millions."

Cooperation Our Mission

Cooperation, making ourselves instruments of good, carrying out the will of GOD for the betterment of humanity—is that or is it not our mission? That is the thing I want to say a word or two about, and that is the thing I want you to take home and think about.

The thing is put upon us, not merely as a life insurance company, but as a life insurance company which has one-fifth of the population of the country insured, whose system involves weekly visits of agents, who make 300,000,000 or more calls a year in the homes of people who need help. That is the situation. It develops at once Opportunity, and I say that as men belonging to a great corporation and engaged in a great public work, it puts upon us Responsibility, and I say that human beings, such as you and your agents are, can't afford to get into this daily relationship with other human beings and neglect those opportunities. (Applause.)

I am taking it for granted that I am addressing a body of men (and through them the agents of this Company whom I love) who are not mere agents of an insurance company, but human beings. They have GOD's life-blood in them. They have, as human beings, human relationships, and this Company creates for them an abounding human relationship. It puts them into weekly contact with millions and millions of people, and I say that no man who has the fear of GOD and the love of humanity in his veins can possibly meet those opportunities in the mere relationship of premium collections and death claims. It isn't possible, it seems to me, for a human being with a human heart to go around and make these visits and not do all the good he can, not contenting himself with simply keeping the contracts which the Company has made for him.

The Home Office Furnishes the Means

Now, if that be so, what can we do? What we have been doing at the Home Office is to furnish you the plan and the material by which you can meet those GOD-given opportunities. First, of course, is nursing, and I have talked to you about that so often that I am not going to talk about it today, except to say that I can not understand at all the act of an agent in neglecting any sick Industrial policyholder who needs a nurse.

Then, I am talking about literature year after year, and I don't want to say much about that. But, gentlemen, if you yourselves read the literature that we issue, you must be impressed with the fact that it is very, very instructive and helpful. I am persuaded that it has

been largely circulated where it would do the most good. I do hope that you will continue to see that it is distributed where it will do the most good and in the *manner* in which it will do the most good. And the manner in which it will do the most good is by consultation over the pieces of literature between the agent and the family.

For thirty years I have been preaching that this Company of ours is a family. I am rejoiced now to think, at the end of a generation, that everybody feels it to be a family. After all, we are members of a great human family, and it is that feeling of a human relationship which I want men to cultivate. It is curious how the heart-touch of human sympathy will enter into men's breasts on the slightest occasion.

I was reading the other day, a letter from one of our districts. It was a story to me extraordinary which illustrates the feeling of how yearning people are, how aching people are to have human friendship and sympathy. One of our men called with an assistant or another agent at a house which he understood was uninsured. He knocked at the door. The door was slightly opened and then a bar thrust across, and the man said: "What do you want?"

"I want to present to you the subject of insurance."

"I don't want to hear you. I have considered it, and I won't take any, and I don't believe in it, and you can go away."

He said: "Well, I think I might say something to you that would be interesting at least to your family and yourself, if you wouldn't mind letting me in for a few minutes."

The man's face softened, and he said, "Well, come in." The agent opened the subject of insuring the father and the mother and the children, and he made no headway. The man got up in a kind of disgust, left the room and went out into the kitchen to shave. Of course, the agent kept on talking to the wife.

The Christmas Message

She hadn't any power to sign an application, but on a chance the agent said: "I wonder if you would like to listen to a Christmas address made by the PRESIDENT of my Company to the men and policyholders; because if you would, it happens that I have a disc in my car outside and a little phonograph, and I can put it on and let you hear it."

Well of course curiosity got the better of the woman, and she said: "Bring it in."

He put on the disc and repeated that Christmas message of a year or two ago, which went all over the country to agents and to policyholders. There was a listener-in from the kitchen. He finally burst into the room and said: "I missed part of that. Do it over again." It was done over again, and the agent left with the application of father and mother and every one of the children. (Applause.)

Of course, you know that story isn't told for the purpose of any exaltation of myself. It is done for the illustration of what I am insisting is true: that the hearts of working people are yearning for sympathy and human relationship; and as soon as that man found

that the agent belonged to a corporation whose head thought it wort while to deliver to him a Christmas message, he said: "I want to b a member of the corporation whose President thinks at Christmas o the welfare of all his policyholders of whom I am going to be one. Do you see? Can you get that argument, that feeling, that impulse tha was in the man's mind? That feeling is in the minds of all workin people, whether they admit it or not.

The Meaning Reaches and Touches Men Who Work

Now, Group Insurance, even more than Industrial Insurance, i reaching out to those men in this matter of human relationships because it involves a cooperation between the employer and employe

The system of Group Insurance is one which, in effect, ties up in mutual contributions, ties up in a business sense, the employer and the employe, and ties them up in a family sense. They are in partnership in business, and they are in partnership in that sense of joint ownership, that mutuality which is the glory of the Metropolitan, that binding together of millions of people for mutual support, the most beautiful thing in the world. It is the consciousness on the part of the employe that he and his boss are as one in this Metropolitan family —that is the great benefit that is produced by Group Insurance. It does ameliorate and is sure to ameliorate the relationships between Capital and Labor, the employer and employe. Therefore, I am bringing it to your attention because I feel that this Group Insurance business which we are doing, doing to such a large extent, but to such a small extent as compared with the possibilities, is one of the most valuable things from a public point of view which any corporation can be engaged in that is interested at all in life insurance.

Influence of the Metropolitan in Linking Employers and Employes in Bonds of Mutual Interest

I said to the Veterans last night, and I think I said to you last year, something about the great power of this corporation, its great mass of wealth, the great responsibilities that come and the great dangers that come. But, gentlemen, who can withstand the attitude of a Company which has not only the working men insured, but employer and employe tied together in Group Insurance? Fancy the industries of this country all members of the Metropolitan. Fancy the power that would come to any company, the defense against assault that would come to any company that has on its books great masses of the population of this country, masses of people engaged in industry in cooperation with their employers. When you talk of Group Insurance in the Metropolitan, you are not talking of Group Insurance at all, as it is commonly known. Group Insurance, as it is commonly known, is a system of what you may call wholesale life insurance, the payment of premiums and the payment of death claims and the payment, perhaps, of accident and dismemberment and sickness claims and all that. That isn't Metropolitan Group. Metropolitan Group Insurance is nursing. Metropolitan Group Insurance is distribution of literature. Metropolitan

Group Insurance is the study of hygiene of the worker. Did you hear me read that list of forty different things that Dr. WADE WRIGHT is doing in his division? Can you see that he is reaching down into all the hazards of employment; that his purpose is to bring home to the employer his responsibility for the health, the welfare, the lives of his employes? Can you fancy this Metropolitan entering into all the employments of this country and going down to the working man through the employer, or independent of the employer, and looking after his health, his domestic conditions, his methods of carrying on his employment, the things provided for him in the place of employment. And this hygienic investigation and survey of Dr. WRIGHT is to go down into the homes of the working people and see what they are at home, what can be done there in the domestic way to advance their welfare and health.

Do you see now this human relationship extended to the *n*th degree, this Metropolitan center stretching out its tentacles in every possible direction to reach the domestic and the working conditions of working people? And then do you see that it is the sweetest of all things, the tender human relationships, the heart touch of crowds who will say, as you go on in this work, that you are marked men in the communities in which you live? The working people will look up to you as their friend and their advisor. Employers will be seeking you to know what more they can do. Capital and labor will lose their strife, and, as GOD'S people under the one roof, whether they be capitalists or laboring men, they may be brothers, and you and your agents, as you walk, will walk, in and out as brothers to humanity, as friends of every man and as servants of GOD. (Long applause and cheers.)

COPY/

REPORT OF THE ACTIVITIES OF THE INDUSTRIAL CLINIC, MONTREAL GENERAL HOSPITAL, FOR THE YEAR SEPTEMBER 1, 1928, to AUGUST 31,1929.

CLINICAL

(A) The investigation of occupational diseases among the Out Patients of the Hospital has progressed this year in the same manner as the previous year. The number of cases for investigation does not appear to be increasing, and I am of the opinion that this aspect of the work, while valuable from a research standpoint, is less important than some of the other activities of the Clinic. Actually there were 523 cases referred to the Industrial Clinic during the period. Among these were 30 cases of active Lead Poisoning, 3 cases of chronic arsenic poisoning. Three cases of carbon monoxide poisoning were seen in the Hospital wards, but these were not Industrial cases.

(B) The examination of Food Handlers referred to the Hospital for certificates has been continued. Actually there have been 275 of these examined.

(C) 383 Industrial accident cases were questioned with regard to the causation. The figures for this study are in the process of compilation, and cannot be given. The difficulties of a study of this type from hospital records becomes apparent as soon as it is undertaken, for one has no assurance that all accident cases of a given company come to the Hospital for treatment.

FIELD ACTIVITIES.

PRODUCED S/C/M/MS

(A) The Plant Medical Departments which were established in the first year of the operation of this Clinic have continued satisfactorily, and have handled a tremendous volume of work. In the year under review 1295 physical examinations have been performed, 17[redacted] ments given, 5914 sickness treatments and 947 [redacted] ese statistical statements only describe the work [redacted] l Departments in part. I believe there is gene[redacted] on the part of the various plant managers in the [redacted] se Medical Departments. A number of firms have been [redacted] regard to the formation of Medical Departments, but only 2 have done so. Both these firms have engaged physicians recommended by the Industrial Clinic, and are operating along the general lines recommended by the Clinic. During the year one large steel company established a Health Service with a full time physician in charge. The Industrial Clinic was consulted in regard to the organization of this, and actually conducted the service for six weeks during the absence of the physician on account of sickness. Another large plant manufacturing company established a Health Service, stimulated I believe by this Clinic, but the Clinic was not consulted as to its organization.

MET 0458

(B) The idea of co-operative Health Sercie to small plants, which was sponsored by the Canadian Manufacturers Association, has made no progress this year.

(C) There have been several calls for investigation of plant conditions. A fairly extensive study was made in one bronze foundry. A number of air analyses for lead were carried through. The results of these studies form the basis of a paper to be read at the annual meeting of the American Public Health Association this fall. A study of the carbon monoxide hazard in a large garage was commenced last winter, but was discontinued for lack of apparatus. The purchase of suitable apparatus is contemplated and it is hoped to continue this study during the coming year.

EDUCATIONAL.

(A) Lectures in Industrial Hygiene have been given to the third year students, the students in architecture, the School of Graduate Nurses, the School of Social Work and the pupil nurses of the Montreal General Hospital.

(B) A special course of 12 lectures with field visits was given to the Public Health Nurses in the School of Graduate Nurses.

(C) 6 Popular lectures have been delivered at various clubs and societies in Montreal, and one in Toronto.

MISCELLANEOUS.

PRODUCED S/C/M/Ms

(A) An Industrial Dental Clinic was opened in December 1928. The Clinic is self-supporting so far as running expenses are concerned, but the Hospital donates the use of the space without charge for rent, light, heat and laundry. At this Clinic 182 cases have been treated. There has been a total of 785 treatments given. In the organization of this Clinic two firms donated $350.00 to purchase the necessary equipment. A total of $1780.46 has been received [redacted] trial Dental Clinic, of which the sum of $14[redacted] for salaries and supplies, leaving a balance of $[redacted] acknowledge here with thanks the services of the [redacted] who have spent their time at this Clinic with [redacted] renumeration, and to the nurses, who volunt[redacted] time to assisting the dentists.

(B) The staff of the Clinic assisted in the production of the periodic Health Examination Film of the Canadian Medical Association. This occupied a very considerable amount of time, but was considered well worth the time spent.

(C) The Industrial Medical Association of the Province of Quebec conducted a successful year. A union of the French and English Associations took place, and this united Association in collaboration with other organizations was able to render considerable service to the Workmen's Compensation Commission of the

Province of Quebec in the extensive revision of their Tariff. Several general meetings were held during the year, and a very successful dinner meeting at the annual meeting of the Canadian Medical Association.

(D) An effort has been made to obtain permission to study the effect of asbestos fibre on the health of workers. Two large companies were approached in this regard. The first one, possibly on account of financial difficulties, was unwilling to sponser such a study. The second has decided to undertake an investigation for itself with our assistance and advice. It is to be hoped that information of scientific value will be forthcoming from this.

(E) The director of the Industrial Clinic attended 4 conventions during the year under review.

Respectfully submitted,

(Signed) Frank G. Pedley,

The Industrial Clinic.



PRODUCED S/C/M/Ms

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PLAINTIFF'S EXHIBIT 5190-0

PLAINTIFF'S EXHIBIT ML-5190

REPORT OF THE ACTIVITIES OF THE INDUSTRIAL CLINIC, MONTREAL GENERAL HOSPITAL, FOR THE YEAR SEPTEMBER 1, 1929 to AUGUST 31, 1930.

CLINICAL

The clinical work in the Hospital as distinguished from that done in the field has continued as in the past, and an additional duty has been assumed, namely the supervision of the health of the Hospital employees. This was undertaken as a service to the Hospital, and has little value from the University standpoint.

The new activity calls for an examination of all new employees of the Hospital, and requires that all cases of illness among the Hospital employees be reported to the Industrial Clinic. During the year 80 pre-employment examinations and 38 periodic re-examinations were performed. 410 sick employees of the Hospital were seen and followed until the termination of their illness. This system, as it operates at present, is not entirely satisfactory on account of the number of departments which engage their own personnel, and a considerable number of new employees are being engaged with no examination. However, it is hoped that as the value of this examination becomes appreciated all departments will take advantage of it.

The study of occupational diseases among the Out-patients of the Hospital continues. Some results of this work are now appearing. One concern, which formerly contributed a large number of cases of lead poisoning to this Clinic, has established a new factory, partly on account of the severe lead hazard which existed in the old plant, and another firm has installed a fume removal system which should reduce the hazard very considerably. 22 cases of active lead poisoning were treated and investigated. Two of these were of special interest, and have been written up for publication, one report, one in the Journal of Industrial Hygiene, and one before the Montreal Medico-Chirurgical Association. [illegible] was one of the principal diseases seen, although several cases of occupational skin diseases were investigated. In this connection an arrangement was made between one manufacturer and the Skin Department of this Hospital to undertake an investigation of a dermatitis caused by a certain lotion of his. This investigation was carried through to a very satisfactory conclusion by the Skin Department.

It may be stated here that the legal aspect of occupational diseases is in a very unsatisfactory condition in this Province, since no provision is made for compensation through the Workmen's Compensation Act. This matter was brought to the attention of the Province of Quebec Safety League, and a committee was formed to investigate it, but so far, unfortunately, this committee has been very inactive.

PRODUCED S/C/M/Ms

The Industrial Dental Clinic has had a very satisfactory year. Its clientele increased, and consequently an increase of staff was necessary. 268 new patients were treated and 984 treatments given. I believe this Clinic is of real value to the community. Industrial workers can get good dental service at a low cost, and since the Clinic is operated at night, they need not lose time from their work. The financial status of the Industrial Dental Clinic is satisfactory, the fees from the patients being sufficient to pay the operating cost.

FIELD ACTIVITIES.

The plant Medical Departments have continued to carry on their work, and have given general satisfaction so far as can be determined. It is our practice to send to each plant manager a monthly report covering the activities of his Medical Department, and indicating the state of health of his employees. Frequently suggestions are made as to improvements in his plant from the standpoint of health. These suggestions are always gladly received, and usually followed. In these Medical Departments 1056 physical examinations were made during the past year, 15,605 surgical treatments and 6336 sickness treatments were given, and 889 nursing visits made to the homes of the employees.

A number of firms have been approached in regard to establishing medical departments, but no success has attended our efforts this year. I believe there is no doubt that the services already established have given satisfaction, but the idea has not sold itself, and we have had very few unsolicited requests for information and advice about the organisation of medical services. It is possible that the general industrial depression has been responsible for this.

Four new activities were proposed during the year:

(1) A study of asbestos workers.

(2) [illegible]udy of a large group of workers by X-ray to determine the incidence of tuberculosis.

(3) [illegible] study of psychological tests for automobile drivers with the view to decreasing accidents.

(4) The organization of an Occupational Therapy Workshop and an Industrial Workshop for handicapped individuals.

[illegible]ation

(1) The asbestos study is nearing completion. 102 individuals were examined clinically and by X-ray at the plant of the Canadian Johns-Manville Co. in Asbestos, P.Q. in July 1930. Other groups were examined at Thetford Mines in September 1930, but these do not come within the purview of this report. This study is being carried on with the co-operation

PRODUCED S/C/M/Ms.

of the Metropolitan Life Insurance Co., and it is expected that valuable information on the subject of asbestosis will be forthcoming. It is hoped that permission to publish the results will be obtained.

(2) The Tuberculosis Survey will probably be commenced during the coming year in co-operation with the Canadian Tuberculosis Association,,the Sun Life Insurance Co. and other bodies. Since tuberculosis is such an important disease in the Province of Quebec, particularly among industrial workers, it is expected that results of real value will accrue from this study.

(3) The psychological study of automobile drivers was discussed in committee and then proposed to the Insurance Casualty Underwriters Association, but they did not show sufficient interest to warrant continuing the matter.

(4) The organization of the Occupational Therapy and the Industrial Workshops for handicapped individuals is still mooted, and will, it is hoped, be accomplished in the future. In that connection the Director of the Industrial Clinic has served as President of the Association of Occupational Therapy and has visited a number of workshops in other cities to acquaint himself with their organization and operation.

EDUCATIONAL.

Lectures have been given at the University in the Faculty of Medicine, the School of Social Work, the School of Graduate Nurses and the Department of Architecture.

Several addresses have been given to clubs and societies in Montreal and elsewhere.

A paper, "Lead Poisoning in Brass and Bronze Industries" was read before the Industrial Hygiene Section of the American Public Health Association at its Annual Meeting in Minneapolis in October 1930.

[redacted] paper, "The Incidence of Occupational Deafness and [redacted] its Prevention", was read before the 11th Annual [redacted] of the American Association of Organizations for the [redacted] Meeting in New York in June 1930.

Through the Province of Quebec Safety League and the Montreal Council of Social Agencies representation was made to the Provincial Department of Public Works and Labour on behalf of handicapped workmen who are discriminated against by the Workmen's Compensation Act. In this connection the Director of the Industrial Clinic was asked to read a paper before the International Association of Industrial Accidents Board and Commissions at its Annual Meeting in Wilmington, Del. in Sept. 1930.

PRODUCED SIGNIFICANT

The Director of the Industrial Clinic served as Chairman of the Industrial and Economic Section of the 2nd Canadian Conference of Social Work held in Toronto in May 1930.

The Industrial Medical Association of the Province of Quebec has held five regular meetings during the year. The attendance at these meetings has been between 20 and 35. The members regularly attending the meetings appear to enjoy them, and I believe the organization of this Association has been well worth while. It plans during the coming year to send lecturers to different parts of the Province and so extend the influence of the Association more widely.

The Director of the Industrial Clinic attended six national or international meetings during the year as follows: The Annual Meeting of the National Safety Council, the Annual Meeting of the American Public Health Association, the Second Canadian Conference of Social Work, the American Association of Organizations for the Hard of Hearing and two meetings of the Conference Board of Physicians in Industry.

In resigning the position of Director of the Industrial Clinic I wish to say that it is my belief that the Industrial Clinic should be continued along the lines already established. Although numerically the number of cases seen and treated is not large, the location of the Clinic and its activities have served the useful purpose of gaining contact with industry, and it seems likely that as time goes on the field of usefulness of the Clinic will be enlarged.

It was my hope at first that more use could be made of the clinical material passing through the Compensation Clinic, but so far no method has been found to handle this material in a useful way. A study was carried on last year of the accident cases of several large firms, but since these firms did not send all their cases to the Clinic a proper statistical background could not be determined and the result of the study were of no practical value.

[redacted] that the present change in personnel affords an opportunity for the re-organization of the Industrial Hygiene Service. There is need in this part of the country for a well trained chemist in the field of Industrial Hygiene, and it is my belief that one should be engaged. The space is available in the Department of Public Health and Preventive Medicine, and many problems await a man qualified in this field. At the present time Industrial Hygiene activities at McGill University are severely hampered by the absence of skilled assistance in chemistry.

Respectfully submitted,

0457

(Signed) Frank G. Pedley,

The Industrial Clinic.

PRODUCED S/C/M/Ms

DEPARTMENT OF PUBLIC HEALTH AND PREVENTIVE MEDICINE

McGILL UNIVERSITY

MONTREAL,

October 11, 1932.

N.L. Burnette, Esq.,
Metropolitan Life Insurance Co.,
Cttawa, Cnt.

NOV 3 1932

Dear Mr. Burnette:

You have asked me to let you have a statement regarding industrial hygiene at McGill in time for the American Public Health Association meeting this month.

As you know, I came to Montreal in August, 1927 to take charge of the industrial hygiene work at McGill. The first activity was the creation of the Industrial Clinic at the Montreal General Hospital. It was thought at the time that the best point of contact with industry was through a clinic to which cases of occupational disease might be sent for investigation and treatment. A considerable number of such cases were directed to the Clinic, particularly cases of lead poisoning, and contact was made with the industries from which they came. One plant with an exceptionally severe lead hazard actually erected a new building, partly, I believe, on our recommendation, and several plants have improved their working conditions, by installing various ventilating devices to carry away poisonous dusts and fumes. Several papers have been published on the subject of lead poisoning, copies of which are enclosed.

The occupational poisoning work has been considered a less important activity than others, particularly on account of the fact that the number of cases of occupational poisoning is small compared with other diseases which affect industrial workers. All evidence points to the fact that industrial workers suffer in the main from the same diseases which affect the general population, and that preventive medicine for industrial workers should be directed towards those diseases and not especially towards the so-called occupational diseases. For this reason, it was thought that a valuable service could be rendered industry in particular, and the community in general, if industrial health services could be established in the larger industries, so that the health of the workers could be brought under the immediate supervision of a doctor and a nurse.

A good deal of time was devoted to making contact with industries which, it was thought, would be interested in a scheme of this nature. Considerable success was achieved at first and five plants created health departments immediately under our supervision, while four or five other concerns were stimulated to establish medical departments. These medical departments have all given satisfaction and are still operating, but the industrial depression during the last three years has made progress in this work very difficult.

PRODUCED SIGNIMS

Industrial Dental Clinic

In connection with the work of the industrial health services,

MET 0357

an industrial dental clinic was established, the activities of which are recorded in an attached re-print. This clinic has financed itself entirely and is having a certain amount of difficulty now in making both ends meet.

Industrial Medical Association of the Province of Quebec

As an outcome of the industrial hygiene work, the Industrial Medical Association, P.Q., was established in 1928. This is a bilingual Association which carries on independent activities, and is also considered a branch of the Province of Quebec Medical Association. Doctors, Pennoyer, Mercier, St. Jaques, and Tees, have been the successive presidents, and Dr. Ward and I have served as secretary. The organization took an active part at the request of the Workmen's Compensation Commission, in drafting the tariff of the 1928 Workmen's Compensation Law, and has held meetings approximately bi-monthly since its organization.

Montreal Health Survey

The Industrial Hygiene Department co-operated with the Montreal Health Survey Committee and prepared the industrial hygiene section of the report.

Study of Asbestosis

In co-operation with the Metropolitan Life Insurance Company, a survey of two companies mining and milling asbestos, was made in July and September, 1930. Physical examination of some 150 men was made, together with chest X-rays, and an interesting state of affairs was disclosed, which was reported to Dr. M.J. Lanza of the Metropolitan Life Insurance Company, but to date permission has not been secured to publish the results of the study.

Lectures at McGill

Courses of lectures on industrial hygiene have been given every year to the third year medical students and graduate nurses, social workers and architects.

General Publicity

A number of public addresses have been given on the subject of industrial hygiene. Various papers have been prepared for publication or presentation at scientific meetings, most of which are enclosed.

I have been submitting reviews and editorials to the Canadial Medical Association Journal, and have also acted as joint editor with Dr. Cunningham of the Industrial Hygiene Section of the Canadian Public Health Association Journal.

A representation favouring the creation of Division of Industrial Hygiene in the Provincial Health Department, has been made to the Social Insurance Commission and the Province of Quebec, and this Commission has recommended such a Division to the Provincial Government.

PRODUCED S/C/MMS

Present Activities

The Industrial Clinic has been moved to the University under the immediate direction of Dr. Vance Ward. The supervision of the plant medical departments continues, and in addition, two new activities have been started and are now in operation: (1) a study of mercury poisoning and (2) an industrial health survey;

(1) Our attention was drawn a year or so ago to the mercury hazard in one of the plants outside the City, and also to the fact that a relatively small amount of experimental work had been done on industrial mercury poisoning. The co-operation of the Department of Pharmacology at McGill was obtained and an experimental study with dogs is now in progress to ascertain the minimum permissable concentration of mercury in air. It is anticipated that a publication of this study will shortly be ready. This study is being financed entirely from the Industrial Hygiene funds.

(2) In co-operation with the Canadian Tuberculosis Association, the Provincial Health Department, and the Department of Industrial Hygiene at McGill, a study has been started with particular reference to tuberculosis in industrial workers, but also with reference to general health. Some 2,000 workers in three companies have already received a complete physical examination, with chest X-rays, and it is hoped to continue this survey so as to include 5,000 employees in different occupations. This survey has been under way for a year, and is being financed, partly by the Provincial Health Department, partly by the industries concerned, and partly by ourselves.

The $25,000 promised by the Metropolitan Life Insurance has all been paid, and some $4,000 is left to carry on the work. We are in hopes that the mercury study can be completed within this appropriation, but it will not be possible to finish the industrial health survey unless additional funds are forthcoming.

An activity which we have been endeavouring to establish for some years, is a co-operative health service to plants too small to provide a complete service of their own. An endeavour was made to get this service under way, financed by the companies themselves, but various difficulties presented, chief of which was the scepticism of the employers of its practicability. Since this scheme has been successful in Philadelphia and Hudson County, New Jersey, it seems likely that when better times return, if a demonstration were made perhaps in co-operation with the Royal Edward Institute, employers might be convinced of the desirability of such a scheme. We feel this would be of value to the community in general, and to the industries affected in particular, and might be of actual economic value to your own company.

These are the main facts in connection with the industrial hygiene work at McGill University.

Yours very truly,

Frank G. Pedley

Frank G. Pedley, M.D.
Assistant Professor, Industrial Hygiene.

FGP/IM.

PRODUCED S/C/M/M3

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REPORT OF THE PHYSICAL EXAMINATIONS
EXAMINATIONS OF ASBESTOS WORKERS IN Asbestos
AND THETFORD MINES, QUEBEC

The report herewith presented deals with the examination of 141 employees of the Canadian Johns-Manville Co., Asbestos, Que. and 54 employees of the Asbestos Corporation of Canada, the Keasby-Mattison Co. and Johnson's Mine, all of Thetford Mines, Que. 40 of the men of the Canadiam Johns-Manville Co. were examinaed by Dr. D. M. Stevenson and Dr. Joseph Wyatt, who performed the physical examinations and X-ray examinations respectively. The other examinations were all performed by me, except the X-ray examinations. Actually, Drs. Stevenson and Wyatt examined 57 men; but since 17 of these men were re-examined by me I am including them in my list. Drs. Stevenson and Wyatt carried on their work in November 1929. My examinations were done in July 1930 in Asbestos, and in September 1930 in Thetford Mines.

The Asbestos andThetford groups are very dissimilar with respect to age distribution and length of service in the asbestos industry, but racially and economically the two groups are much alike.

Table I gives the age distribution of the men and Table II the distribution according to length of service in the asbestoe industry.

REPORT ON THE PHYSICAL EXAMINATIONS OF ASBESTOS MINERS IN ASBESTOS AND THETFORD MINES, QUEBEC.

The report herewith presented deals with the examination of 141 employees of the Canadian Johns-Manville Co., Asbestos, Que. and 54 employees of the Asbestos Corporation of Canada, the Bell-Thetford Co. and Johnson's Mine, all of Thetford Mines, Que. 40 of the men of the Canadian Johns-Manville Co. were examined by Dr. F. H. Stevenson and Dr. Joseph Pratt, who performed the physical examinations and X-ray examinations respectively. The other examinations were all performed by me, except the X-ray examinations. Actually, Drs. Stevenson and Pratt examined 57 men; but since 17 of these men were re-examined by me I am including them in my list. Drs. Stevenson and Pratt carried on their work in November 1929. My examinations were done in July 1930 in Asbestos, and in September 1930 in Thetford Mines.

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Exhibit N

REPORT OF THE PHYSICAL EXAMINATIONS OF ASBESTOS WORKERS IN ASBESTOS AND THETFORD MINES, QUEBEC.

The report herewith presented deals with the examination of 141 employees of the Canadian Johns-Manville Co., Asbestos, Que. and 54 employees of the Asbestos Corporation of Canada, the Beaver-Montgomery Co. and Johnson's Mine, all of Thetford Mines, Que. 40 of the men of the Canadian Johns-Manville Co. were examined by Dr. F. L. Stevenson and Dr. Joseph Tyrell, who performed the physical examinations and X-ray examinations respectively. The other examinations were all performed by me, except the X-ray examinations. Actually, Drs. Stevenson and Tyrell examined 57 men; but since 17 of these men were re-examined by me I am including them in my list. Drs. Stevenson and Tyrell carried on their work in November 1929. The examinations were done in July 1930 in Asbestos, and in September 1930 in Thetford Mines.

The Asbestos and Thetford groups are very dissimilar with respect to age distribution and length of service in the asbestos industry, but racially and economically the two groups are much alike.

Table I gives the age distribution of the men and Table II the distribution according to length of service in the asbestos industry.

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Exhibit N.

TABLE I.

AGE DISTRIBUTION OF ASBESTOS WORKERS

	Asbestos		Textile Mill	
[illegible]	Number	Percentage	Number	Percentage
15 - 19	3	2.1		
20 - 24	24	17.0	2	3.7
25 - 29	24	17.0	5	9.3
30 - 34	26	18.5	6	11.1
35 - 39	25	17.7	4	7.4
40 - 44	18	12.8	15	27.1
45 - 49	14	10.0	7	13.0
50 - 54	3	2.1	6	11.1
55 - 59	1	0.7	4	7.4
60 - 64	1	0.7	6	11.1
65 - 69	1	0.7	1	1.9
[illegible]	1	0.7		
[illegible]	141	100.00	54	100.0

T A B L E II

LENGTH OF SERVICE IN ASBESTOS INDUSTRY

Years of service.	Asbestos		Thetford Mines	
	Number	Percentage	Number	Percentage
0 - 4	44	31.2	1	1.85
5 - 9	65	46.1	8	14.8
10 - 14	11	7.8	8	14.8
15 - 19	10	7.1	16	29.6
20 - 24	6	4.3	9	16.7
25 - 29	2	1.4	9	16.7
30 - 34	2	1.4	1	1.85
35 - 39	1	.7		
40 - 44			2	3.7
TOTAL	141	100.0	54	100.0

It will be noted that while 68 percent of the men in Thetford Mines were over 40 years of age only 28 percent of the men in Asbestos were over 40. And further with respect to length of service 83.4 percent of the men examined in Thetford Mines had worked in the asbestos industry for 10 years or more, but in Asbestos only 22 percent had worked for more than ten years.

Table III shows the disposition of the men in various parts of the industry. Since the numbers are

small broad occupational groupings are used. In Asbestos the occupations are divided into 3 groups - mill, pit and factory; in Thetford Mines only the first two occupational groups are used, since no asbestos manufacturing is carried on there. All the men of the Thetford Mines group could be so classified, but 5 men were excluded from the Asbestos group since they did not appear to be exposed to an unusual amount of dust.

T A B L E III

LENGTH OF SERVICE IN DIFFERENT OCCUPATIONS IN ASBESTOS [illegible]

Years of service	Asbestos			Thetford Mines	
	Mill	Drilling pit	Factory	Mill	Drilling pit
0- 4	14	7	24	1	
5- 9	36	8	16	3	5
10-14	6	6		7	1
15-19	7	3		12	4
20-24	3	1		6	1
25-29	1	1		6	1
30-34	1	1		1	
35-39	1				
40+					2
TOTAL	69	27	40	40	14

The past occupational history in industries other than the asbestos industry was significant only in 5 cases. Of these one had been a grain inspector

for 6 years and so exposed to very dusty conditions, one had been an underground copper miner for 18 years, one a copper miner for 2 years, a fourth had worked in a cement plant for 9 years, and the fifth had operated a drill in an iron mine. This last individual showed X-ray evidence of pneumoconiosis, the others did not have pneumoconiosis.

In Table IV are given observations of weight in relation to height by age. The average weights are taken from the figures compiled by the Association of Life Insurance Medical Directors and the Actuarial Society of America.

T A B L E IV.

WEIGHTS AND HEIGHTS ACCORDING TO AGE

		Pounds Under average				Pounds over average			
		20-29	10-19	5-9	-4 to +4	5-9	10-19	20-29	30+
[illegible]	No.	21	28	19	24	16	19	9	4
	%	15.0	20.0	13.6	17.1	11.4	13.6	6.4	2.9
[illegible]	No.	9	11	8	9	5	6	7	1
	%	10.7	20.4	14.8	16.7	5.6	11.1	13.0	1.9
10,000 male Industrial workers	%	15	18	11	21	9	14	10	5

The group of 10,000 male industrial workers referred to in the above table was studied by the United States Public Health Service (see Public Health Bulletin

No. 162). It will be noted that there is very little distinction between this large group and the group of asbestos workers so far as degrees of overweight or underweight are concerned.

In the consideration of individual defects some interesting facts have been found. In this study only the 101 men at Asbestos and the 54 men at Thetford Mines are considered, since the records of the men examined by Dr. Stevenson are not strictly comparable with mine.

TEETH:-

Dividing the men into two groups according to whether the teeth did or did not need attention, of the Asbestos group 49.5% required attention, and of the Thetford Mines group 51.8 %.

HEARING:-

Acuity of hearing was tested by means of a watch. (My own hearing, which has been tested by an audiometer, was considered normal, and used as a standard) The watch test is admittedly very rough. In noisy occupations impaired hearing is frequently found in the older employees. Of the 101 men at Asbestos 10 showed definite hearing loss. This is not an excess proportion since an:

group of adults will show a similar picture. In Thetford Mines 28 of the 54 men suffered from well marked hearing loss. This is a very high percentage, and comparable to what may be found in weaving sheds and boiler shops. All these men, except two, had been exposed to loud noise in their work for 10 years or more, and it is reasonable to suppose that noise played a part in their hearing disability.

The number of men with infected TONSILS was 27 in Asbestos and 13 in Thetford Mines, and almost indetical ratio to the total in both groups.

Defects of the THYROID were rare. 4 men in Asbestos and 1 in Thetford Mines had enlarged thyroids.

BLOOD PRESSURE:-

Readings were recorded in all men over 40 years of age. Except in exceptional circumstances the blood pressure was not taken in the younger men. Consequently although the groups examined in Thetford Mines was smaller than that in Asbestos more blood pressure readings were taken there. 2 men in Asbestos had blood pressures of over 150 and 2 blood pressures under 100 m.m. of mercury. 8 men in Thetford Mines had blood pressures of over 150 and 2 blood pressures under 100.

The incidence of HERNIA is of interest from the compensation standpoint. In Asbestos all new employees must pass a physical examination before employment. There were 4 cases of inguinal hernia discovered among the 101 men examined there. In addition to these 5 men had been operated upon for this condition

In Thetford Mines physical examination is not required before employment. There were 5 cases of inguinal hernia among the 54 men examined and 2 cases which had been operated upon.

Some interest has arisen in connection with the occurrence of the so-called ASBESTOS CORNS. These are usually pin head sized elevations of the skin, somewhat like minute warts. None of these were detected in the Asbestos men probably due to my ignorance of their appearance. 8 of the Thetford Mines men had these growths on their hands and several others reported having had them at one time or another.

L U N G S

Of the 101 men examined by me at Asbestos only 4 suffered from definite first stage pneumoconiosis. These will not be considered on account of the doubtful diagnosis.

Of the 40 men examined by Drs. Stevenson and Wyatt 14 were diagnosed as first stage pneumoconiosis (asbestosis 1) (I am including the 17 men examined by Drs. Stevenson and Wyatt and subsequently re-examined by me in my group of 101). The much lesser incidence of pneumoconiosis in my group of men may seem surprising, but it must be remembered that the X-ray negatives were not read by the same men. In my group the X-ray diagnoses were made by Dr. Meriwether of Pitcher, Oklahoma, and in the other group the interpretations were by Drs. Wyatt and ~~Innocent~~ Meriwether. Further the ~~group~~ examined by Drs. Stevenson and Wyatt were, in general, older than those in my group.

Of the 54 men examined at Thetford Mines 24 were diagnosed by X-ray as suffering from pneumoconiosis (asbestosis), of these 4 were diagnosed as probably first stage asbestosis, 8 as early stage, 9 as definite first stage and 3 as second stage.

The pertinent facts regarding the definite cases of asbestosis are given in tables V and VI.

Table V

Case No.	Diagnosis	Age	Occupational history	Symptoms	Signs.
			Asbestos Group.		
66	A.1	50	Foreman 3 cyclone 10 years	coughs, not much loss of strength	deficient expansion occ, crepitations left apex.
71.	A.1	47	General operator Knakt foreman 24 years	cough, dyspnoea frequent colds	poor expansion, percussion dullness left chest, crepitations all over both lungs.
72	A.1	47	loading cars in mill 3 foreman 28 years	no symptoms	no abnormal signs.
73	A.1	50	driller 7 years	no symptoms	no abnormal signs.
74	A.1	41	Millwright 21 years	dyspnoea, cough	no abnormal signs
75	A.1	7	motor attendant for 11 years	no symptoms	faint moist rales 2/3 left in front.
76	A.1	57	millwright 16 years	no symptoms	no abnormal signs
77	A.1	50	labourer 3 watchman in mill 7 years	no symptoms	slight dullness right base, left chest expansion more than right.
78	A.1	55	labourer to floor mill, 7 years	no symptoms	breath sounds at apices harsh
79	A.1	47	in mill 16 years	no symptoms	no abnormal signs
80	A.1	55	millwright 30 years	no symptoms	expansion slightly limited
81	A.1	61	[illegible] in mill 27 years	no symptoms	expansion limited
82	A.1	44	mine (work not stated) 14 years	no symptoms	no abnormal signs
83	A.1	41	driller 4 years	no symptoms	no abnormal signs
84	A.1	41	driller 24 years	no symptoms	no abnormal signs
85	A.1	60	driller 4 years engineman 4 years foreman 28 years	no symptoms	almost vocal fremitus
86	A.1	37	driller 7 years tracksman 4 years	no symptoms	bronchial pulse left side
87	A.1	55	pipe coverer (factory) 4 years	no symptoms	no abnormal signs.

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Table VI

Thetford Mines Group

No.	Exposure	Age	Occupational history	Symptoms	Signs.
1	A.1	55	filling bags 6 years oiler 15 years foreman 4 years	no symptoms	coarse crepitations over lower part both lungs behind.
2	A.1	44	driller 23 years	no symptoms	no abnormal signs
3	A.1 (probably)	39	cleaner in mill 3 yrs. filling bags 4 yrs.	dyspnoea	no abnormal signs
4	A.1	54	millwright 27 years	dyspnoea	no abnormal signs
5	A.2 (early)	43	sweeper 11 years	cough, expectoration, occ. blood in sputum, dyspnoea, loss of weight & strength	coarse crepitations left lung, ex behind
6	A.1	51	millwright 21 years	cough & expectoration, dyspnoea, loss of weight & strength	dry rales over rt. chest behind, expiration prolonged
7	A.1 (probably)	57	millwright 21 years	cough	occasional dry rales at left base
8	A.1	52	driller 11 years		
9	A.1 (early)	43	driller 17 years	no symptoms, history of pleurisy, brother died of T.B.	no abnormal signs no abnormal signs
10	A.1 (early)	55	millwright 19 years	dyspnoea	no abnormal signs
11	A.1 (early)	61	driller 40 years	no symptoms	many crepitations right base.
12	A.1 (early)	52	driller 6 years general work in pit 4 years	no symptoms	no abnormal signs
13	A.1	44	filling bags 1 year last shot 4 years	history of bronchitis	no abnor al signs
14	A.1 (early)	53	in mill 3 years in tunnel feeling crusher 3 years	cough, dyspnoea.	no abnor al signs
15	A.1 (early)	51	crusher 11 years sweeper in mill 4 yrs. oiler in mill 3 years	mis. contd. T.B. in f.	no abnor al signs
16	A.1	52	loading boxes in pit 22 years, feeling bins mill 3 years	no symptoms shortness of T.B.	no abnor al signs Shadows of fine crepitation both lungs behind fro. vertebra dum.; crepitation note diminished
17	A.1 (early)	53	millwright 25 years foreman 27 years	dyspnoea	no abnormal signs
18	A.1	62	feeling crusher 10 yrs cleaning in mill 10 yrs.	dyspnoea	crepitations in rt. axilla & l. base behind,
19	A.1 (probably)	47	feeling crusher in mill 6 years, driers 1 year, foreman in mill 7 years	no symptoms	no abnormal signs

Table VI (continued)

No.	Diagnosis	Age	Occupational history	Symptoms	Signs
			Thetford Mines Group (cont'd)		
63	A.1 (early)	54	loading boxes in pit 2 yrs., driller 2 yrs.	no symptoms	no abnormal signs.
71	A.1 (probably)	71	operator in mill 2 yrs., millwright 11 years	no symptoms	[illegible] over right lung, [illegible] over left lung, [illegible]
77	A.1	57	oiler in mill 10 yrs. foreman mill 2 yrs.	non-specific T.B.C. daughter has tuberculosis.	[illegible] in R. axilla, [illegible] R. & L. lung fields [illegible]
78	A.1	41	mill repairs 12 yrs. mill foreman 4 yrs.	cough, dyspnoea	[illegible] poor air entry. no rales.
79	A.1 (late)	44	Foreman mill 17 yrs. millwright 7 yrs.	no symptoms	no abnormal signs.

It will be noted that of the 111 men examined at Anderson 17 were diagnosed as first stage asbestosis, while of the 34 examined at Textford three were diagnosed as first stage asbestosis and 3 as second stage asbestosis. This is not to be interpreted as indicating an excess hazard in Textford mines. The increased incidence of pneumoconiosis in Textford mines is simply a reflection of the different distribution with respect to age and length of service. Reference to tables 1 and 2 will recall the great differences in these two things.

In the great majority of cases the length of service in dusty work was more than 5 years an indicator in the following table:

Length of service	Number of cases	Number of men examined
0 - 4 yrs.	2	53
5 - 9	8	22
10 - 14	7	7
15 & over	21	31
Total	41	113

From this table one would conclude that asbestosis is not likely to develop with an exposure of less than 5 years, but that with exposure of more than 15 years there is a great possibility of it developing. It is, however, of interest to remember thirteen men with long periods of exposure do not develop any signs of asbestosis.

As to occupations of 41 drillers 15 were cases of asbestosis, of 11 mill workers 17 were cases of asbestosis and of 40 workers in the factory only 1 case showed x-ray evidence of the disease. Evidently there is little difference in the hazard in mill workers and drillers. The mill workers never to be exposed to far greater dust concentrations than the drillers and it is rather difficult to understand the high incidence of asbestosis among the drillers. However, it may or may not be of interest to note the

Tuberculosis did not play an important part in this study. Four of the cases of asbestosis appeared to be complicated with this disease. In each this incidence of definite tuberculosis in the lung areas of the individuals were very low. There were several suspected cases on clinical examination which were not confirmed by x-ray and several suspected cases by x-ray which showed no real evidence in the way of signs and symptoms. Only one case in the group can be considered as actively tuberculous.

It was difficult to obtain sputum from most of the men since very few of them were coughing. About 10 cases were examined for tubercle bacilli and asbestos bodies. No tubercle bacilli were found but one case did show several asbestos bodies. This case was also diagnosed by x-ray as having tuberculosis (first stage) but is not included in the number of tuberculosis cases since the x-ray film was not satisfactory.

Conversation with physicians and plant managers in the area in question indicated that no hazard to health was suspected in connection with work in the asbestos mining and milling industry.

In general it may be said that the hazard of pneumoconiosis in the asbestos mining and milling industry has been demonstrated, but evidently the disease does not incapacitate to any great degree and apparently is not particularly associated with tuberculosis.

Jack J. Bloomfield 1930

TUBERCULOSIS AND ASBESTOSIS

A brief review of current knowledge and analysis of tuberculosis mortality in the asbestos mining community of Thetford Mines, P.Q., Canada

Recent developments in Canada have focused attention on the question of the relationship between asbestosis and tuberculosis. Asbestosis has been declared a compensable disease in the Province of Québec, thus increasing medico-legal interest in the establishment of this diagnosis and evaluation of any contributing factors. Autopsy of asbestos miners has disclosed evidence of active tuberculosis and asbestosis in the same individuals.[1&2] In Thetford Mines, where a substantial part of all the asbestos in Canada is produced, the mortality from tuberculosis has in the past 16 years approximately doubled in contrast to a significant decline in the Provincial rate. These developments have materially helped to create the impression in the Province of Quebec that there is a causal relationship between tuberculosis and asbestosis similar to the carefully demonstrated and generally accepted relationship between silicosis and tuberculosis.

Observations in the United States

Previous studies of workers exposed to asbestos dust have not disclosed a higher incidence of tuberculosis among workers with clinical and X-ray evidence of asbestosis. Lanza[3] in 1935 concluded that asbestos dust did not predispose to tuberculosis. In his examination of 126 workers in the industry in the United States, 53.1% were found to have definite X-ray evidence of asbestosis. Two cases of active tuberculosis were found. One of these was a worker with asbestosis.

In 1936[4] Donnelly reviewed X-ray film of 151 workers in asbestos mills and found evidence of asbestosis among 34.4% of the group. No cases of active tuberculosis were found among workers with asbestosis. On the other hand, in the group without asbestosis he found four active cases of tuberculosis. Two of these active cases

had been in the asbestos industry, six and ten years respectively. Donnelly concluded that there was no tendency per se in this type of industrial occupation to exacerbate old tuberculosis lesions.

McPheeters[5] reported in 1936 an X-ray survey of 210 persons exposed to asbestos dust. He found 25.2% had some evidence of asbestosis. Three cases of active tuberculosis were found. No tuberculosis was found in workers with asbestosis. The three individuals with tuberculosis had been exposed to asbestos dust 6, 9, and 10 years respectively. In five cases healed pulmonary tuberculosis and asbestosis were found in association. The average duration of exposure for the 5 was 10.4 years and for the entire group 10.2 years. McPheeters decided there is no accelerating effect of tuberculosis on asbestosis.

In summation of this evidence it can be said that X-ray and clinical studies among asbestos workers in the United States does not reveal a significantly greater amount of tuberculosis than expected in the routine examination of workers in any industry. Moreover there is no evidence from these studies to indicate that long exposure to asbestos dust activates or accelerates the tuberculous process. Both these observations are in contrast to findings among workers exposed to free silica.

Canadian Observations

These have been no published reports of studies among asbestos workers in Canada with respect to the prevalence of asbestosis or of tuberculosis in the asbestos industry. In 1930 Pedley and his associates examined physically and by X-ray 19[illegible] asbestos workers in the towns of Asbestos and Thetford Mines.[6] The results of this survey appear in Table 1.

TABLE 1

	Asbestos	Thetford Mines
# examined	141	54
% with more than 10 years exposure	22	83.4
# with asbestosis	18	24
% with asbestosis	12.7	44.4

One case of active tuberculosis was found among the 195 individuals examined. This is a very satisfactory incidence of tuberculosis among an industrial group, even today. For example, it approximates the indicence in a survey in 1940 of the garment trade when 1 active case was found per 165 individuals examined.[7] Pedley[8] found that the tuberculosis mortality in Thetford Mines for the years 1926, 1927, and 1928 compared favorably with the tuberculosis mortality for the Province of Quebec.

TABLE 2

Average Tuberculosis Mortality for All Ages per 100,000

Place	1926-28	1940-42	% Change
Quebec	123.6	78.6	35 -
Thetford	137.9	252.1	83 +

However, since this report of Pedley there has been a sharp change in the tuberculosis mortality relationship between Thetford Mines and the Province as a whole. Table 2 shows that in the Province of Quebec the average rate for the three years 1940-42 has decreased 35% compared to the average rate for the years 1926-28. This corres-

...s to experience elsewhere in Canada and the United States. On the other hand, in Thetford Mines for the corresponding period tuberculosis mortality has increased more than 80%. The obvious existence of a serious tuberculosis problem in Thetford Mines has led to speculation regarding the influence of asbestos dust.

Tuberculosis Mortality Study

If the industrial exposure to asbestos dust is a significant factor in exacerbating or accelerating tuberculosis one would expect to find a significant difference in males over 25 years of age since, in Thetford Mines, practically all of this part of the population not in military service work in the asbestos industry. Socio-economic factors are also significant in relation to tuberculosis. Therefore, comparison of the tuberculosis mortality rates in Thetford Mines with communities in the Province of like size, medical and public health facilities, socio-economic and racial characteristics is important. Dublin has pointed out that where socio-economic factors were dominant the tuberculosis mortality rates for both husbands and wives were similarly affected; where industrial factors played a leading role the standardized mortality rates for the husbands greatly exceeded that of the wives.[9]

Through the courtesy of the Demographer of the Provincial Ministry of Health and Social Welfare, Dr. Paul Parrot, we were furnished the number of deaths from tuberculosis by age and sex for the years 1939 to 1943 for the cities of Thetford Mines, Rimouski, Chicoutimi, Cap de Madeleine, St. Hyacinthe, St. Jeand, and Valleyfield, as well as for the Province and the Dominion as a whole. Of the six communities picked with these characteristics in mind, the town of Rimouski was thought more nearly to compare with Thetford Mines, except instead of asbestos mining its principal industry is lumbering and wood finishing (see Table 3, p.4a).

TABLE 4

Shows the Average Mortality Rate by Sex for All Ages in Province and in the Seven Selected Communities 1940-1942

	Tuberculosis Death Rate per 100,000 All Ages	
	Male	Female
PROVINCE OF QUEBEC	77.5	80.8
Cap de la-Madeleine	55.9	44.5
St. Hyacinthe	84.5	90.9
St. John	75.1	109.8
Valleyfield	101.7	85.3
Chicoutimi	141.8	149.1
Thetford Mines	190.1	223.9
Rimouski	171.9	287.3

TABLE 3

Descriptive Data on Selected Communities

	Population	Industries	Health Officers ~	Health Unit	Pub.H. Nurses	≠Private Physicians	Ratio Phys.to Population
ıetford Mines	12,000	Asbestos mining	1	1	5	12	1/1000
ımouski (incl. suburbs)	10,000	lumbering, wood finishing	1	1	4	10	1/1000
ıp Madeleine	13,000	rubber mfg., steel foundry, bag, mfg. silk	1	1**	6	2	1/6500
hree Rivers	45,800	paper, linen mfg., rubber, iron	1	1	9	40	1/1150
hicoutimi	25,000	aluminum, pulp, paper, iron fdry., clay products	1	1***	10	19 (incl. 7 specs.)	1/4500
t. Hyacinthe	18,500	textile mfg.	1	1****	6	14	1/1300
alleyfield	20,600	munitions, other war industries, cotton, silk	1	1	5	10	1/2000

≠full-time health officers

~ including 1 dentist

** including 1 tb. specialist

**** including 2 full-time physicians

From Table 4 it will be noted that three of the seven towns for which data was obtained have a tuberculosis mortality which is appreciably higher than the provincial rate. Females in Rimouski have the highest average rate for the years 1940-42. Females in Thetford Mines have a higher average mortality for the corresponding period than males in Thetford Mines who ranked third in this analysis.

Further analysis by age and sex has been attempted for the communities of Rimouski and Thetford Mines and the results appear in Table 5. Interpretation is difficult because of the small number of persons involved in the age groups in the two communities. It is of interest to note, however, that among Thetford males the highest mortality rate is recorded in males aged 25-34. In Rimouski males the highest rate is in the group 35 and older. Thetford females aged 25-34 have the highest rate in either male or female groups, being 519.8 per 100,000, or four times the Provincial rate for the same agres. The rate in the corresponding age group in Rimouski females is 446.4 which is nearly three times the Provincial rate in the same age group. Tuberculosis also takes a high toll in Rimouski females 35 and older. Here the rate is four times that of Provincial females of the same ages.

TABLE 5

Tuberculosis Deaths and Death Rates per 100,000
1940-1942

MALES

AGE	Prov. of Quebec		Rimouski		Thetford Mines	
	Deaths	Rate	Deaths	Rate	Deaths	Rate
All Ages	3888	77.5	17	171.9	36	190.1
0-24	1167	45.2	5	93.3	13	121.3
25-34	803	102.1	2	114.4	10	342.9
35 +	1918	116.2	10	360.9	13	245.0

FEMALES

AGE	Prov. of Quebec Deaths	Prov. of Quebec Rate	Rimouski Deaths	Rimouski Rate	Thetford Mines Deaths	Thetford Mines Rate
All Ages	4019	80.8	32	287.3	43	223.9
0-24	1614	62.7	13	211.9	18	162.5
25-34	1072	134.1	9	446.4	16	519.8
35 +	1333	83.1	10	334.7	9	178.1

ENVIRONMENTAL OBSERVATIONS AT THETFORD

Visual inspection of the mills of the three asbestos operators was made. Dust counts were made at all important working locations of these properties, and the results are given in a separate report. There was no opportunity to personally observe home conditions, eating and living habits of the population, but this information was reported to us by competent observers.

Several conditions prevail in the mills which would favor the spread of pulmonary tuberculosis. The workmen appear to be careless about spitting and other personal habits. In order to keep warm in cold weather they huddle in groups in small wooden cabin-like enclosures. These measure about 6' x 6'. They usually contain a bench or two and a chair, with some heating facilities; a small tin can on the floor which is used for cigaratte butts, spitting, or left-over food. In one mill a tin drinking cup has been in use for many years. It is obvious that, if there is an employee with tubercle bacilli in his sputum, these environmental conditions favor the spread of tuberculosis. It should be noted that in review of the death claims in the mines insured with the Company a difference in tuberculosis mortality was found. In Mine A between 1941-1944, eight deaths were due to tuberculosis with a rate of 2.8 per 1,000 employee-years. In Mine B for the corresponding period there were two tuberculosis deaths with a rate of 1.4. It was in Mine A that the most conspicuous unsanitary practice, the common drinking cup, was found.

Home living conditions are crowded and it is common practice for children and adults

[redacted]re beds. This is an important factor favoring the transmission of the disease--not [redacted]ly because it promotes closer human contact but, by interfering with adequate rest, the individual's resistance to infection is lowered. Poor eating habits and food selection which prevail also contribute to the lowering of resistance to tuberculosis.

These observations on environmental factors are admittedly superficial because of the brief time available for inspection and observation. Nevertheless, because of their probable importance in creating and maintaining tuberculosis in the community, further investigation of them would seem to be warranted.

DISCUSSION

It is obvious that tuberculosis mortality is excessive in the town of Thetford Mines. But there is no indication from these data that occupation is a dominant factor because: 1) the mortality is equally bad among females; 2) it is excessive in the age group under 24 where there is little or no industrial exposure; 3) tuberculosis is also a serious problem in Rimouski where there is no asbestos industry.

The age and sex distribution of mortality from tuberculosis resembles the picture of tuberculosis in a heavily seeded, susceptible population with a substantial proportion of the mortality occurring in both sexes under age 24 and the majority of deaths under age 35. There is no evidence, if asbestos dust is a factor, that it resembles free silica in its influence on tuberculosis mortality. Careful and thorough mortality studies[10] among granite cutters in the state of Vermont revealed that they are subject to an excessive frequency of deaths from pulmonary tuberculosis, not because of an exceptional risk of contact infection, or because of inferior physique, or because of unfavorable housing conditions or other sanitary deficiencies, but primarily because of the occupational exposure. This same conclusion has been reached in every other study of workers who contract silicosis.

Unfortunately we were unable to calculate expected deaths based on the Provincial rates because the age groupings obtained for Thetford Mines and Rimouski did not correspond to the age groupings available in the census data for the Province. For further insight into the magnitude of the tuberculosis problem in these two communities, it would be desirable not only to construct such expectancy tables, but to carry out case-finding studies in these and similar communities in the Province of Quebec.

CONCLUSION

1. Based on current mortality data, tuberculosis in Thetford Mines, in contrast to many communities in the Province as well as the Province as a whole, has substantially increased.

2. Rimouski, a lumbering town, comparable to Thetford Mines in socio-economic conditions, medical and public health resources, has a high tuberculosis mortality comparable to Thetford Mines.

3. Analysis of the tuberculosis mortality by age and sex in Thetford Mines, in the other communities and in the Province shows that both males and females in Thetford succumb to the disease with approximately the same frequency. This is not the mortality picture seen where there is industrial exposure to free silica.

4. Admittedly our data is inadequate for final conclusions, nevertheless there is no indication from this mortality study that demonstrates asbestos mining per se in Thetford Mines is the cause of the high tuberculosis mortality.

5. Further mortality studies should be made to construct expectancy tables for age and sex in Thetford Mines, Rimouski, and perhaps elsewhere in the Province.

6. Tuberculosis case-finding surveys should be made both in Thetford Mines and comparable communities.

7. Health education concerning prevention of the disease is needed, as well as improved sanitation, particularly in the plants.

George M. Wheatley, M.D.
Assistant Medical Director
Metropolitan Life Insurance Company

Mr. R. J. Vane, Manager of Occupation Ratings, has contributed to this study by valuable suggestions regarding the handling and interpretation of the data as well as by making the statistical analysis.

Dr. A. J. Lanza, Assistant Medical Director, has very generously permitted us to use his unpublished data secured by Pedley in 1930 on asbestosis and tuberculosis in miners of Thetford and Asbestos. Dr. Lanza has also advised on the preparation of the final report.

Dr. N. L. Burnette, Assistant Secretary, secured for us the information on the socio-economic conditions of the selected communities.

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From files of Ivan Sabourin Q.C. Counsel.

16

IVAN SABOURIN, Q.C.

ALDRED BUILDING, MONTREAL.

MEMO

This Tuberculosis-Asbestosis 1944 Survey conducted by Metropolitan Life (Dr. George Wheatley then Assistant Medical Director of Metropolitan Life in New York) might be of interest to you. At the time this study was communicated to the officers at Quebec such as Workmen's Compensation Board, departmental heads and also to the members of the Pneumoconiosis Committee of the Workmen's Compensation Board and also to the then pulmonary experts in the Province.

The attached copy was made out of the basic rep of Dr. Wheatley which I have in my files.

In connection with Cancer, the same prejudice i rampant now, as you know, which was rampant before 1944 as Tuberculosis. The Metropolitan survey dispelled that prejudi At that time we also had test cases conducted (the hearings b attended by the leading experts of the continent) to prove that asbestosis exposure did not invite T.B.

As to Cancer - exposure to asbestos incidence, th Pittsburg survey took place in the 50's (Dr. Daniel Braun - his was also published) which survey's conclusions, just as in the c asbestosis, concluded that there is not seemingly any relations... between dust exposure and cancer.

Dr. Braun (together with Dr. Grégoire, Professor Beattie of Cambridge, Professor Kushner of New York University -- an expert in the pathology of cancer tumors -- is a member of the scientific committee of our proposed institute under the chairmanship of Dr. Wright.

MAY 3 1966

April 29th, 1966. I.S.

IVAN SABOURIN, Q.C. Alared Building,
ADVOCATE Montreal, P.Q.

MONTREAL.

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April 29th, 1966. I.S.

MÉDECINE INDUSTRIELLE

TUBERCULOSE ET AMIANTOSE

Revue des connaissances actuelles sur l'association amianto-tuberculose et analyse de la mortalité par tuberculose à Thetford-les-Mines, Québec, Canada, centre minier d'amiante.

Certains incidents récents ont attiré l'attention sur la relation qui pourrait exister entre la tuberculose et l'amiantose. De plus, le fait que cette dernière vient d'être reconnue comme maladie industrielle par le gouvernement de la province de Québec a accru l'intérêt médico-légal du diagnostic et de l'appréciation des facteurs étiologiques, car les malades qui font de l'amiantose deviennent sujets à indemnisation. L'étude histo-pathologique des poumons d'anciens employés dans l'industrie de l'amiante a montré la présence, chez le même sujet, d'amiantose et de tuberculose (1 et 2).

A Thetford-les-Mines, centre minier d'amiante le plus considérable au Canada, le taux de mortalité par tuberculose a approximativement doublé durant ces dernières années, tandis que dans la province de Québec en général, il a sensiblement diminué. Cette constatation a contribué objectivement à créer dans Québec l'impression qu'il existe une relation de cause à effet entre l'amiantose et la tuberculose, relation qui serait semblable à celle déjà solidement établie et généralement acceptée qui existe entre la silicose et tuberculose.

(9)

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Malheureusement, il nous a été impossible de calculer les « morts probables » basées sur les taux provinciaux, parce que les groupes d'âge obtenus pour Thetford et Rimouski ne correspondaient pas aux groupes d'âge que nous fournit le recensement de la province. Pour rendre possible une étude plus approfondie du problème de la tuberculose dans ces deux villes de Thetford et Rimouski, il semblerait souhaitable de préparer, non seulement de semblables tableaux de probabilités, mais aussi de faire des enquêtes de dépistage dans ces villes et dans plusieurs autres villes de la province de Québec.

CONCLUSIONS

1. D'après les statistiques démographiques, surtout celles des décès, la tuberculose à Thetford-les-Mines, contrairement à ce qui se produit dans plusieurs autres villes et dans la province en général, a augmenté substantiellement.

2. Rimouski, ville dont l'industrie principale est le commerce du bois de construction et qui jouit de conditions sociales et économiques, d'organisations médicales et d'hygiène ressemblant à celles de Thetford, montre aussi un taux élevé de mortalité par tuberculose.

3. L'analyse de la mortalité par tuberculose par groupes d'âge et par sexe, à Thetford, dans les autres villes et dans la province, démontre que la fréquence de la tuberculose est à peu près la même chez les hommes et les femmes. Toutes les fois que la poussière de silice devient un facteur de mortalité, le taux de mortalité change notablement.

4. Nous admettons que plusieurs données nous manquent pour nous permettre de conclure de façon définitive ; néanmoins, dans cette étude, rien ne démontre que « l'industrie de l'amiante » soit le facteur causal qui pourrait expliquer le taux élevé de mortalité par tuberculose qui existe à Thetford.

5. D'autres études démographiques devraient être faites afin de pouvoir établir l'incidence probable de la tuberculose suivant l'âge et le sexe à Thetford-les-Mines, à Rimouski et ailleurs dans la province.

6. Des campagnes de dépistage devraient être organisées à Thetford et dans d'autres villes industrielles.

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qu'il nuit au sommeil et, indirectement, diminue la résistance individuelle à la maladie. Une mauvaise hygiène alimentaire, assez générale au sein de la population ouvrière, contribue aussi à diminuer la résistance à la tuberculose.

Ces observations d'économie sociale sont évidemment superficielles à cause de leur courte durée. Néanmoins, le facteur social joue dans l'étude de la tuberculose un rôle important et il y aurait de nombreux avantages à pousser plus loin une enquête de ce genre.

DISCUSSION

Il est évident que la mortalité par tuberculose est trop élevée à Thetford. Cependant, il est difficile, d'après les faits que nous venons d'énumérer, de conclure que le travail même soit un facteur causal dominant parce que la mortalité est aussi élevée chez les femmes ; parce qu'elle est très fréquente chez les individus âgés de moins de 24 ans chez qui il n'y a pas d'histoire de maladie professionnelle et parce que la tuberculose constitue un problème aussi sérieux à Rimouski où il n'existe pas d'industrie d'amiante ni aucune industrie minière.

La dissémination de la tuberculose d'après l'âge et le sexe des individus morts de tuberculose, semble bien être celle qui se voit dans une population fortement contaminée et particulièrement sensible à l'infection. En effet, une forte proportion des décès surviennent chez des sujets des deux sexes qui n'ont pas encore 34 ans et la grande majorité des décès arrivent avant l'âge de 35 ans. Il ne semble pas d'après les faits relevés, que la poussière d'amiante influence autant que la silice libre la mortalité par tuberculose et qu'elle en soit un facteur causal. Des études sérieuses et approfondies de la mortalité chez les tailleurs de granit de l'État du Vermont ont révélé une fréquence très élevée de la tuberculose pulmonaire, non pas à cause d'une possibilité exceptionnelle de contamination plus massive; non pas à cause d'un état physique inférieur des employés, de logements malsains ou d'autres conditions hygiéniques déficientes, mais bien à cause du métier même de ces ouvriers. La même conclusion s'est imposée après toutes les enquêtes faites chez les ouvriers exposés à la silice libre.

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observé dans toute la province de Québec pour tous les sujets du même âge. A Rimouski, le taux chez les femmes ayant 25 à 34 ans, est de 446.4, soit trois fois le taux officiel pour la province de Québec. La tuberculose est aussi très répandue à Rimouski, chez les femmes de 35 ans et plus, et le taux de la morbidité par tuberculose est chez celles-ci, quatre fois plus élevé que celui de toute la province de Québec.

CONDITIONS HYGIÉNIQUES A THETFORD

La surveillance hygiénique des moulins de trois compagnies minières a été faite. Des échantillons d'air ont été prélevés à divers endroits des usines et les particules de poussière y ont été comptées. Les renseignements concernant l'hygiène alimentaire, l'hygiène personnelle et l'hygiène de l'habitation nous ont été transmis par des gens dignes de foi. Nous n'avons pas pu faire nous-même cette enquête.

Il existe dans l'usine plusieurs causes qui peuvent favoriser la propagation de la tuberculose pulmonaire. Les ouvriers sont peu soucieux de leur hygiène personnelle et plusieurs ont même l'habitude de cracher sur le plancher. En hiver, pour se protéger contre le froid, on se groupe dans de petites cabines de bois ayant six pieds par six pieds, garnies d'un petit poêle, d'un banc, d'une couple de chaises et d'un crachoir de fortune. Dans le moulin, les ouvriers boivent tous à la même tasse. Dans ces conditions, il semble évident qu'un cas de tuberculose ouverte devient un réel danger de contamination. En étudiant les réclamations lors du décès des ouvriers ayant une police d'assurance, nous avons constaté dans le taux de mortalité par tuberculose, une différence qui serait en rapport avec les conditions hygiéniques des différents moulins. A la mine A, de 1941 à 1944, huit morts ont été causées par la tuberculose, ce qui donne un taux de 2.8 par 1,000 employés-années. Dans la mine B, pour la période correspondante, il n'y a eu que 2 morts, soit un taux de 1.4. La mine A avait des conditions hygiéniques moins satisfaisantes.

Les habitations sont encombrées et, assez fréquemment, les enfants et les adultes partagent le même lit. Cet état de choses anormal favorise la contagion, non seulement à cause de la promiscuité, mais aussi parce

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TABLEAU 5

Décès par tuberculose et taux de mortalité par 100,000
1940-42

Âge	Province de Québec		Rimouski		Thetford-les-Mines	
	Décès	Taux	Décès	Taux	Décès	Taux
Hommes						
Tous âges	3,888	77.5	17	171.9	36	190.1
0 à 24 ans	1,167	45.2	5	93.3	13	121.3
25 à 34 ans	803	102.1	2	114.4	10	342.9
35 ans et plus	1,918	116.2	10	360.9	13	245.0
Femmes						
Tous âges	4,019	80.8	32	287.3	43	223.9
0 à 24 ans	1,614	62.7	13	211.9	18	162.5
25 à 34 ans	1,072	134.1	9	446.4	16	519.8
35 ans et plus	1,333	83.1	10	334.7	9	178.1

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Rimouski qui est le centre industriel le plus comparable, bien qu'à Rimouski, l'industrie principale soit le bois, et qu'à Thetford, ce soit l'amiante (voir tableau 3).

TABLEAU 4

Taux moyens de mortalité, par sexe et pour tous les âges dans la province et dans les sept centres choisis, 1940-42

Décès par tuberculose — Taux par 100,000 tous les âges

	Hommes	*Femmes*
PROVINCE DE QUÉBEC	77.5	80.8
Cap-de-la-Madeleine	55.9	44.5
Saint-Hyacinthe	85.4	90.9
Saint-Jean	75.1	109.8
Valleyfield	101.7	85.3
Chicoutimi	141.8	149.1
Thetford-les-Mines	190.1	223.9
Rimouski	171.9	287.3

Le tableau 4 nous indique que trois des sept villes choisies pour établir la comparaison ont un taux de mortalité par tuberculose sensiblement plus élevé que celui de toute la province de Québec. A Rimouski, durant la période 1940-42, le taux moyen chez les femmes est le plus élevé et, à Thetford, le taux, durant la période correspondante, est aussi plus élevé chez les femmes que chez les hommes. Ceux-ci occupent le troisième rang dans cette analyse.

Une analyse supplémentaire par groupes d'âge et par sexe a été faite à Rimouski et à Thetford et a fourni les résultats inscrits dans le tableau 5. A cause du petit nombre de personnes comprises dans chaque groupe d'âge pour ces deux villes, il est difficile de donner une interprétation satisfaisante des faits. Tout de même, il est intéressant de remarquer qu'à Thetford, le taux le plus élevé chez les hommes, est enregistré chez des individus âgés de 25 à 34 ans, tandis que, à Rimouski, le taux le plus élevé est observé chez ceux qui ont 35 ans et plus. A Thetford, les femmes âgées de 25 à 34 ans fournissent un taux plus élevé que celui des hommes : 519.8 pour 100,000, soit quatre fois le taux

TABLEAU 5

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TABLEAU 3

Renseignements sur les villes choisies

	Population	Industries	Officier médical d'hyg.	Unité sanitaire	Officier d'hyg. public.	Médecins privés	Rapport médecins et pop.
Thetford-les-Mines	12,000	Extraction d'amiante	1	1	5	12	1/1,000
Rimouski et région	10,000	Bois de construction	1	1	4	10	1/1,000
Cap-de-la-Madeleine	13,000	Caoutchouc, acier, soie	1	1++	6	2	1/6,500
Trois-Rivières	45,800	Papier, toile, caoutchouc, fer	1	1	9	40	1/1,150
Chicoutimi	25,000	Aluminium, papier, papier, fer, produits de la glaise	1	1+++	10	19 (dont 7 spécialistes)	1/4,500
Saint-Hyacinthe	18,500	Tissage	1	1++++	6	14	1/1,300
Valleyfield	20,680	Munitions, et industries de guerre, coton, soie	1	1	3	10	1/2,000

+ Officier médical plein temps.
++ 1 dentiste
+++ 1 spécialiste en tuberculose
++++ 2 médecins plein temps

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Depuis la parution de ce rapport de Pedley, il s'est produit un changement très appréciable entre les taux de mortalité par tuberculose à Thetford-les-Mines et les taux de la province de Québec. Le tableau 2 indique que le taux moyen de la province de Québec a diminué de 35% si l'on compare la période 1940-42 à la période 1926-28. Cette constatation est sensiblement la même ailleurs, tant au Canada qu'aux États-Unis. Mais à Thetford, pour les périodes correspondantes, il existe une augmentation de 80 p. cent. Or, le fait que la tuberculose soit à Thetford un problème dominant, a fait naître des hypothèses sur le rôle que peut avoir la poussière d'amiante dans la production d'une telle situation.

ÉTUDE DE LA MORTALITÉ PAR LA TUBERCULOSE

Si l'inhalation de la poussière d'amiante peut réellement accentuer ou accélérer l'évolution de la tuberculose, l'on peut vraisemblablement s'attendre de trouver à Thetford un plus grand nombre de tuberculeux chez les hommes de 25 ans et plus, puisque la majeure partie de ces individus qui ne font pas partie de l'armée, travaillent dans l'industrie de l'amiante. Le rôle des conditions sociales et économiques est important dans l'étude de la tuberculose. C'est pourquoi, avant de comparer les taux de la mortalité par la tuberculose dans la ville de Thetford-les-Mines avec ceux d'autres centres, il est nécessaire d'en étudier les conditions sociales et économiques, les conditions hygiéniques, les organismes d'hygiène publique et les caractères raciaux de la population. Dublin fait remarquer que lorsque les facteurs sociaux et économiques sont évidents, les taux de la mortalité par tuberculose chez les maris comme chez les épouses sont identiques ; et quand ce sont les facteurs industriels qui prédominent, les taux standardisés de la mortalité sont plus élevés chez les hommes que chez les femmes.

Le Dr Paul Parrot, démographe de la province de Québec, a eu l'amabilité de nous fournir les statistiques de mortalité par tuberculose, suivant l'âge et le sexe, de 1939 à 1943, pour les cités de Thetford-les-Mines, Rimouski, Chicoutimi, Cap-de-la-Madeleine, Saint-Hyacinthe, Saint-Jean, Valleyfield, la province de Québec et le Canada. Des sept villes qui ont été choisies à cause de nombreuses ressemblances, c'est

TABLEAU 3

05/22/95 16:53 TX/RX NO.1824 P.004

OBSERVATIONS RECUEILLIES AU CANADA

Aucun rapport n'a été publié des études faites au Canada chez les ouvriers de l'amiante au sujet de l'incidence de la tuberculose ou de l'amiantose dans l'industrie de l'amiante. Tout de même, en 1930, Pedley et ses collaborateurs ont fait l'examen clinique et radiologique de 195 ouvriers de l'amiante dans les cités de Thetford-les-Mines et Asbestos (6). Le tableau 1 donne le résultant de cette enquête.

TABLEAU I

	Asbestos	*Thetford-les-Mines*
Nombre d'employés	141	54
Pourcentage d'employés exposés à l'amiante, depuis plus de 10 ans	22	83.4
Nombre de cas d'amiantose	18	24
Pourcentage des cas d'amiantose	12.7	44.4

Un seul cas de tuberculose en activité a été trouvé parmi les 195 personnes examinées. Même aujourd'hui, c'est une fréquence de tuberculose très satisfaisante au sein d'un groupe industriel, puisqu'elle est approximativement celle trouvée en 1940 après enquête dans l'industrie de la confection. Dans cette dernière industrie, un seul cas de tuberculose active a été trouvé parmi les 165 individus examinés (7). Pedley (8) estima que le taux de mortalité par tuberculose, à Thetford, pour 1926, 1927 et 1928, pouvait se comparer favorablement avec le taux de la province de Québec.

TABLEAU 2

Taux moyen de la mortalité par tuberculose, tous les âges, par 100,000

Endroit	*1926-28*	*1940-42*	*% changement*
Province de Québec	123.6	78.6	−35
Thetford-les-Mines	137.9	252.1	+80

Dr. McConnell
Welfare Division
Industrial Health Section

Re: 43-G-2 - Johnson's Co.,
Thetford Mines West, Quebec

We issued this policy in 1929, and to date we have premiums of $33,000 against Death claims of $28,500 and Disability claims of $3,000. The experience is very unfavorable in the current year, the premiums amounting to $6,830 with Death claims of $11,000 and Disability claims of $1,000.

An analysis of the claims shows a preponderance of lung disorders. The company is engaged in the quarrying and manufacturing of asbestos, and we feel that there is a decided occupational hazard here. We would like to have you or Mr. Fehnel inspect the plants of this company at your convenience.

Attached is a copy of the claim analysis.

G.W. Fitzhugh, Supervisor
Actuarial Division
Group Life & Health Section

May 27, 1935
GWF/DB

MET 1055

5204

PRODUCED S/C/M/Ms

215

Dr. McConnell,
Welfare Division,
Industrial Health Section

Re: Johnson's Company, Thetford Mines West, Quebec

We cover the employees of the above company for group life insurance, and to date the claims amount to 83% of the premiums. Several years ago the experience was unfavorable, and we referred the group to you because there was a substantial number of claims for lung diseases. There has been an improvement in the experience in recent years and the coverage has shown a profit since 1935.

In 1936 the question of offering this company Accident & Health benefits was considered and we asked you to make an inspection of the properties. You reported that the employees were French Canadians and looked undernourished and that in your opinion the claim experience would not be very good. On the basis of this report, we decided not to offer Accident & Health coverage.

Our representative has again raised the question of Accident & Health coverage and advises us that the company has appropriated a considerable sum of money for mine improvements. Possibly this will improve the group as a risk for group coverage.

We would appreciate a further inspection of this company's properties and a report from you at your convenience. The group is not large enough to justify the expense of a special trip for this inspection, but possibly you will have someone in the vicinity soon and can have him make a report.

In advising us whether you consider this company an acceptable risk for Accident & Health coverage, you will want to take into consideration that for this industry (asbestos mines) we load our standard rates 40%. In other words, if you think the claim rate will be less than 140% of the claim rate in a non-hazardous industry, our normal rate should be adequate. Of course, the plan we will offer will not provide benefits for occupational accidents.

D. C. Bull

Actuarial Division
Group Life & Health Section

August 22, 1939
DCB/HM

Discussed with Bull over 'phone

Told him had experience was due to French Canadians & mine industrial [illegible]

MET 1060

PRODUCED SCANNING
PRODUCED SCANNING

05/22/95 MON 16:53 FAX 410 685 7155 GOLDMAN, SKEEN, WA 002

OBSERVATIONS FAITES AUX ÉTATS-UNIS

Les enquêtes faites chez les ouvriers dans l'industrie de l'amiante n'ont pas démontré que la tuberculose était plus fréquente chez ceux qui présentaient des signes cliniques et radiologiques d'amiantose. Et Lanza (3) concluait, en 1935, que l'amiantose ne prédispose pas à la tuberculose. L'examen médical de 126 employés dans l'industrie de l'amiante aux États-Unis a démontré que 53.1% de ceux-ci avaient des signes radiologiques d'amiantose, et que deux ouvriers avaient une tuberculose en activité dont l'un était aussi amiantosique.

En 1936, Donnelly (4) faisait l'examen radiologique de 151 ouvriers de l'amiante et dépistait 34.4% de cas d'amiantose, mais aucun ouvrier de ce dernier groupe ne faisait une tuberculose active. Par ailleurs, parmi les cas qui ne présentaient aucune image d'amiantose, il trouva quatre cas de tuberculose active, dont 2 travaillaient dans l'amiante depuis 6 et 10 ans. Alors, Donnelly concluait que l'inhalation de poussière d'amiante *per se*, n'était pas de nature à réveiller un ancien foyer de tuberculose.

McPheeters (5), en 1936, publiait le rapport de son enquête radiologique sur 210 ouvriers de l'amiante dans lequel il dit que 25.5% présentaient des signes radiologiques d'amiantose, mais qu'aucun de ceux qui souffraient d'amiantose n'était tuberculeux. D'un autre côté, 3 ouvriers après 6, 9 et 10 ans d'exposition à la poussière d'amiante présentaient une image de tuberculose active. Chez 5 individus, il y avait association d'une tuberculose guérie et d'amiantose. Après cette enquête McPheeters concluait que la tuberculose ne modifiait pas l'évolution de l'amiantose.

En résumé, les enquêtes faites aux États-Unis chez les ouvriers de l'amiante indiquent que la fréquence de la tuberculose n'est pas plus élevée dans l'industrie de l'amiante que dans les autres industries. Et même plus, qu'il n'existe aucun fait qui prouverait que l'inhalation prolongée de la poussière de l'amiante serait de nature à réveiller ou à stimuler un processus tuberculeux. Conclusions totalement différentes de celles qui ont été obtenues dans l'industrie de la silice libre.

05/22/95 16:53 TX/RX NO.1824 P.002

10/09/90 11:49

IVAN SABOURIN
ADVOCATE

MONTREAL. June 30th, 1945.

George M. Wheatley, Esq., M.D.,
Assistant Vice-President, Welfare,
Metropolitan Life Insurance Company,
NEW YORK CITY, N.Y.
U.S.A.

Dear George,

I beg to acknowledge receipt of yours of the 18th inst. Contents have been noted.

I have not succeeded in having young Ethier work at Thetford this summer as the operators there had lately made some changes in their "public relations" set-up which set-up they did not wish to disturb for the coming Summer. I have informed Father Bouvier accordingly and Father Bouvier appeared appreciative of my efforts and of yours. Dr. Lanza is meeting Father Bouvier this morning.

I have spent part of the day yesterday with Dr. Lanza and he will be spending the week-end at my home. He met the Doctors of the Quebec Workmen's Medical Board yesterday and made a deep impression on them. His contribution, I am sure, will prove to be very helpful in the proper appreciation by the medical experts, here, as regards our asbestosis-tuberculosis incidence.

Thank you for the copy of the letter written by Dr. Parret. This point is now fully cleared up.

Best personal regards.

Cordially,

IVAN SABOURIN

S.3

MET 0737



-2-

Dr. G. M. Thornley
Assistant Medical Director
Medical Division

Sometime ago this Division referred numerous groups to Dr. McConnell who has a survey team of the health conditions, and was at times able to make recommendations to our policyholders for improving these conditions.

Johnson's Company is a concern we have our Group Life carried. This concern carries on manufacturing activities. During the last three years we have paid 28 claims of which 13 deaths were due to tuberculosis. It seems quite possible that this high tuberculosis rate is due to conditions on the premises of the policyholder. You might consider it worthwhile to have a survey made of this group similar to the ones Dr. McConnell made on other groups in the past.

Our number on this policy is 43 CE[2]. The location of the firm is Quebec, Canada.

E. Wainwright
Group Life & Health Insurance Section
Actuarial Division

June 13, 1944
CE/cb

PLAINTIFF'S EXHIBIT 4184

PCC EXHIBIT MET-348

Bialy
PML 5/8

with you. Dr. A. R. Foley should also be seen. He is the Provincial Epidemiologist and is interested in the study that we made. I attach a letter from him dated April 24th that you might want to be familiar with. Dr. Paul Parrot, the Statistician of the Provincial Health Department, was very helpful to me by supplying the statistical information and also answering some questions that have arisen since my visit. I wrote Dr. Parrot on June 6th, asking him whether the tuberculosis deaths, as reported for Thetford Mines, represent deaths of residents of Thetford Mines only or whether they include deaths of tuberculous individuals of other communities dying in Thetford Mines Hospital. You may be able to get an answer to this question because I have not heard from him. This is a very important point to establish, if possible.

6. You ought to see Dr. Graham Ross, Medical Director of National Breweries. As soon as I know your plans as regards dates that you will be in Montreal, I will be glad to write Dr. Ross and let him know that you are coming. He may wish to bring together a group of physicians who are doing industrial health to meet you. I attach a copy of the report which summarizes the trip I made to Canada between October 16 and 21, 1944, which you might want to glance through. I would be glad to answer any questions that you have.

George M. Wheatley, M.D.
Assistant Vice-President, Welfare

PRODUCED SCANNED

PM2-18
QBC
4/13/79

PLAINTIFF'S EXHIBIT Wheatley 64 Dec 11-6-84

MEMORANDUM

June 15, 1945

DR. LANZA:

Re: Contacts in Quebec relating to the asbestosis problem

1. You should see Mr. Ivan Sabourin, Aldred Building, Montreal. (See copy of my attached letter of June 12th.) Among the reasons for seeing Sabourin would be: (a) To secure his help in arranging a trip for you to Thetford and Asbestos. He might be able to drive you. He certainly can facilitate your contacts with the management. (b) He is eager for knowledge about asbestosis and would gain a lot in talking to you. (c) If you agree that it would be worth while to have Father Bouvier's student of industrial relations from the University of Montreal spend several months this summer living at Thetford Mines and studying working conditions, you could help persuade Sabourin to have him invited and his expenses paid by the asbestos operators. Burnette has already spoken to him about it and I have written him, as you know, and perhaps Sabourin will have already agreed to this.

I write him this from here but your date.

2. See Father Emile Bouvier, S.J., Director of the Industrial Relations Section of the University of Montreal. Norman knows him well and probably will arrange this meeting for you. Father Bouvier was here this week and is, of course, interested in the industrial health problems in Thetford Mines. He impresses me as being a fairminded man and the mine operators in Thetford would do well to have his support.

3. Visit Thetford Mines to meet the mine operators; Dr. Jacques Cartier, the new Medical Director of the Industrial Health Clinic which the mine operators ~~which the mine operators~~ operations were establishing; Dr. Sirou, the physician in charge of the Thetford Mines Hospital tuberculosis service. He works part-time for the Health Department. Dr. Sirou believes asbestosis causes tuberculosis. The situation in Thetford Mines is a difficult one because no matter what the mining operators do they are "behind the eight ball". They will uncover a lot of old asbestosis as well as tuberculosis by their industrial health program. The more thorough the job the more problems they are going to discover. Since asbestosis is compensable, this is going to cost them much money. On the other hand, if they have to be pushed at every step in developing a health program, they will get no credit and they will eventually have to pay in compensation claims for conditions that they may deliberately shut their eyes to now. It seems to me that they must set aside substantial sums now to put their house in order. They should develop the best industrial health service possible and they should aid in every way the improvement of health and living conditions in the community.

4. You ought to look at Asbestos where they have Dr. Stevenson, who has been associated with J.M. for a good many years, and Dr. Smith, a young physician recently employed. Dr. Smith impressed me as being a very good man. You might want to look him over and keep him in mind for some positions which may be available in the States or elsewhere in Canada, because I understand he might be interested in a change.

5. I suggest that you get to Quebec and see Dr. F. J. Tourangeau, Director of Industrial Hygiene for the Provincial State Health Department. Dr. Tourangeau would be honored to see you and would have many things he would like to discuss

PRODUCED S/C/MMS.

PERSONAL FACILITIES

Ample toilet facilities are provided and kept clean. Drinking water is supplied by bubbler type fountains. Heated rooms or cabanas are located on each floor of the mill building.

CONCLUSIONS AND RECOMMENDATIONS

The concentrations of dust found at the time of this survey are much lower than those found in 1930. This may be due to the mill not operating to capacity and improvement in the housekeeping. Covering of conveyors is, no doubt, a contributing factor also. When the samples were taken, the windows were open and the day was clear.

It is recommended that efforts be made to further reduce the dust concentrations. According to the United States Public Health Service(2), five million particles per cubic foot may be regarded as the maximum allowable concentration of asbestos dust.

HEALTH HAZARDS

There are attached reprints of two studies which may be of interest in connection with the hazard of asbestos dust:

"Effects of the Inhalation of Asbestos Dust on the Lungs of Asbestos Workers"

"Asbestosis"

(2)U.S. Public Health Service, Public Health Bulletin No. 241, "A Study of Asbestosis in the Asbestos Textile Industry", 1933.

King Mine

Asbestos Corporation

Thetford Mines, Quebec, Can.

Sample No.	Location	Date of Sampling	Cu. Ft. Air Sampled	Millions of Dust Particles per cu. ft. air	Type of Dust	Remarks
1	Crusher house, picking belts on primary crusher	10/26/44	15.0	11.6	Asbestos talc	Test made on special run of small quantity of rock. Clear day. Not full production.
2	Mill Bldg. 4th floor (fans and collectors)	"	20.0	14.8	"	Brick building, wooden floors. Windows open. Clear day.
3	Mill Bldg. 3rd floor fibre screening	"	15.0	17.0	"	Wooden floor, windows open. Clear day.
4	Mill Bldg. 2nd floor rock screening	"	15.0	26.6	"	
5	Mill Bldg. 1st floor bagging	"	15.0	18.1	"	Concrete floor, windows and doors open. Clear day.

MANUFACTURING OPERATIONS

No changes have been made in the mill operations since the first survey. The only effort at dust suppression consisted in covering some conveyors.

METHODS OF SAMPLING AND ANALYSIS

The samples were collected and analyzed by the method devised and used by the United States Public Health Service.(1)

The following table shows the concentrations of dust found at the time of this survey.

(1)U.S. Public Health Service, Public Health Bulletin #217, Determination and Control of Industrial Dust, J.J. Bloomfield and J.M. Dallavalle, 1935.

KING MINE

ASBESTOS CORPORATION

Thetford Mines, Quebec, Can.

* * *

A recheck survey of the dust conditions in the mill of this company was made by the Industrial Health Section of the Metropolitan Life Insurance Company on October 26, 1944.

A previous study had been made in June, 1930.

* * *

See Dr. Lanza - 2070
Lanza - 2077

INSTITUTE OF OCCUPATIONAL
AND
ENVIRONMENTAL HEALTH
MONTREAL, CANADA

-: M E M O R A N D U M :-

TO: Dr. Wheatley

FROM: Miss Reilly

DATE: June 19, 1944

Attached are copies of the surveys made by Mr. Fehnel of the Johnson's Company mines and mills in 1930 and of the new mill in March 1931. The dust concentrations found were much higher than the allowable concentration of five million particles per cubic foot as established by the U.S. Public Health Service for dust in asbestos mills. Although there was an improvement in the new mill, the concentrations in the crusher department and the screening department were still too high.

Among six men physically examined two showed first degree asbestosis but none of the men appeared to have tuberculosis.

The sanitary conditions in the plant were rather poor and it was noticed that there was an unusual degree of carelessness among the employees in spitting on the floor. Housing conditions in Thetford Mines were also poor. Since the war the mills and mines have been operating 24 hours a day. The increased work causing a corresponding increase in the production of dust, and the lack of rest may produce a decreased resistance among the employees which may influence the incidence of tuberculosis.

If it is advisable Mr. Fehnel can arrange to go to Thetford Mines to make a recheck survey of the Johnson's Company properties. If possible, it might be well to include a survey of living conditions of employees.

Reilly

MET 1052

4785

PRODUCED BY UMS

METROPOLITAN LIFE INSURANCE COMPANY

FREDERICK H. ECKER, Chairman of the Board
LEROY A. LINCOLN, President

NEW YORK CITY

HOWARD J. LANZA, M.D.
Assistant Medical Director

February 10, 1942

Mr. Manfred Boeditch, Director
Division of Occupational Hygiene
23 Joy Street
Boston, Mass.

Dear Manfred

I have your letter of the 13th. I think it is possible that this man may have asbestosis. As you know, we find our cases of asbestosis in those who fabricate asbestos and not in those who mine it. We have found evidence of it in men who trim asbestos pipe moldings, shingles, and other material of this nature, with a power saw.

Of course, as you know, the fact that a man may be a competent roentgenologist is not worth a hurrah in diagnosing this type of film unless he has some experience. The "competent roentgenologist", particularly if he is a TB expert, will almost invariably read a lot of pathology in the film of an average healthy chest. Rage the shade of Dr. Hayes.

I would suggest to them, if there is any doubt in the matter, that they send the film to Homer Sampson for verification.

Best regards.

Sincerely yours

Howard

A. J. Lanza, M.D.
Assistant Medical Director

cc Ray Gardner

No more news.

PLAINTIFF'S EXHIBIT ML-4772

PLAINTIFF'S EXHIBIT 4772

PRODUCED JM - 83

2/16/42

I have your letter of the 13th. I think it is possible that this man may have asbestosis. As you know, we find our cases of asbestosis in those who fabricate asbestos and not in those who mine it. We have found evidence of it in men who trim asbestos pipe moldings, shingles, and other material of this nature, with a power saw.

Letter from A.J. Lanza, M.D.
to Manfred Bosditch, Director
Division of Occupational Hygiene, Massachusetts
ML4772

INDUSTRIAL DUST HAZARD

(*Continued from Page* 1417)

error, nevertheless it is interesting to observe that they were quite uniformly high for copper miners, gold and silver miners, and lead and zinc miners.

The situation as regards iron miners is interesting because it was thought for a long time that they had little or no exposure to silica. More recent studies show that there is actually a moderate degree of silica hazard which produces silicosis in upwards of twenty years. However, in both insurance studies there were too few deaths from respiratory tuberculosis to permit definite quantitative conclusions therefrom.

A great many workers in mining occupations, it must be borne in mind, are common laborers among whom we should expect a much higher mortality from tuberculosis than among standard ordinary policyholders. From the limited data available for unskilled workers, from these studies it would appear that the tuberculosis death rate for this class of workers runs between two and three times the rate of standard ordinary business. Thus it is clear that even when allowance is made for the important factor of social-economic class, the death rates for the metal miners are extremely high.

Coal miners in different sections of the country present an interesting contrast. Among the bituminous miners, exclusive of the Pennsylvania miners, the mortality from tuberculosis was over 1½ times that on standard ordinary miners, a low ratio for this type of worker. Pennsylvania miners, on the other hand, most of whom were employed in the anthracite field, had a very high ratio of actual to expected deaths—well over 300 per cent. Anthracite miners, as we have stated, are exposed to an appreciable amount of silica dust, which accounts for their relatively unfavorable position.

No dusty trade has received more careful study in the United States than that of granite cutting. Long recognized as a dangerous trade, it has been found time and again to take a heavy toll in deaths from tuberculosis. The amount of free silica in the dust breathed by these workers is very large. In the years 1925 to 1936, the mortality from tuberculosis among granite and sandstone cutters was the highest recorded for any of the groups of insured lives studied. There were more than 25 times as many deaths from tuberculosis as expected, whereas in the earlier years, there were nearly ten times as many deaths as expected, based on a small exposure. Marble and limestone cutters did not show anything like as high a ratio as the granite and sandstone cutters. There were ten deaths where one was expected in the years 1925 to 1936.

It can be but regretted that there are so few mortality statistics for occupations exposed to dusts other than silica. Grinders of metals, most of whom for many years have been using composition wheels in place of the old sandstone wheels, and consequently have had a little or no exposure to free silica, experienced a relatively low extra mortality from tuberculosis in both studies, based, however, on a small exposure. An interesting point to be noted here is that this occupation also offers exposure to metallic dust. It would appear that neither the dust from the composition wheels nor the metal dust has produced excessively high death rates from tuberculosis. Buffers and polishers, a somewhat similar group, also appeared to have a low extra mortality from tuberculosis in the years 1915 to 1926.

Cement and Lime Workers

Cement, lime, and artificial stone workers were reported upon in both the Joint Occupation Study and the Occupational Study, but the number of deaths from tuberculosis was in each instance less than the number required for separate tabulation. This fact in itself is significant, although it does not mean necessarily that the death rate from tuberculosis was below the average. Nevertheless, from the facts presented in these studies, it is quite evident that the tuberculosis death rate for this occupational class was comparatively low.

Three groups of male workers exposed to organic dusts are included in the table—upholsterers, cotton mill operatives, and woolen mill operatives. The ratios for all of these classes run about 200 per cent, based on small exposures.

It must be admitted that these occupational mortality statistics are meagre and do not permit of very definite conclusions regarding the effects of specific dusts. So far as they go, they fully substantiate clinical and laboratory findings regarding the injurious character of silica dust. The death rates from respiratory tuberculosis for men in occupations where there is a serious exposure to silica dust are so high as to leave no room for doubt that silica is the offending agency.

Contrary to clinical and laboratory findings, however, the mortality statistics, presented by Collis and Yule, suggest that long continued exposure to non-siliceous inorganic dust has an injurious effect on the lungs as is indicated by the higher mortality from tuberculosis among exposed workers age 45. About all that can be said from the limited American life insurance company experience is that the tuberculosis death rates for grinders, metal polishers, and buffers who are exposed to inorganic dusts, most of which do not contain a large percentage of silica, are not high, having in mind the economic status of these workers as compared with the average ordinary policyholder. Lime, cement, and artificial stone workers had a quite favorable mortality. The very high ratio for marble and limestone cutters, however, may be suggestive of some untoward influence. Dr. L. U. Gardner at Saranac Lake, found that animals dusted with marble dust by inhalation, developed little reaction, but became temporarily more susceptible to infection with tuberculosis. The increased susceptibility was not marked.

The three occupations in which there is exposure to organic dust had from two to two and one-half times the number of tuberculosis deaths expected. Even allowing for the economic position of these groups as compared with ordinary policyholders generally, the mortality is high. It is difficult to see in the light of present clinical knowledge, how it is possible to account for the excess mortality on the score of damage to the lungs caused by such dust.

Mortality findings, then, are still not in complete harmony with clinical and laboratory findings. But from a practical underwriting standpoint, it may be said that the only dust which of itself might s... the total mortality, by increasing t... dence of tuberculosis, as to require an... premium charge for life insurance, is free silica. We have no mortality data for asbestos workers but, it may well be that exposure to asbestos dust in large quantities will also be found to produce a high mortality.

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home-office men:

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1.	Metropolitan	$309,717,567	23.	National Life & Acc.	10,451,570	49.	Wash. National	1,253,833	75.	Amer. Mutual, Ia.	1,217,705
2.	Prudential	209,392,460	24.	Lincoln National	8,941,163	50.	Minnesota Mutual	1,066,705	76.	Colonial Life	1,161,364
3.	New York Life	125,639,022	25.	Equitable Life, Ia.	8,277,602	51.	Sun Life, Md.	1,045,994	77.	Industrial L. & H., Ga.	1,157,717
4.	Equitable, N. Y.	90,762,658	26.	State Mutual	8,625,381	52.	Columbus Mutual, O.	2,708,398	78.	Protective Life, Ala.	1,111,333
5.	John Hancock	37,961,337	27.	Phoenix Mutual	7,344,962	53.	Ohio National	2,672,773	79.	Country Life, Ill.	1,101,143
6.	Travelers	64,902,795	28.	Southwestern Life	7,340,000	54.	Guarantee Mutual	2,578,074	80.	American Standard	1,097,335
7.	Northwestern Mutual	57,186,343	29.	Kansas City Life	7,205,984	55.	Midland Mutual	2,570,341	81.	Indianapolis Life	1,512,305
8.	Mutual Life, N. Y.	51,852,202	30.	Fidelity Mutual	6,468,839	56.	Amer. United, Ind.	2,500,000	82.	Amicable Life	1,490,437
9.	Aetna Life	36,855,402	31.	Jefferson Standard	6,300,000	57.	North Amer. Reassur.	2,411,961	83.	Paul Revere Life	1,440,425
10.	Penn Mutual	30,944,720	32.	Bankers Life, Neb.	5,799,129	58.	Commonwealth	2,353,555	84.	Franklin Life	1,430,002
11.	Mutual Benefit	30,314,767	33.	Pacific Mutual	5,672,956	59.	Western Life, Mont.	2,350,000	85.	Capital Life, Colo.	1,373,668
12.	Western & Southern	28,383,923	34.	Northwestern National	5,457,918	60.	Home Beneficial	2,348,435	86.	Union Labor Life	1,344,333
13.	Mass. Mutual	27,050,794	35.	Guardian Life	5,269,459	61.	Continental Amer.	2,321,712	87.	Oregon Mutual	1,313,523
14.	Provident Mutual	19,374,230	36.	Reliance Life, Pa.	5,171,696	62.	Mass. Sav. Bank	2,293,596	88.	Monarch Life, Mass.	1,309,124
15.	New England Mutual	19,010,803	37.	Great Southern	4,783,020	63.	Pilot Life, N. C.	2,285,976	89.	Loyal Protective	1,301,597
16.	Life Ins. Co. of Va.	16,956,930	38.	Monumental Life	4,569,137	64.	Pan-American Life	2,244,524	90.	Southland Life	1,301,167
17.	Amer. Nat'l, Tex.	15,533,244	39.	Home Life, N. Y.	4,300,635	65.	General American	2,244,449	91.	National Reserve	1,300,577
18.	Conn. General	14,423,687	40.	Occidental, Calif.	4,152,034	66.	Old Line, Wis.	2,211,278	92.	Illinois Bankers	1,274,333
19.	Conn. Mutual	13,020,498	41.	Life & Casualty	4,077,235	67.	Baltimore Life	2,154,771	93.	Volunteer State	1,269,179
20.	Union Central Life	11,848,155	42.	Continental, Ill.	3,922,443	68.	Ohio State Life	2,074,617	94.	Atlantic Life, Va.	1,256,692
21.	Bankers Life, Ia.	11,599,738	43.	Central Life, Ia.	3,878,551	69.	Presbyterian Min.	1,963,971	95.	Girard Life, Pa.	1,242,820
22.	National Life, Vt.	11,224,492	44.	Columbian National	3,529,068	70.	Alliance Life	1,859,775	96.	Great Amer., Texas	1,174,325
			45.	Acacia Mutual	3,412,797	71.	Berkshire Life	1,840,918	97.	United Life & Acc.	1,093,817
			46.	Calif. Western States	3,295,000	72.	Farmers & Bankers	1,834,668	98.	Northern Life	1,082,901
			47.	Provident Life & Acc.	3,283,576	73.	Business Men's, Mo.	1,808,949	99.	Mass. Protective	1,063,010
			48.	Mutual Trust	3,281,718	74.	New World Life	1,799,790	100.	Lutheran Mutual	1,052,766

*Includes $128,801,620 contingency reserve.

INDUSTRIAL DUST HAZARD

(*Continued from Page* 1413)

are rarely seen now and the clinical picture has changed with the progress of dust control measures. The trend is towards a lessened incidence of new cases of silicosis. This improvement depends upon the maintenance of constant vigilance in detecting unsuspected hazards and in supervising the efficiency of dust control methods after they have been put into effect. It cannot be expected that this improvement will be reflected in insurance mortality until a considerable period of time has elapsed.

The conclusion seems warranted from clinical and laboratory experience, then, that the only dusts which of themselves might have sufficient effect on the mortality of workers exposed to them, so great as to require an extra premium charge for life insurance, are silica and possibly, asbestos.

Life insurance men naturally will turn to mortality statistics for confirmation of a finding so at variance with the common belief, long held, that exposure to all kinds of dusts is productive of a high incidence of respiratory tuberculosis. To the layman it seems only reasonable to suppose that the difficulty in breathing he experiences when exposed to large quantities of dust must in some way affect his health, and that filling the lungs with foreign particles must have injurious effects on them. The writings of eminent students of occupational mortality statistics have served to strengthen this belief. Nearly all such statistics show the mortality from respiratory tuberculosis among workers exposed to a wide variety of dusts to be well above the average for all workers included in the study. But, when these figures are refined so far as is practicable to make allowance for factors other than dust, which may influence the mortality from tuberculosis of men employed in these occupations, the importance of many dusts as causative factors becomes less evident.

There is a surprisingly large number of factors, other than dust, any one of which may be responsible for the high mortality from tuberculosis among men in dusty trades. Some dusty occupations are carried on by men recruited from the lower income classes, among whom it is now known that apart entirely from exposure to a specific occupational hazard, the death rate from tuberculosis, is considerably higher than among persons in the higher income groups. The selection of certain kinds of work by the less robust workers is reflected in the high mortality from tuberculosis of men in other callings. Racial and nationality groups tend to enter certain occupations, with the result that the peculiar susceptibility or relative immunity to tuberculosis of these stocks, colors the mortality picture of men in such occupations. These are but a few of the many circumstances for which allowance must be made before conclusions can be drawn as to whether a particular dust is or is not the responsible agent in the high mortality found among men in a dusty trade.

Unfortunately there is, for the United States, no considerable body of mortality statistics sufficiently detailed to permit of evaluating separately some of even the most important conditions affecting the mortality of men in specific occupations. Perhaps the best statistical demonstration of the effect of different types of dust on mortality from tuberculosis is supplied by two British authorities, Dr. Edgar L. Collis and G. Udney Yule. These authors selected for study, from the occupations reported upon in the Registrar General of England and Wales' report on Occupational Mortality covering the years 1921-1923, two groups of occupations—one exposed to silica dust, and the other to non-silica inorganic dust. The groups were so chosen that each had, as far as possible, the same amount of dust exposure, physical effort, exposure to heat or to weather, or any underground environment. Part of the authors' comment on the results as regards respiratory tuberculosis is quoted:

"For all ages (20 to 65) the comparative mortality figure (this figure is defined as the number of deaths that would have occurred in the Standard Population at the rates ruling in the occupation) of the Silica Group is no less than 592.2 against 163.5 for the Standard Population, i. e., the mortality is more than three and a half times the normal. For the Non-silica Group, the Comparative Mortality Figure, although actually slightly higher than normal, at first sight hardly seems to differ significantly from the normal; nor would one's judgment be much affected if, instead of making comparison with the Standard Population, one had used the Social Groups III and IV, for which the respective Comparative Mortality Figures are 139.8 and 164.2. But the summary figures conceal interesting changes with age. A glance at the figures (shown on Table 4 of their study), shows that in the Silica Group the ratio of mortality to the normal, though greater than unity even in the lowest age group, rapidly increases as age advances. In the Non-silica Group, the comparative mortality is actually below normal up to age 35; it rises just above normal in the following age group; but as ages over 45, it is conspicuously above normal."

The facts regarding tuberculosis were not published in this report for each of the six silica occupational classes included in the study. We have, however, determined by reference to the report of the Registrar General, that each of the silica occupations had over twice the expected number of deaths. The extraordinary high ratio of 1,150 per cent was recorded for tin and copper miners, while sandstone masons, cutters, and dressers had a ratio of 441 per cent. On the other hand, only the limestone masons, cutters, and dressers of the five occupations considered in the non-silica group exhibited a high ratio, 191 per cent.

Like the English tin and copper miners, American metal miners are exposed to a serious silica hazard and have an inordinate mortality from respiratory tuberculosis as will be seen by reference to Table 1. In this table are given the ratios of actual to expected deaths from tuberculosis for a number of occupations exposed to dust and reported upon in the Joint Occupation Study, 1928, and in the Occupational Study, 1937, both published by the Actuarial Society of America and the Association of Life Insurance Medical Directors. In the period 1915-1926, the number of deaths from respiratory tuberculosis among metal miners was over eight times the number expected on the basis of death rates by ages prevailing among standard ordinary lives in the same years. In the latter study covering the years 1925 to 1936, the ratios were even higher—over 11 times as many deaths were recorded for metal miners as were expected on the basis of death rates among standard lives in these years.

While the actual number of deaths for each separate metal mining class was rather small in both investigations, and consequently the ratios are subject to a large margin of

(*Continued on Page* 1420)

mental animals nor do workmen exposed to these dusts show any clinical symptoms or X-ray appearances suggestive of silicosis.

Silicates

A considerable number of silicate dusts have been studied and their effects upon experimental animals, both by inhalation and injection, noted. They produce little or no reaction in the body tissues and what little reaction some of them do produce does not tend to progress. An exception should be noted here regarding asbestos, which is considered separately.

Nor is occupational exposure to silicate dusts accompanied by any such clinical picture of disability and death as is found in silica dust exposures. The Public Health Service studied some talc mines in 1935. Only 66 men were exposed. Tuberculosis morbidity and mortality rates were very high in the county where the mines were located and the dust exposure was exceedingly severe, running into hundreds of millions of particles. Eight men showed advanced pneumoconiosis but tuberculosis was also present in most of them. It is conceivable that exposure to tremendous quantities of any mineral dust, regardless of silica content, might so overwhelm the lungs that they could not deal with the invading substance. Irritation, inflammation, and probably infection would follow with disability in proportion. Such isolated instances do not invalidate the conclusions stated in the previous paragraph.

Asbestos

Asbestos is the only dust of combined silica which is known to cause a definite pulmonary fibrosis which may result in disability and death. Most of the asbestos fabricated in the United States comes from the mines in Quebec. Asbestosis, however, is not found among asbestos miners, most of whom work in open quarries or pits, nor among men engaged in milling operations whereby the asbestos is prepared for shipment and bagged, but among workers in fabricating plants. Only recently has an explanation been offered for this anomaly. It would appear that not only is asbestos an exception in that it differs from other silicate dusts in its ability to cause structural changes in the lungs but its action appears to be mechanical and not chemical like the action of silica. If asbestos is crushed to fine particles, it will not cause asbestosis in experimental animals nor will asbestos produce any reaction elsewhere than in the lungs. If its action were in the nature of silica, the effect would be more pronounced with smaller particle sizes. Consequently, Gardner concludes that the relatively long spicules of asbestos produce their effect because the lungs are never at rest and the constant movement provokes the fibrous reaction.

Like silicosis, asbestosis develops slowly, presenting the characteristic symptom of shortness of breath. The number of cases of asbestosis that have come to autopsy is small but there are several cases on record in which death was due entirely to the asbestos and not to any associated infection or other condition. There does not seem to be any pronounced tendency to tuberculosis in asbestosis, but most of the fatal cases have been complicated by other disease such as cancer and diabetes so that the extent to which the asbestosis was responsible for death is not clear.

The pathology and X-ray appearance of asbestosis are entirely different from silicosis and in the absence of a definite history of exposure over a considerable period of time to asbestos dust, the diagnosis is difficult. A great deal of success has been attained in controlling dusts in the plants where asbestos is fabricated so that it is not likely that asbestosis will ever become an important industrial disease, as far as the number of cases is concerned.

The scarcity of clinical data on asbestosis makes the prognosis doubtful. We have had a small group of cases under observation for about ten years and some of these show a definite but slow progression as far as can be judged from the X-ray films. However, what the outcome may be remains to be seen. These men are all working and showing no signs of any disability.

Silicosis

It may be said that there is a very general accord among the leading investigators and research authorities in the opinions and conclusions presented in the international conferences on silicosis. Such differences of opinion as may be expressed from time to time do not seriously affect the general agreement on the basic factors affecting the cause, incidence, effects, and prognosis of silicosis.

The effect of silica upon the lungs depends on the nature and extent of exposure. That is to say, upon the quantity of dust in the air breathed by workmen, the amount of free or uncombined silica in the dust, the size of the dust particles, the presence of other substances in the dust which may modify the action of silica, and the length of time or duration of exposure. The individual himself must also be considered. Previously existing disease of the lungs, especially a tubercle infection, will influence his reaction to inhaled silica. There may be other phases of susceptibility about which we know little or nothing but in the main, it may be stated that individual susceptibility to the action of silica dust is an acquired rather than a congenital condition.

In industry we find different types of silica hazards. The severity of a silica hazard is estimated on the amount of dust in the air and this is expressed in millions of particles per cubic foot. The particles counted are those under ten microns in size, though the present opinion is that it is the particle between one-half a micron and three microns that is mostly responsible for causing the disease.

Exposure to excessive quantities of pure silica dust, that is, where the dust count is in the hundreds of millions of particles per cubic foot, is now rare. Isolated instances may be found as in the case of a sandblaster improperly protected. Such exposure produces a severe type of silicosis in upwards of five years, even sooner in extreme cases. With such extensive silica damage to the lungs, tubercle infection is almost inevitable, though cases will be seen occasionally that proceed to a fatal termination without infection.

Exposure to moderate amounts of silica dust where the particle counts are in excess of ten million does not occur frequently at the present time, though it is only in the last few years that silica industries have endeavored to cope with their dust problem and effectively reduce the amount. Such exposures produce definitely disease in from eight or ten to twenty or more years, in proportion to the actual quantity of dust. The incidence of tuberculosis is high and of those who die of their pulmonary condition, 75 per cent are tuberculous.

It is also possible to find degrees of silica exposure which, while producing definite silicosis evident on X-rays, will not produce disability or death in an average working lifetime. Mortality statistics are not broken down by industry to an extent sufficient to make available definite figures by degree of exposure. We must rely then on the clinical results obtained in industrial investigations which are conclusive enough for those industries studied. Our own impression is that even where the silica hazard is of a mild type, the incidence of tuberculosis will be higher than the average. It has been stated that where silica dust contains caustic alkalies also, the action of the silica is intensified very considerably. The evidence here is meager. Other substances apparently have some inhibiting effect upon the action of silica, affecting the pathological as well as the clinical picture.

Prognosis

The prognosis is fair for a silicotic whose lungs are not extensively damaged and who is free of infection. Such persons have an increased susceptibility to infection and if brought into intimate contact with a case of tuberculosis are very apt to become tuberculous also. The outlook for the tuberculo-silicotic is poor. Many cases are essentially chronic and may live for years. Others show rapid progression and die in from one to two years after their infection becomes active. The importance of tuberculous infection among persons exposed to silica dust brings up a very important underwriting consideration, that is, where the worker in a silica occupation is in contact in his home with an open case of tuberculosis.

The question is frequently asked whether men who had worked in silica dust at one time but later changed to a job in which there was no exposure to silica might be considered standard risks for life insurance if they passed the usual insurance physical examination. While there are no insurance statistics to prove the point one way or the other, there is every reason to believe that a group of such men will not give a standard mortality. The usual type of physical examination will not detect silicosis. The only way to be sure is to secure X-rays of the lungs of such applicants and have them interpreted by some one who has specialized in reading films of this kind.

Silicosis is gradually coming under control. The aggravated cases seen twenty years ago

(*Continued on Page 1417*)

See page 2

Monthly Life Insurance Department

JUNE 8, 1940

Underwriting Aspects of the Industrial Dust Hazard

By A. J. Lanza, M.D., Assistant Medical Director, and R. J. Vane, Statistical Bureau, Metropolitan Life

Address Before Medical Section of American Life Convention, Colorado Springs, Colo., June 6

OUR knowledge of health hazards resulting from exposure to various kinds of dust in industrial occupations is based on observation and clinical studies of workmen exposed to these dusts, and upon noting the results of the action of these same dusts upon experimental animals. The former method goes back for centuries and our earliest conceptions of the harmful properties of dust were based on first hand observation.

Many of these conceptions were erroneous. It is only in the past twenty years that anything like a comprehensive knowledge of dust diseases has been attained—due first to the perfection of the X-ray as a means of diagnosis, and the development of successful laboratory technique for conducting tests on experimental animals.

Now we have arrived at a point where intensive studies, both clinical and experimental, conducted in this country and in other countries, have resulted in a crystalization of our ideas. In the English speaking world, the outstanding contributions to our knowledge have come from the South African Institute for Medical Research and the Miner's Phthisis Prevention Committee in Johannesburg; from various official agencies in England and Australia, in Ontario, Canada, and in this country, especially the United States Public Health Service, the United States Bureau of Mines, and the Saranac Laboratory.

In presenting this discussion of industrial dusts, their effects on workmen exposed to them, and the bearing that this subject has on life insurance underwriting, we have attempted to summarize what should be the insurance attitude, based on the present state of our knowledge. Briefly, the present concept regarding industrial dust hazards is as follows: Organic dusts, of which the dust arising in textile operations is an example, do not cause any specific pulmonary disease. There is no clinical nor experimental evidence to the contrary. Coal, which is an organic substance, is considered in connection with mineral dusts. Organic dusts at times may cause an allergic reaction and also irritation of the upper air passages. They do not cause protracted disability nor death. In this classification may be included cotton, wool, silk, sugar, flour, starch, wood, tobacco, and leather.

It is true that some occupations in which is involved exposure to organic dusts manifest a tuberculosis mortality rate higher than the average. Formerly, it was thought that this undue prevalence of tuberculosis was due to the occupational dusts but the dust studies of recent years have demonstrated that, mostly, organic particles are too large to penetrate to the pulmonary tissue and when they do, they are absorbed without producing any specific inflammatory reaction. Nor is much credence given nowadays to the idea that organic dust particles convey tubercle bacilli to the lungs and thus cause tuberculosis.

Metallic Dusts

Here the situation is not unlike that of organic dusts. The prevalence of pulmonary disease among workers in certain occupations exposed to metallic dusts gave rise to the theory that metallic dust was a fruitful source of tuberculosis. Such diseases as "grinder's rot" were recognized clinically long before the era of modern diagnosis and laboratory research. Metallic particles in the form of fumes may cause such reactions as zinc chills or brass founder's ague, which are more in the nature of an allergic reaction. The pulmonary disease which afflicts grinders and buffers is silicosis and not in any way a result of exposure to metallic dust. Metallic dust particles are mostly large and heavy (that is, comparatively speaking), consequently do not penetrate to the lung, in many instances, and when they do they are either absorbed or remain fixed and inert in the tissues. From an underwriting standpoint then, the hazard of metal dust is the hazard of such silica dust as may be associated with it.

Coal

For many years there has been a belief that coal miners had less tuberculosis than the average for wage earners and, on the other hand, miner's asthma has been recognized as an occupational disease of coal miners. Here again, recent studies have clarified the situation to a considerable extent.

Bituminous or soft coal miners do not have an occuptional pneumoconiosis of a disabling quality. Their lungs become pigmented from coal dust, but they do not develop a true fibrosis. For anthracite miners, the picture is quite different and the reason is that anthracite mining includes exposure not only to coal dust but also to silica. Disabling miner's asthma was shown by the United States Public Health Service study of 1935 to be a type of silicosis, to which the term anthraco-silicosis is properly applied. Anthracite seams are often found in country rock which contains a considerable amount of free silica and, as in other silica dust exposures, the development of pulmonary fibrosis was found to be proportionate to the amount of silica in the coal dust and the length of exposure. The incidence of tuberculosis among anthracite miners is very high. Clinical pulmonary tuberculosis was found in 15 per cent of those with early anthraco-silicosis and in 43 per cent of those with advanced anthraco-silicosis. Service upwards of twenty to twenty-five years was associated with a tuberculosis rate of 14 per cent among regular miners and 37 per cent among those with a number of years as rock workers. Animal experimentation, with both bituminous and anthracite coal dust, free from associated silica, produced no specific reaction.

Non-Siliceous Minerals

There is no evidence that non-siliceous minerals produce any pulmonary disease. Gardner, at the Saranac Laboratory, tested upon animals such substances as diamond, aluminum oxide, rutile, marble, gypsum, galena, chalcopyrite, iron sulphide, zinc sulphate, fluorite, and dolomite. The sulphides and dolomite proved toxic but this affect is outside of our present discussion. Non-siliceous minerals proved inactive in animals and there is no clinical evidence of specific disease among workers exposed to this type of dust.

Artificial Abrasives

Experiments with artificial abrasives demonstrated the incorrectness of earlier ideas that dust caused injury to the lungs proportionate to the hardness and sharpness of the particles. Artificial abrasives are among the hardest substances known. Neither silicon carbide nor aluminum oxide produced any reaction resembling silicosis in experi-

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the same physician, that it was impossible to come to any definite conclusion and say, "this man died of asbestosis," when his previous disability certificates showed that he had myocarditis or high blood pressure or cancer or diabetes or pulmonary tuberculosis.

The pathology and X-ray appearance of asbestosis are entirely different from silicosis and in the absence of a definite history of exposure over a considerable period of time to asbestos dust, the diagnosis is difficult. A great deal of success has been attained in controlling dusts in the plants where asbestos is fabricated so that it is not likely that asbestosis will ever become an important industrial disease, as far as the number of cases is concerned.

The scarcity of clinical data on asbestosis makes the prognosis doubtful. We have had a small group of cases under observation for about ten years — there were originally, I think, some sixty odd men in this group and we still have fifty of them where we can get at them — and some of these show a definite but slow progression as far as can be judged from the X-ray films. However, what the outcome may be remains to be seen. These men are all working and show no signs of any disability.

In the meantime the plants have been cleaned up so that these men are not exposed now to inordinate quantities of asbestos dust, so it is difficult to say what would have been the progress of their disease had their working conditions remained the same.

SILICOSIS

It may be said that there is a very general accord among the leading investigators and research authorities in the opinions and conclusions presented at the international conferences on silicosis (Johannesburg, August, 1930; Geneva, August and September, 1938.) Such differences of opinion as may be expressed from time to time do not seriously affect the general agreement on the basic factors affecting the cause, incidence, effects, and prognosis of silicosis.

The effect of silica upon the lungs depends on the nature and extent of exposure. That is to say, upon the quantity of dust in the air breathed by workmen, the amount of free or uncombined silica in the dust, the size of the dust particles, the presence of other substances in the dust which may modify the action of silica, and the length of time or duration of exposure. The individual himself must also be considered. Previously existing disease of the lungs, especially a tubercle infection, will influence his reaction to inhaled silica. There may be other phases of susceptibility about which we know little or

dust particles of one to two and three microns in their largest diameter, that those particles had no physical characteristics in the ordinary sense in which we apply them. Artificial abrasives are among the hardest substances known. Neither silicon carbide nor aluminum oxide produced any reaction resembling silicosis in experimental animals nor do workmen exposed to these dusts show any clinical symptoms or X-ray appearances suggestive of silicosis.

SILICATES

A considerable number of silicate dusts have been studied and their effects upon experimental animals, both by inhalation and injection, noted. They produce little or no reaction in the body tissues and what little reaction some of them do produce does not tend to progress. An exception should be noted here regarding asbestos, which is considered separately.

Nor is occupational exposure to silicate dusts accompanied by any such clinical picture of disability and death as is found in silica dust exposures. The Public Health Service studied some talc mines in 1935. Only 66 men were exposed. Tuberculosis morbidity and mortality rates were very high in the county where the mines were located and the dust exposure was exceedingly severe, running into hundreds of millions of particles. Eight men showed advanced pneumoconiosis but tuberculosis was also present in most of them. It is conceivable that exposure to tremendous quantities of any mineral dust, regardless of silica-content, might so overwhelm the lungs that they could not deal with the invading substance. Irritation, inflammation, and probably infection would follow with disability in proportion. Such isolated instances do not invalidate the conclusions stated in the previous paragraph.

ASBESTOS

Asbestos is the only dust of combined silica which is known to cause a definite pulmonary fibrosis which may result in disability and death. Let me make that point clear. When we talk of silicosis and the types of dust that produce silicosis, we mean dusts that contain silica in a free or uncombined state, SiO_2. When the silica is in the form of silicon carbide or magnesium silicate or iron silicate that is what we mean by combined silica. The combined silicate dusts, as I have just mentioned, do not produce any pulmonary disease, with one exception, and that one exception is asbestos, which is a hydrated magnesium silicate mixture, with a little iron in it. Most of the asbestos fabricated in the United States comes from the mines in

Quebec. Asbestosis, however, is not found among asbestos miners, most of whom work in open quarries or pits, nor among men engaged in milling operations whereby the asbestos is prepared for shipment and bagged, but among workers in fabricating plants. Fabrication, you will understand, being in the nature of a textile process. Only recently has an explanation been offered for this anomaly. It would appear that not only is asbestos an exception in that it differs from other silicate dusts in its ability to cause structural changes in the lungs but its action appears to be mechanical and not chemical like the action of silica. If asbestos is crushed to fine particles, it will not cause asbestosis in experimental animals nor will asbestos produce any reaction elsewhere than in the lungs. If its action were in the nature of silica, the effect would be more pronounced with smaller particle sizes. In other words, Gardner established that the intensity of a silica reaction upon animals depended upon the smallness of the silica particles, because, to sum it up briefly, the finer the silica particles, the greater is the surface exposure which acts upon the pulmonary tissue.

Asbestos particles, below a certain size, do not produce any effect in experimental animals. Furthermore, you can produce a silicotic reaction, the typical silicotic nodule, in any organ by injecting prepared silica. You can get silicosis of the liver or of the spleen or elsewhere. But you cannot produce any reaction in animals with asbestos anywhere except in the lungs, and then only if your particles are sufficiently large. Consequently, Gardner concludes that the relatively long spicules of asbestos produce their effect because the lungs are never at rest and the constant movement provokes the fibrous reaction.

Like silicosis, asbestosis develops slowly, presenting the characteristic symptom of shortness of breath. The number of cases of asbestosis that have come to autopsy is small but there are several cases on record in which death was due entirely to the asbestos and not to any associated infection or other condition. There does not seem to be any pronounced tendency to tuberculosis in asbestosis, but most of the fatal cases have been complicated by other disease such as cancer and diabetes so that the extent to which the asbestosis was responsible for death is not clear.

I made a rather exhaustive study a few years ago of all the insurance certificates that I could find in which asbestos was given as the cause of death and then followed up the previous history of these people and got their medical certificates when they were on disability. The diagnosis given on the disability certificates was usually so at variance with the diagnosis given on the death certificates, often by

PROCEEDINGS

OF THE

THIRTIETH ANNUAL MEETING

OF THE

MEDICAL SECTION

OF THE

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far exceed those found for men in other pursuits, as to leave little room for doubt that silica is implicated.

With regard to silicate and other inorganic dusts not containing free silica, American mortality data are very meagre. The relatively low death rate from tuberculosis among grinders in the small American insurance experience suggests that the effects of aluminum oxide, silicon carbide and other substances used in manufactured wheels are slight. British data, much more complete, show lower than average tuberculosis mortality up to age thirty-five, but substantially higher mortality after age forty-five for a group of men exposed to inorganic dusts other than silica dust. Whether this unfavorable situation later in life is due to the cummulative effect of such dusts with duration of exposure or whether it is due to the inclusion in these occupational groups of a substantial number of men who had been exposed also to silica dust, is not clear.

There are no mortality data for men exposed solely to metallic dusts.

Recent statistical studies, like the earlier ones, show higher than average death rates from tuberculosis among men employed in certain occupations or industries in which organic dust is generated. In no instance, however, does the rate for a group of this kind approach in magnitude the extremely high rates found among men employed in some of the occupations in which there is exposure to silica dust, [illegible] the light of clinical knowedge, is it possible to account for the excess [illegible]ity on the score of damage to the lung tissue caused by dust.

The relationship between dust inhalation and acute pulmon[illegible]ase remains a field for further investigation. A splendid contribution to our knowledge of this subject has already been made by the United States Public Health Service in their bulletins on *The Health of Workers in Dusty Trades* (32, 33). A greater volume of data of this kind and more detailed studies of occupational mortality are vitally needed to guide the work of industrial physicians and hygienists in this field.

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an unusually high mortality from pneumonia (28) and the same is true of certain occupations in the steel industry (29, 30). Exposure to dust is associated with some of these occupations and usually extremes of temperature are also encountered with such other conditions as would tend to cause dampness and chilling. So far as silica is concerned, a high mortality from pneumonia is associated with the silica trades, both in this country and abroad. Whether silica acts as a predisposing cause of pneumonia or due to the accompanying lung damage the prognosis is more unfavorable, cannot be shown from the figures available.

For some years, a series of interesting studies has been carried on in Pittsburgh by Haythorn and Meller and their associates in an endeavor to establish any possible connection between the prevailing high mortality rate from pneumonia in that city and atmospheric pollution. These reports are interesting and suggestive but not entirely conclusive. The following quotation is from a recently published report of these authors (31).

> It is further seen . . . that during the years from 1932 to 1935 when the depression was at its height, when air pollution from industrial flues was greatly decreased and when economic and living conditions were at their worst, there was a great decrease in the number of deaths from pneumonia. However, the decrease occurred in females as well as males so that the change cannot be attributed to conditions within the plants, such as overheating and rapid chilling of the employees.

SUMMARY

Early occupational mortality studies focussed attention on the importance of dust as a cause of respiratory diseases. Virtually all kinds of dusts were implicated. Present day clinical and laboratory studies point to the serious damage to the lung tissue caused by a few dusts, notably silica and asbestos, and to the relatively little damage to the lung tissue caused by many other dusts. The most complete recent mortality studies have been examined in the light of this clinical and laboratory knowledge. These mortality data, while yielding highly suggestive information, are very incomplete and permit only qualified general conclusions regarding the effects of dust exposure on the incidence of respiratory diseases for even the broad classes of dust with one exception—silica dust. The death rates from tuberculosis among men in occupations in which there is exposure to free silica so

In the American insurance experience, covering the years 1915–1926 (6), also, the ratio of actual to expected deaths was above average for several occupational groups exposed to organic dust. The ratios of actual to expected deaths for the more important of these were: cotton mill operatives, 176 per cent; woolen mill operatives, 134 per cent; upholsterers, 225 per cent; cigar makers and tobacco factory operatives, 174 per cent.

The occupations discussed here have been traditionally classified among the dusty trades. One may well question, however, the inclusion in such a list of boot and shoe and of tobacco factory workers. The great bulk of workers in these industries cannot be said to be exposed to appreciable quantities of dust. But taking the list as it stands, there is obviously no resemblance between the tuberculosis ratios for these occupations and the very high ratios for occupations with exposure to silica dust. Some condition connected with the work of persons in these trades obviously is associated with the above-average incidence of tuberculosis. It may be that the less robust workers are attracted to them. Whatever may be the explanation, clinical findings would suggest that dust is not an important factor in the high incidence of tuberculosis in these trades.

FUNGUS DISEASES OF THE LUNGS

Dust may convey to the respiratory tract various types of fungi. Some of these apparently have no clinical significance. Others are pathogenic and may produce either acute or chronic disease. The constantly increasing use of the roentgen-ray in diagnosis and in routine physical examinations has served to awaken interest in fungoid diseases about which too little is known and which are not uncommonly diagnosed as tuberculosis (25). Our knowledge of the subject is very incomplete but it is recognized that these fungus diseases are frequently occupational in origin and associated with dust inhalation and may result fatally. Mortality statistics are entirely lacking, but the reports of Fawcitt (26) and the recent studies of coccidioidal infection in California (27) indicate that such pulmonary diseases may be quite important.

PNEUMONIA

The effect of dust inhalation upon the incidence of and mortality from pneumonia has been the subject of much study without any clear-cut picture of the rôle of dust resulting (32, 33). The foundry industry has

of textile plants and he stated that there was no evidence of organic dust causing pulmonary diseases (24).

The mortality picture as regards organic dust and tuberculosis is confused. In the Registrar-General's Report (5), out of thirteen classes of textile workers, six had above average death rates from tuberculosis but in only one class—wool, worsted, card, comb or frame (not spinning frame) tenters—was the rate as much as 59 per cent above average. No other class showed more than 16 per cent excess, while in several classes the rate was quite low. On the other hand, boot and shoe factory workers showed an 82 per cent excess; tobacco factory operatives had 100 per cent excess mortality, and brush makers and drafters, 138 per cent excess. The rate for upholsterers, coach trimmers, bedding makers was 26 per cent above the average. Table 4 gives the Standardized Mortality for the principal occupations exposed to organic dust.

TABLE 4

*Standardized mortality (comparative mortality figures) from respiratory tuberculosis of males ages 20 to 65 years in occupations exposed to organic dust compared with that of all occupied and retired civilian males taken as 1,000, England and Wales, 1921–1923**

OCCUPATION	MORTALITY RATIO
All occupied and retired civilian males	1,000
Wool sorters	1,065
Cotton blow room operatives—skilled	750
Rag grinders, wool willowers, etc.	1,093
Cotton card and frame (not spinning frame) tenters	1,057
Wool, worsted card, comb, or frame (not spinning frame) tenters	1,591
Cotton strippers and grinders and card room jobbers	796
Cotton spinners and piecers	1,072
Wool and worsted spinners and piecers	898
Cotton—doublers, winders, warpers, beamers, etc.	869
Wool and worsted—doublers, winders, warpers, beamers, etc.	510
Cotton weavers	731
Woolen and worsted weavers	1,162
Weavers of other textiles	904
Boot and shoe clickers and cutters	1,820
Skilled boot and shoe operatives, not clickers or cutters	1,821
Bakers and pastry cooks	1,016
Tobacco factory operatives	2,002
Upholsterers, coach trimmers, and bedding makers	1,262
Drafters and brush makers	2,376

* Compiled from Registrar-General's Decennial Supplement, England and Wales, 1921, Part II. Occupational Mortality.

dust was injected into the peritoneal cavity of animals, the reaction was inert.

In the process of welding, metals and metallic oxides are volatilized and inhaled into the lungs in a very finely divided state. Reports have been made of roentgen-ray films, taken during the physical examination of welders, which showed an appearance of nodulation resembling fine silicosis. This has given rise to the question as to whether silicosis might be contracted from welding (21, 22), although all these cases were symptom free.

One of the cases reported by Sander came to autopsy following an accidental death. No fibrous tissue was found and it was concluded that the nodular shadows on the film were caused by collections of iron and carbon pigment in the lymph channels of the lung (21, 23).

No satisfactory statistics are available on the mortality of men exposed solely to metallic dust. Perhaps there is as much dust of this character thrown off in grinding as in any other process and the comments regarding the mortality of grinders and of buffers and polishers, given under inorganic dust, are pertinent here. These mixed metal and other dusts from the composition wheels do not seem to have produced mortality rates from tuberculosis comparable in any way with those where the silica hazard is severe.

ORGANIC DUSTS

Until the action of various kinds of dusts upon the lungs was made the subject of experimental studies, the organic dusts, rising from industrial processes, were considered to be responsible for tuberculosis. Knowledge resulting from the extensive studies of silicosis has tended to minimize the possible action of organic dust, both on account of the large average size of the particles and their small numbers when compared with the concentration of inorganic dust particles found in various industries. The presence of pulmonary fibrosis or other structural change caused by organic dust and associated with infection has not been demonstrated among industrial workers. Nor is there evident, in connection with industrial processes involving exposure to organic dust, a clinical picture which could be compared with that associated with silica.

The late Doctor Landis of Philadelphia was one of a group of physicians who were among the first in this country to study tuberculosis among industrial workers. His studies included employees of a number

might have been expected and 18 deaths from influenza and pneumonia where 11 were expected.

In the 1925–1936 study (7) there were 10 deaths from tuberculosis among limestone and marble cutters where one was expected. Here again, as in the case of the British limestone masons, cutters and dressers, the question is raised as to whether some of these men had not worked on granite and other stones as well. Granite and sandstone cutters in the American insurance experience, as we have shown, had more than twenty-six times as many deaths from tuberculosis as expected.

American iron miners apparently have a different type of exposure from the British. We have included them in table 1, somewhat arbitrarily, with the occupations exposed to silica dust. There were 12 deaths from tuberculosis among them where only 1.4 were expected, or a ratio of 857 per cent. This very high ratio suggests that, in some American mines, there may be a greater silica hazard than had been thought. The number of deaths was small, however, and the result cannot be considered conclusive.

METALLIC DUSTS

Hoffman (2), in Bulletin 231, emphasized the danger of exposure to metallic dusts (pages 51–161), but the experience of recent years has not borne out his conclusions. There has not been defined in the various industries in which exposure to metallic dust occurs any definite or specific pulmonary disease resulting therefrom. All the indications are that, where pulmonary disease has been described in conjunction with metallic dust, the blame must be placed on coincidental exposure to silica dust. Macklin and Middleton (17), reporting in 1923, point out that silicosis is associated with the use of natural grindstones and not artificial grindstones and make no mention of ill effects from metal dust. Collis (18) had stated the same general conclusion in his well known Milroy Lecture in 1915 and stated further that the percentage of free silica is the index of harmfulness.

Drinker (19) states that there are no data to indicate that iron in the absence of silica caused pathology in any way comparable to silicosis. Carleton (20) states that hematite is relatively harmless compared with flint and other silica dusts; if inhaled over long periods of time, it might cause fibrosis and tuberculosis but further evidence is needed. Under experimental conditions, it is a relatively harmless dust.

In a series of experiments by Miller and Sayers (15), when iron oxide

deaths. The extraordinarily high ratio of 1,150 per cent was recorded for tin and copper miners, while sandstone masons, cutters and dressers had a ratio of 441 per cent. On the other hand, only the limestone masons, cutters, and dressers in the nonsilica group exhibited a high ratio, 191 per cent. Why these men should have so high a ratio is not clear. It may be that many of them had carried on their trade, at one time or another, in districts where granite or sandstone were cut and, consequently, had been exposed to silica dust.

So far as the occupations exposed to silica dust are concerned, as we have mentioned, these findings are in agreement with American insurance experience. Unfortunately, there are only a few occupations exposed to inorganic dust, other than those discussed under silica and coal dust, included in the American insurance experience and none of these is entirely free from complicating exposure to silica. In the 1915–1926 Medico-Actuarial Study (6), a small group of grinders of metals had twice the expected number of deaths from tuberculosis, while in a somewhat larger exposure in the period 1925–1936 (7), the number of deaths from tuberculosis was about one and a half times the number expected. In recent years, sandstone grinding wheels have largely been replaced by composition wheels throughout industry. It is a fair assumption, therefore, that most of the grinders were exposed to dust from composition wheels, silicon carbide, aluminum oxide, etc., although undoubtedly some grinders were employed where sandstone wheels are still in use. This comparatively favorable result is at variance with the result for grinders in England and Wales (5) who had a ratio of actual to expected deaths of 368 per cent. That study covered the years 1921 to 1923, and the proportion of workers using sandstone wheels may have been greater than in the later American insurance experience. The report of the Registrar-General brings out the important fact that grinders in the cutlery industry, where the sandstone wheel is much in use, have a much higher mortality than do other grinders. We have determined from the facts presented in this report that among the cutlery grinders there were over seven and a half times as many deaths from respiratory tuberculosis as expected, whereas among other grinders actual deaths were somewhat fewer than three times the expected.

Buffers and polishers of metal, a somewhat similar group, were represented in the 1915–1926 American insurance study (6) by 17,000 life years of exposure. There were 10 deaths from tuberculosis where 7

rapidly increases as age advances. In the Non-silica Group, the comparative mortality is actually below normal up to age 35; it rises just above normal in the following age-group; but at ages over 45, it is conspicuously above normal.

The report does not give the facts regarding the mortality from respiratory tuberculosis separately for each of the eleven occupations included in either the silica or the nonsilica group. Because of our special

TABLE 3

*Ratio of actual to expected deaths from respiratory tuberculosis among males ages 20 to 65 years, exposed to specified kinds of dusts, England and Wales, 1921–1923**

OCCUPATION	ACTUAL DEATHS	EXPECTED DEATHS	RATIO PER CENT
Silica Dust			
All selected occupations	654	179	365
Tin and copper mine—underground workers, not superintending staff	92	8	1,150
Potters' mill workers; slip makers; potters	105	37	284
Earthenware, china, etc., kiln and oven men, and kiln setters and placers	50	23	217
Metal grinders	221	60	368
Sandstone miners and quarriers	36	17	212
Sandstone masons, cutters, and dressers	150	34	441
Nonsilica Dust			
All selected occupations	162	150.3	108
Brick and plain tile makers, moulders, etc., furnace and crucible pot makers	34	33.7	101
Brick, tile, etc., kiln and oven men	15	22	68
Iron ore mine—underground workers, not superintending staff (Staffordshire and North Riding of Yorkshire)	13	24	54
Limestone miners and quarriers	39	38.6	101
Limestone masons, cutters, and dressers	61	32	191

* Compiled from: Registrar-General's Decennial Supplement, England and Wales, 1921, Part II. Occupational Mortality.

interest in the facts for this particular disease, we have calculated, from the original report of the Registrar-General (5), for each of the selected occupations, the number of deaths from respiratory tuberculosis which might have been expected on the basis of death rates prevailing among all occupied and retired civilian males between the ages of twenty and sixty-five. These results, together with the numbers of deaths which actually occurred, are presented in table 3.

Each of the silica occupations had over twice the average number of

INORGANIC DUSTS OTHER THAN SILICA, ASBESTOS AND COAL DUST

Many industrial dusts contain silica in combined form, as distinguished from free silica, such as combinations with magnesium, iron and aluminum. The effect of silicate dusts upon the lungs, with one exception (asbestos), is problematical. Where exposure to silicate dusts occurs in industrial establishments, under circumstances which might be thought hazardous, one does not see the clinical picture which is presented where free silica is involved nor is there evidence of disability and tendency to infection. Extensive animal experimentation with silicates, both by inhalation and intraperitoneal injection (15), fails to produce any disease akin to silicosis or other evidence of definite disease. It is doubtful whether there is a definite disease to which the term *silicatosis* can be applied, although such a term has been devised. Certainly, the last word has not been said with respect to silicate dusts.

Similarly the dusts of aluminum oxide and some other artificial abrasives, of hematite, and of other inorganic dusts have not been shown to be the cause of marked pulmonary damage. Mortality statistics tend to emphasize the distinction between the effects of dusts containing free silica and other inorganic dusts. This is very strikingly brought out in a study, based on the occupational mortality data of the Registrar-General of England and Wales (5), by Collis and Yule (16). These authors selected for study two groups of occupations—one exposed to silica dust and the other to nonsilica—so chosen that each had as far as possible the same amount of dust exposure, physical effort, exposure to heat or to weather, or any underground environment. Part of the authors' comment on the results as regards respiratory tuberculosis is quoted:

> For all ages (20 to 65) the C.M.F.[3] of the Silica Group is no less than 592.2 against 163.5 for the Standard Population, i.e., the mortality is more than three and a half times the normal. For the Non-silica Group, the C.M.F., although actually slightly higher than normal, at first sight hardly seems to differ significantly from the normal; nor would one's judgment be much affected, if instead of making comparison with the Standard Population, one had used the Social Groups III and IV, for which the respective C.M.F.'s are 159.8 and 164.2. But the summary figures conceal interesting changes with age. A glance at the figures shows that in the Silica Group, the ratio of mortality to the normal, though greater than unity even in the lowest age-group,

[3] Comparative Mortality Figure: This figure is defined as the number of deaths that would have occurred in the Standard Population at the rates ruling in the occupation.

employees; at ages 45 to 54, in 10 per cent; and at ages 55 to 64, in 20 per cent. No such rise with age occurred in any general population group for which comparable data are available.

The prevalence of tuberculosis was greatest among the rock workers. The next to the highest rate occurred among anthracite workers who had changed more than five years previously from very dusty to relatively non-dusty occupations in the industry. The third highest rate was exhibited among persons who had had appreciable exposure to harmful dusts in other industries. Among the regular miners working at the face, the rate was definitely higher than in the control group (men whose dust exposure averaged less than 5 million particles per cubic foot) which showed a prevalence rate of less than 1 per cent.

When the term of service exceeded 20 years, more than 2 or 3 of which involved exposure to heavy concentrations of rock dust, about 37 per cent of such employees [classified as rock workers] showed evidence of pulmonary tuberculosis. Service of 25 to 34 years was associated with a tuberculosis rate of 8 per cent among non-rock workers employed in the haulageways, of 14 per cent among the regular miners, but with a rate under 2 per cent among men exposed to less than 5 million dust particles per cubic foot of air.

Asbestos: Exposure to asbestos dust may produce a pulmonary fibrosis which, like silicosis, may cause disability and death but which does not appear to carry with it a predisposition to tubercle infection and which has a pathology quite distinct from silicosis. The circumstances under which asbestosis will occur are not too clearly defined and undoubtedly there has been a tendency to classify as asbestosis cases in which the causal relationship of asbestos to the condition present has been assumed rather than proved.

Our knowledge of asbestosis is based on individual reported cases. The actual number of fatal cases of asbestosis, supported by postmortem examination, is too few to have any statistical weight but the disease itself and its pathology have been clearly demonstrated. Gardner (13) believes that the action of asbestos dust, unlike silica, may be mechanical and not chemical. If this is so, it would well explain some of the confusing aspects of this disease. The cases described have originated in textile and other asbestos fabricating plants and not in connection with the mining of asbestos. Pedley (14) found that the tuberculosis mortality rate in Thetford Mines (whence 80 per cent of the asbestos used in the United States is derived) did not differ materially from the rate of the Province of Quebec as a whole.

ard lives. Compared with the death rate for laboring groups generally, therefore, the tuberculosis rate for bituminous miners is quite low, whereas the rate for anthracite miners is as high, if not actually higher, than the average for this class of workers. The number of deaths and the ratio of actual to expected deaths for coal miners is given in table 2.

The following quotation from the Public Health Service report (9), previously referred to, is of interest in showing the incidence of clinical tuberculosis among anthracite miners:

Several surveys have shown that tuberculosis of the lungs occurs among 1 to 2½ per cent of the general adult white male population of the country. In a

TABLE 2

Number of deaths and ratio of actual to expected deaths from tuberculosis of the respiratory system

Ordinary Department Mortality Experience of American Life Insurance Companies*

Coal Miners

OCCUPATION	1915–1926		1925–1936	
	Actual deaths	Ratio per cent actual to expected	Actual deaths	Ratio per cent actual to expected
Operatives not underground	14	159	†	—
Operatives underground				
Total	125	157	135	288
Pennsylvania (mostly anthracite)	†	—	115	334
Other localities (bituminous)	†	—	20	161

* Compiled from: Joint Occupation Study, Actuarial Society of America and The Association of Life Insurance Medical Directors, 1929; and Occupation Study, Actuarial Society of America and The Association of Life Insurance Medical Directors, 1938.

† Data not available.

study of tuberculosis in Framingham, Massachusetts (10), it was found that about 1 per cent were suffering from the disease in an active form, and another 1 per cent were classified as having arrested tuberculosis. Physical examination of 100,924 adult white males made by the Life Extension Institute (11) indicated a prevalence rate of about 1½ per cent when suspected cases were included. A somewhat higher percentage, namely 2½ per cent, was found by the Public Health Service (12) from the examination of 10,000 male industrial workers.

Among the anthracite workers examined, the clinical tuberculosis rate was below normal in the younger adult ages, but at ages 35 to 44 clinical pulmonary tuberculosis was diagnosed in about 5 per cent of the hard coal mining

high among certain groups of miners while among others the death rate from tuberculosis has been consistently low. Recent investigations have cleared up many points about the hazard of coal dust and have indicated certain differences between anthracite coal and bituminous coal. It is desirable, therefore, in studying the effects of coal dust to consider these two types of exposure separately.

In 1934, the Public Health Service (9) made a report on an investigation of pulmonary disease among anthracite miners. This report stated what had previously been suspected, namely, that anthracite mining had, under certain conditions, a silica hazard and many anthracite miners were exposed to the effects of coal and silica dust. The evidence tends to show that disabling miners' asthma is, in effect, silicosis, a silicosis modified by coal dust but nevertheless a silicosis.

Turning to the mortality record of coal miners, we find that the Medico-Actuarial Occupation Study (7) shows for the Pennsylvania miners (nearly all anthracite) the following figures, based on 144,535 life years, for the twelve-year period 1925–1936: There were 1,699 actual deaths where 613 were expected, giving a ratio of actual to expected deaths of 277 per cent. Of this excess, 37 per cent was due to accidents and 63 per cent to disease. The pneumonia and influenza death rate was five times the normal; tuberculosis, over three times the normal; and accidents, five times the normal.

Miners elsewhere (bituminous) presented the following figures: There were 52,522 life years and 330 actual deaths against 187 expected, a mortality ratio of 176 per cent, but of this excess mortality, 84 per cent was due to accidents and 16 per cent to disease. The death rate from accidents was five times the normal; the pneumonia death rate was normal; and the tuberculosis death rate, 61 per cent in excess of normal.

In the insurance occupation study (6, 7), as we have pointed out, the death rates for each occupation are compared with the rate for standard ordinary policy holders, a rigorous standard as compared with the rate for all occupied males. When considering the mortality of men employed in mining operations many of which are carried on by unskilled workers, it is especially necessary to bear this fact in mind. Apart from any specific occupational influence conducive to a high incidence of tuberculosis, we should expect a greater than average mortality from tuberculosis among them because of their economic status. Insured common laborers outside of the mining industry, it should be mentioned, have a death rate from tuberculosis about three times as great as that of Stand-

miners, but in the earlier study (6), covering the years 1915–1926, there were 11 deaths from tuberculosis in this group or eighteen times as many as expected. The ratio for iron miners, 857 per cent, is unexpectedly high inasmuch as it is thought that most of these workers are exposed to only moderate amounts of silica dust, except for a limited number who are working in hard rock. It might have been expected that their mortality would more closely approximate that of coal miners. The number of deaths is small, however, and the difference may be more apparent than real.

Among cutters of granite and sandstone, there were 38 deaths from tuberculosis in an exposure of 5,944 life years, compared with 1.4 expected, or more than twenty-six times as many as the expected number of deaths. Chippers of metal (exclusive of ship chippers) had 16 deaths from tuberculosis where only one was expected.

It will be observed that the ratio of actual to expected deaths from tuberculosis for each of the silica occupations is higher in the period 1925–1936 than in the period 1915–1926. The reason for this apparently lies in the difference in the trend of the death rates for men in these occupations and the rate for insured persons generally. While the figures are too small on which to base broad conclusions, they suggest that men in silica occupations have not shared in the general decline in the death rate from tuberculosis. It may be that there was actually an increase in the rates for the period 1925–1936 over that for the period 1915–1926.

Interesting confirmation of these high ratios by English data is presented in table 3. English tin and copper miners had a death rate from tuberculosis eleven and one-half times the average; sandstone masons, cutters and dressers, nearly four and one-half times the average; and metal grinders, about three and two-thirds times the average. Ratios such as these cannot be explained away on the ground of differing social classes or the selection of the occupation by physically weaker types of workers.

This evidence is in agreement with reports of silicosis studies from South Africa, Australia, Canada, and Great Britain as well as the United States and is supported by clinical experience of physicians in many parts of the world whose practice has been among workers exposed to silica dust.

Coal dust: It has long been known that coal miners are subject to chronic pulmonary disease characterized by dyspnoea and usually termed "miners' asthma," also that the death rate from respiratory diseases is

No useful purpose would be served by quoting extensively from the impressive volume of mortality data available to show the influence of silica dust on the incidence of tuberculosis. Virtually every one of the many studies is in agreement in showing extraordinarily high mortality rates from tuberculosis for industries and occupations in which large numbers of men are known to be exposed to a real silica hazard. These rates are so high, in fact, as to leave no room for doubt of the cause-and-effect relationship between the hazard and the high mortality. A few figures from the insurance investigations (6, 7) may be quoted. Table 1 shows the ratio of actual to expected deaths for the chief occupations exposed to silica dust.

TABLE 1

Number of deaths and ratio of actual to expected deaths from tuberculosis of the respiratory system

Ordinary Department Mortality Experience of American Life Insurance Companies*

Occupations exposed to silica dust

OCCUPATION	1915–1926		1925–1936	
	Actual deaths	Ratio per cent actual to expected	Actual deaths	Ratio per cent actual to expected
Stonecutters—granite and sandstone	16	976	38	2,639
Chippers of metal—(not shipbuilding)	8	615	16	1,667
Mine operatives—underground				
Copper mine operatives	24	913	29	1,381
Gold and silver mine operatives	9	804	11	940
Iron mine operatives	4	260	12	857
Lead and zinc mine operatives	11	1,833	3	—
Other and not specified mine operatives	†	—	10	1,020

* Compiled from: Joint Occupation Study, Actuarial Society of America and The Association of Life Insurance Medical Directors, 1929; and Occupation Study, Actuarial Society of America and The Association of Life Insurance Medical Directors, 1938.

† Data not available.

Among a group of underground miners employed in mines other than coal mines, nearly all of whom were employed in metal mines, there were 65 deaths from tuberculosis in the years 1925–1936 in an exposure of 25,000 life years where 6 were expected, or about eleven times as many deaths as the expected number. There were 13 deaths from pneumonia where 5 were expected. Tuberculosis deaths were fourteen times the expected among copper miners, nine times the expected among gold and silver miners, and eight and a half times the expected among iron miners. In this experience, there was only a small representation of lead and zinc

These are the Registrar-General's Decennial Supplement for England and Wales (5) and two studies made jointly by the Actuarial Society of America and the Association of Life Insurance Medical Directors (6, 7).

In the English study, the tuberculosis death rate for men in a given occupation, ages 20 to 65 years, is compared with that for all occupied and retired civilian males of the same ages. The method of analysis employed in the insurance studies was to compare the actual number of deaths which occurred among men engaged in a specific occupation with the expected number of deaths calculated on the basis of death rates by ages prevailing among standard lives, that is, persons who buy insurance on an annual basis in amounts of $1000 or more and who are not employed in hazardous occupations. Thus the insurance standard is a more rigorous one than that of "occupied males in the general population" since those in the lowest social-economic class are excluded, as are men who are employed in occupations where there is a serious exposure to dust, accident or other hazards. This should be kept in mind in interpreting the figures presented for insured lives in the following discussions.

INORGANIC DUSTS

Silica: Silica in the form of dust produces a definite, characteristic disease of the lungs, namely silicosis, a progressive fibrosis which, in itself, may cause disability and death and which carries with it a special disposition to tuberculous infection. Silicosis results from the inhalation of dust containing free or uncombined silica. Its pathology has been extensively studied, both clinically and in the experimental laboratory. It has been established that silica particles which penetrate the lungs are under ten micra in their largest diameter and are mostly from one to three micra. Not only must the silica dust be in a state of such fine subdivision, but the particles must be present in large amounts and the exposure of the individual must be prolonged. When such conditions are fulfilled the natural defenses of the body against inhaled dust break down and silicosis results.

The precise nature of the action of silica dust upon body tissues is not definitely known but it appears to be a protoplasmic poison and produces its effect chemically and not mechanically. A given dust is dangerous in proportion to the amount of free silica which it contains. The nature of the relationship between silicosis and tubercle infection has not been determined, but the fact of such relationship is attested by overwhelming evidence both clinical and statistical (8).

There are reasons, obvious to us to-day, why these mortality studies have not been an entirely accurate guide. For one thing, students of mortality did not have the benefit of the clinical and laboratory knowledge regarding dusts now available and, consequently, had to make their own classifications of dusts on a somewhat arbitrary basis. They were handicapped, too, by the fact that the existing occupational codes often brought together all the men in a whole industry. This did not permit of detailed studies of the mortality of men exposed to a single type of dust. Occupational mortality statistics still lose much of their value because of this same lack of refinement in methods of classifying occupations. Then again, factors other than dust, which have a marked influence upon the incidence of tuberculosis among men engaged in different occupations, were not as well understood and were not given due consideration in interpreting the results of mortality studies.

There are pitfalls in reasoning from cause to effect, especially where tuberculosis is concerned, and the error of *post hoc ergo propter hoc* is particularly to be guarded against. A high incidence of tuberculosis or other respiratory disease among men in a given occupation does not necessarily indicate the existence in that occupation of a definite occupational hazard. It is well established that people of the poorer economic classes, whether in industry or out of it, have a higher incidence of respiratory tuberculosis than do people better off financially. In Miss Whitney's (4) study of *Death Rates by Occupation in Ten States in 1930*, the standardized death rate for tuberculosis was over twice as high among unskilled workers as among all occupied males while in the Registrar-General of England and Wales' study (5), 1921–1923, the rate for unskilled workers was about two-fifths higher than the rate for all occupied and retired civilian males. Certain occupations, too, are more suited to the physically weak and are selected by them as a means of earning a livelihood. When the followers of an occupation are recruited from the ranks of either of these classes, it is to be expected that a high r incidence of tuberculosis mortality will be found among them. Failure to take cognizance of these factors as possible explanations of a high tuberculosis incidence in certain callings has led to much misinterpretation of the significance of mortality findings.

It is not our purpose to reassess the older statistical material to which reference has been made. We shall limit our discussion of statistics mainly to the results of the three most recent investigations in which tuberculosis death rates are obtainable for a number of occupations.

In 1908, Dr. Frederick Hoffman (1) wrote an article on the mortality from consumption in the dusty trades. Ten years later, he produced the well known Bulletin 231, *The Mortality from Respiratory Diseases in the Dusty Trades* (2), an important milestone in the hygiene of industry. In 1919, appeared the first and second preliminary reports of the Committee on Mortality from Tuberculosis in the Dusty Trades (3), of which Committee, Doctor Hoffman was Chairman. An indefatigable worker in many fields of public health, Doctor Hoffman's name is thus linked to the early authoritative publications in this country dealing with dust and pulmonary disease. The various reports of Governmental Commissions in South Africa, Australia, Great Britain and other countries have also stimulated industrial studies and laboratory research into the effects of many kinds of industrial dusts, especially those containing silica.

At the present time, while no one would state that we have adequate information about the effects of the inhalation of industrial dusts, we do know a great deal more than we did twenty years ago. Both clinical and laboratory studies have given us some knowledge of what kinds of dusts are dangerous, the circumstances under which they are dangerous, and the nature of their action upon the pulmonary tissue. We have also learned a great deal about the prevention and control of the dust hazard by engineering methods. But when we seek evidence of the effects of dust inhalation in mortality and morbidity records, we find that the statistical demonstration of mortality and morbidity due to the inhalation of dusts is anything but satisfactory or complete.

This situation is the more regrettable because comprehensive mortality and morbidity statistics would be of the greatest value in clearing up many doubtful points regarding the effects of specific dusts and would bring to light occupations in which there might be a real, but unsuspected, exposure to injurious dusts. Early occupational mortality studies, it must be admitted, gave the first broad clues to the extent of the dust hazard in industry and to the kinds of dust which are most injurious. These earlier mortality studies, valuable as they were, however, were in many instances misleading. Virtually all kinds of dusts were shown to be productive of tuberculosis rates higher than average, whereas recent clinical and laboratory experience points to the very considerable damage to the lung tissue produced by a few dusts, notably silica and asbestos, and to the relatively little evidence of harm done to the lung tissue by organic and many inorganic dusts.

Amer. Rev. Tuberc. 39: 419 (1939)

INDUSTRIAL DUSTS AND THE MORTALITY FROM PULMONARY DISEASE[1]

A. J. LANZA[2] AND R. J. VANE[2]

Air and water are the two immediate vital necessities of our lives. We take extraordinary precautions to guarantee for ourselves not only an ample supply of water but one of defined purity, and vast engineering water-supply projects, costing many millions of dollars, are an accepted and commonplace fact in our times.

With respect to the air we breathe, we are more complaisant. Dust arising from industrial processes pollutes the atmosphere of working places, in mine, factory and mill, and the products of combustion, both industrial and nonindustrial, are liberated into the atmosphere of our communities with little restraint. In recent years, particularly, industrial dusts have received much attention and much effort has been put forth by industrial firms of all kinds to control dusty processes in their establishments.

Fortunately, nature has furnished us with a respiratory system which has not only a large margin of safety, but a fairly efficient protective mechanism. When that protective mechanism is subjected to severe stress for a sufficiently long period of time, it may fail. The extent to which such failure may be reflected in mortality experience is, within certain limitations, the subject of this discussion.

We are concerned here with industrial dusts other than those commonly recognized as poisonous. Lead, mercury, arsenic, manganese and other systemic poisons are excluded, together with the chemical poisons. Those dusts with which we are concerned are both organic and inorganic, and the latter, in turn, may be subdivided into metallic and nonmetallic. There are many possible subdivisions of these three classifications but for our purpose extensive subdivision is unnecessary. Indeed, it is difficult to get sufficiently ample statistical material to give us definite information under the general headings.

[1] Read as part of the Symposium on *Tuberculosis in Industry* at the joint session of the Pathological, Clinical, Social Work and Administrative Sections at the 34th annual meeting of the National Tuberculosis Association, Los Angeles, California, June 23, 1938.

[2] Me ropolitan Life Insurance Company, New York City.

Dr. Norman Burnette

October 25, 1944

you prefer to send him material in which you think he would be interested through the Head Office or would you wish us to do so?

While I was at RCA in Canada I met Dr. Kaufman, Mr. McCallum, and Mr. Rousseau; Medical Director, Personnel Director, and Safety Director respectively. Their claim rate, as you know, is running currently around 40 per 1,000, according to data which they have at hand. Peak was reached during August, which was more than twice this rate, I believe. Dr. Kaufman does not believe that these claims are all for legitimate illness. He is particularly critical of the part played by the Company Medical Examiners in claim administration. He said they were poorly trained for their work and their follow-up visits did not aid in the control of malingering. He stated that the Company should employ laboratory diagnostic tests such as blood examination, x-rays, etc., to check up on vague diagnoses submitted by attending physicians. The predominant diagnoses are neurasthenia, weakness, anemia, etc., and occur among the female employees, particularly in the radio assembly department, which has about 90 percent females.

In Asbestos Dr. Stevenson, who is the Johns-Manville physician, is also Medical Examiner for the Company. He mentioned that employees were abusing their A&H insurance. He has talked with local physicians about their signing of certificates and their excuse is that they are accommodating the patients. One of the attending physicians suggested that the Company print in bold letters on the form, which is given to the attending physician to fill out, that the insurance is not intended to cover vacations, rest periods, etc.

I did not know whether this comes within your province, but I thought that I would pass it on to you to do whatever you see fit.

Sincerely yours,

George M. Wheatley, M.D.
Assistant Medical Director

A + H
insurance
Sold to JM
(mines) 1944

October 25, 1944

Dr. Norman L. Burnette
Assistant Secretary
Canadian Head Office

Dear Norman:

Your questionnaire regarding community health services and living conditions, which you planned to send to the Nurses in communities in which we are making the tuberculosis mortality study, reached me today. I think it covers everything we talked about Saturday and should give us the necessary information. If it seems necessary and we are in doubt about conditions it may be possible for me to make an inspection visit later on. I assume from your letter that you can secure the information from a trusted source known to you in Rimouski. If you are in doubt about a source in Asbestos, I believe I can secure this information through Dr. Smith, the assistant to Dr. Stevenson at Canadian Johns-Manville in Asbestos.

I have several questions which I did not take up with you on Saturday which relate to my visit. (1) Dr. Graham Ross, Medical Director of National Breweries, Montreal, was interested in our industrial health material. He has about 25 physicians in his professional organization which he and Dr. Pildfell, Medical Director of Aluminum Company of Canada, are organizing. He could use 25 copies of appropriate literature for these men. Do you have supplies of our Industrial Health Series and do you wish to supply Dr. Ross with them? (2) Mr. C. M. McCaw, in charge of Industrial Relations of Canadian Johns-Manville, Asbestos, Que., is interested in having health education material for educational work with their employees in Asbestos. They have become quite active in safety education and now want to turn to health education. He wanted to be supplied with the health education material which we have available. Do you have literature you can send him? If not, what do you wish done? I might also mention that Mr. McCaw raised the question about nursing service. He said that the impression had been given them that they would have nursing service when the insurance was purchased. I explained that we provide nursing service where it is available and that would not necessarily follow the contract. You perhaps know the background of this and you may wish to say something to him.

In connection with the nursing service, I gave Miss Chess the names of the managers of the two mines we insure in Thetford, Mr. O. C. Smith of the Bell Mines, and Mr. Andrew Johnson, of Johnson's Mine. She is planning to call on them this week.

(3) Mr. Ivan Saburin is also interested in Metropolitan health literature. I shall arrange to put him on the Statistical Bulletin mailing list, but am in doubt as to what you prefer to do about other health literature. Would

A + H
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7. Un programme éducationnel sur la prévention de la tuberculose et une amélioration des conditions hygiéniques du travail dans les usines s'imposent.

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Metropolitan Life Insurance Company.

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