

Policy development for compensating workers exposed to crystalline silica in Ontario, Canada

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The Ontario Workers' Compensation Board develops policy for diseases by considering scientific information within legal, political, and social contexts. The purpose of this paper is to describe the process used to develop a policy for lung cancer among gold miners and to examine the extent to which this process assists the development of similar guidelines for workers with silica dust exposure. The scientific and policy questions are similar, both requiring consultation with stakeholders. To improve the development process for the gold miner policy, consultation for silica and lung cancer needs to be more inclusive. The resulting procedures would also need to be precise enough to assist adjudicators to make decisions without limiting their ability to decide each claim on the merits of the case. The major challenge is to ensure that the final policy is scientifically and legally supportable and acceptable to both workers and employers.

Key terms gold mining, lung cancer, policy, silica, silicosis, workers' compensation.

Because the Ontario Workers' Compensation Board has received claims from lung cancer patients who had been occupationally exposed to silica, the staff of the Board have begun to develop a policy proposal to help adjudicators decide on these claims. Although all policy development for disease claims begins with an assessment of the scientific evidence, there are issues beyond which need to be resolved before a final policy can be approved and implemented. This paper describes and discusses these issues. For this purpose it uses the current Ontario gold miners' compensation as an example and compares the relevant issues for gold mining and silica exposure.

Policy making of the Ontario Workers' Compensation Board

According to the Ontario Workers' Compensation Act of 1915, compensation for disease was provided if a worker had an industrial illness due to employment. Initially, such compensation was approved only for the following conditions: anthrax from handling wool, hair, bristles, hides and skins; lead poisoning and its sequelae; poisoning from other metals and substances such as arsenic, mercury, and phosphorous; and ankylostomiasis, a hookworm disease commonly found among miners. Currently the Act² defines occupational disease as follows (1): (i) a disease resulting from exposure to a substance relating to a particular process, trade, or occupation in an industry, (ii) a disease peculiar to or characteristic of a particular industrial process, trade, or occupation, (iii) a medical condition that, in the opinion of the Board, requires a

worker to be removed temporarily or permanently from exposure to a substance because the condition may be a precursor to an industrial disease, or (iv) any of the diseases appearing on the list found in schedule 3 or 4 of the enabling law (1).

It is specified in the Act that for diseases and work processes included in schedule 3 or 4, a presumption of work-relatedness is appropriate. If a claimant has a disease listed in schedule 3 and was employed in the stated work process, the disease is presumed to be due to the nature of employment unless the contrary is shown. If a claimant has a disease listed in schedule 4 and was employed in the appropriate work process, the ailment is conclusively presumed to be due to the nature of the employment. With this definition and the addition of diseases to the two lists of compensable conditions, the Board today compensates many more diseases than earlier.

When the policy for lung cancer and gold mining was developed in 1988, the first question for the Board was whether lung cancer among gold miners was an industrial disease. The next question was how to determine if a person's lung cancer was due to the claimant's employment. As discussed later, similar questions are being asked about lung cancer and workplace silica exposure.

Policy development process

A condition is considered an "occupational disease" under the Act when an association exists between the disease and a work process

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² On 9 December 1994 the Act to Amend the Workers' Compensation Act received Royal assent. This amendment changed the words "industrial disease" to "occupational disease" and the Industrial Disease Standards Panel to the Occupational Disease Panel. There were no substantive changes to these sections of the amendment.

or a disease and a work substance as described in the first two definitions given earlier (ie, when the relationship between a disease and a work process is defined as causal). Because it is often difficult to obtain scientific consensus on disease causation, the Act established, in 1985, a body known as the Industrial Disease Standards Panel (now known as the Occupational Disease Panel) to resolve some of these issues.

The Panel is composed of a maximum of nine members and includes representatives of the public and the scientific community and persons with technical and professional expertise. The mandate of the Panel is to investigate possible occupational diseases and report its findings to the Board as to whether a "probable connection" exists between a disease and an industrial process, trade or occupation in Ontario. In particular, the Act states that the Board must solicit a written stakeholder opinion and publicly respond to the Panel's findings. After considering the opinion of stakeholders, the Board may accept, reject, or amend the Panel's findings. The Panel can identify its own issues for review and can also respond to questions raised by the Board. The issues brought to the Panel often lack scientific and stakeholder consensus, are controversial, and often elicit a great deal of public interest.

In 1985, the Act also established the Workers' Compensation Appeals Tribunal to hear appeals from workers or employers disputing Board decisions. The current gold miner policy was developed within the context of the Panel process, the Tribunal decision, additional scientific information, and further consultation with workers and employers.

Table 1. Guidelines from the 1988 gold miner policy for workers' compensation (3).^a

Necessary conditions	Necessary evidence to meet conditions
Worked in an Ontario gold mine	Substantiated occupational history
Gold miner had primary lung cancer	Medical evidence establishing primary cancer of trachea, bronchus or lung
Biologically plausible latency period	Minimum of 15 years between first employment in "dusty gold mining" ^b occupation and diagnosis of cancer of the trachea, bronchus or lung
Worked during dustiest years of gold mining	Evidence of "dusty gold mining" in Ontario prior to 1945
Sufficient and consistent evidence of occupational exposure	At least one of three based on chest X-ray, weighted dust exposure index, age at which gold mining started and years of "dusty gold mining" experience before 1945. For example: a chest X-ray rating of 4 or more as rated by the chest X-ray classification system of the Ontario Workers' Compensation Board and a weighted dust exposure index of 60 or more, where weighted dust exposure is the sum of (i) years worked in "dusty gold mining" in Ontario pre-1936, multiplied by 4; (ii) years worked in "dusty gold mining" in Ontario from 1936 to 1944, multiplied by 3; (iii) years worked in "dusty gold mining" in Ontario from 1945 to 1954, multiplied by 2; (iv) years worked in "dusty gold mining" in Ontario after 1954, multiplied by 1.

^a Policy statement: "Primary cancer of the trachea, bronchus or lung are accepted as industrial diseases . . . as characteristic of gold mining in Ontario prior to 1945" (2).

^b "Dusty gold mining" is defined by the coding system of the Ontario Workers' Compensation Board.

Policy on lung cancer among gold miners

Because of a significant number of claims submitted to the Board in the 1980s by Ontario gold miners or their survivors, the Board asked the Panel to investigate the relationship between lung cancer and gold mining. To expedite the policy development process, the Board also commissioned a prominent cancer epidemiologist in Toronto to review the relationship between gold mining in Ontario and lung cancer deaths. Combining the recommendations of the Panel and independent scientific opinion (2), and using additional analyses by the Board staff, the Board of Directors approved a policy in January 1988 to guide the adjudication of claims from gold miners who developed lung cancer (3).

Because an excess of lung cancer deaths was found among gold miners employed before 1945, the policy was designed to compensate all miners with lung cancer who worked in an Ontario gold mine prior to 1945 and belonged to subgroups which had significantly elevated mortality from lung cancer (table 1). Workers not in these subgroups were automatically excluded from compensation because it was believed that further investigation would not detect any additional gold miners whose lung cancer was work-related.

This policy recognized cancer of the trachea, bronchus, or lung as an industrial disease characteristic of gold mining in Ontario prior to 1945. In addition it provided numerous conditions to be met for qualification for compensation: employment in an Ontario gold mine, employment during the dustiest years of gold mining, diagnosis of primary lung cancer, a biologically plausible latency period, and sufficient and consistent evidence of occupational exposure. The policy also listed the evidence needed to meet each condition. Experience in Ontario prior to 1945 would be the necessary evidence to indicate that the miner worked during the dustiest years of gold mining, and an Ontario-classified chest X-ray code of 4 or more (representing an intermediate stage between normality and abnormality and consistent with known exposure history) (see Finkelstein this issue for definition) and a weighted dust exposure index (table 1) of ≥ 60 would be one of three ways of demonstrating sufficient and consistent evidence of occupational exposure (3). If the worker met all of the necessary conditions, neither smoking nor any other factors were considered, and the claim was allowed.

Adjudicators experienced little difficulty in administering the gold miner policy until March 1989, when the Workers' Compensation Appeals Tribunal heard the appeal of the wife of a gold miner who died of lung cancer. The widow was denied survivors' benefits because there was no evidence that her husband had mined gold in Ontario prior to 1945. The Tribunal concluded that compensation cannot be denied because an individual worker does not meet every requirement set out in the policy of the Board (4). The Panel stated that the Act requires that a decision about causation be made on the merits and justice of the individual case in every single claim. In this claim, after investigating the special circumstances of the miner's work environment, the Panel decided that the miner had unusually high dust exposure and that his disease was probably work-related. After seeking legal opinion on the issue, the Board of Directors recognized the need to revise the gold miner policy and also instructed adjudicating staff to reconsider all of the 253 claims that had been denied under the policy (4).

At about the same time, Kusiak et al (5) published a paper on risk factors for lung cancer among gold miners. The paper provid-

ed new information on probable causative agents of lung cancer excess, and its findings were useful in the re-adjudication of the denied claims and for future claims.

A revised gold miner policy was adopted on 29 August 1991 (6). It contained the same five necessary conditions for establishing that the worker's lung cancer was related to gold mining. However, the policy had only two requirements: (i) that there must be a substantiated occupational history of gold mining and (ii) that there must be medical evidence establishing the presence of primary cancer of the trachea, bronchus, or lung.

Instead of "necessary evidence" as stated in the original, the revised policy listed evidence that is "persuasive" in substantiating that each of the necessary conditions has been met. Persuasive evidence for "sufficient and consistent occupational exposure" includes the factors listed in the 1988 policy, as well as additional factors identified by Kusiak et al (5) (eg, work in dusty mines, significant arsenic levels, or significant levels of radon progeny).

Finally, the policy states that "all decisions shall be made in accordance with the real merits and justice of the case, and all available evidence of work and nonwork factors is to be considered to make a determination of work-relatedness in each individual case" (6).

Evaluation of the gold miner policy

The process used to develop the gold miner policy was long and arduous. The scientific assessment had its roots in the release (in 1983) of a study by Muller et al (7). An analysis of the same cohort by a scientific panel appointed by the Industrial Disease Standards Panel and an independent scientific review in 1988 were added to the process (2). Finally Kusiak et al (5) provided more information. After more than eight years, all of the analyses concurred that there was likely a causal association between gold mining and lung cancer.

The consultation process in the development of the original gold miner policy consisted primarily of written submissions to the Ontario Workers' Compensation Board. For the revised policy, there was a 1-h face-to-face meeting between Board staff and workers' representatives and another similar meeting between Board staff and employers' representatives. Since 1991, after consultation on the revised gold miner policy took place, consultation on other Board policies has become more extensive.

Acceptance of the final policy was mixed. Workers and their representatives were satisfied with the recognition of lung cancer among gold miners as an industrial disease. They also approved of the open-ended wording for demonstrating sufficient and consistent occupational exposure. However, they would have preferred that lung cancer and gold mining be entered into schedule 3 of the Regulations of the Act and given a presumption of work relatedness. Some employers' representatives did not however recognize the causal relationship between lung cancer and gold mining and argued that the excess lung cancer mortality in the gold miner cohort was due to smoking. Hence they are particularly concerned about the lack of consideration of smoking in the policy. Furthermore, adjudicators have had difficulty in applying the policy because it requires considerable case-by-case evaluation and provides limited guidance in certain instances.

Under the original gold miner policy, 249 lung cancer claims were allowed, and 253 claims were denied. With the re-adjudication of denied claims under the revised policy, an additional 79 claims were allowed.

Toward a policy on silica exposure and lung cancer

Before proceeding with a general policy on occupational silica exposure, the following scientific questions need to be answered: (i) is there a causal connection between silicosis and lung cancer and, if so, under what circumstances would lung cancer likely occur in workers diagnosed with silicosis, and (ii) does silica exposure cause lung cancer and, if so, under what circumstances is lung cancer likely to occur among workers exposed to silica?

Scientists have hypothesized the following three possible mechanisms for an association between silicosis and lung cancer (8): (i) crystalline silica could be a carcinogen that directly causes lung cancer and the presence of silicosis in a worker is an indication that the worker has been exposed to large amounts of silica, (ii) silica causes silicosis and silicosis may be an intermediate pathological state leading to lung cancer, or (iii) cigarette smoke (which includes many known carcinogens) may attach to crystalline silica dust. Since heavy doses of polyaromatic hydrocarbons are not easily cleared from the lungs, the lungs would be exposed to high doses of a known carcinogen.

Although most, if not all, mortality studies among silicotics show elevated mortality from lung cancer, the interpretation of the findings is still controversial. Worldwide, at least 10 cohort studies on silicotics have been published since 1987 (9). All of these studies reported excess mortality from all causes [standardized mortality ratio (SMR) ranging from 140 to 302] and from lung cancer (SMR ranging from 129 to 685). The Ontario study by Finkelstein et al (10) reported a lung cancer SMR of 230 for silicotic miners and 302 for silicotic surface workers. Some reviewers (11, 12) believe that cohorts of silicotics, especially those who receive workers' compensation, are neither representative of silica-exposed workers nor of silicotics in general. They may be compensated because of poor health or because they have more symptoms due to smoking. Such interpretations are refuted by more recent studies showing that excess lung cancer is found among silicotics identified by a registry and active surveillance programs (13). (See Merlo et al and Rosenman et al, this issue.) In addition, even though smoking has been either directly or indirectly adjusted for in most studies, an excess of twofold or more still persists. Therefore, it is reasonable to conclude that silicosis is a probable cause of lung cancer death, whatever the underlying mechanism.

To assess the causal relationship between silica exposure and lung cancer, additional mortality studies have been conducted among several cohorts of silica-exposed workers worldwide since 1987 (9). The studies investigated workers in different ore mining operations, in ceramic manufacturing, and in granite and stone work. Results of these studies are not consistent. Most do not show a dose-response relationship when duration of employment is used as a measure of dose. In studies showing elevated lung cancer risks, the excess is concentrated mainly among workers who were diagnosed as silicotic (13). In cases when an excess has been shown among nonsilicotics, the excess has usually been less than 50% (a risk measure of 1.5) (13). Although some scientists support occupational silica exposure as carcinogenic (9), there are others who would disagree (11).

Policy issues

Even with a consensus on the preceding scientific issues, the policy direction which follows is not straightforward. One option

available is to revise the listing of silicosis in schedule 3 to read "silicosis and its sequelae." This change would recognize the clear and consistent relationship between silicosis and lung cancer, as well as silicosis and other sequelae, such as tuberculosis and cor pulmonale. Guidelines would be developed to inform stakeholders and adjudicators of the sequelae for silicosis and the circumstances under which these conditions are most likely to occur.

As yet there is no scientific consensus on whether a causal relationship exists between crystalline silica and lung cancer, even though the International Agency for Research on Cancer (IARC) identifies silica as a probable human carcinogen (14). More investigations on the relationship between silica exposure and lung cancer in the absence of silicosis, particularly in Ontario cohorts, may help to clarify the issue. Failing that, what is needed is consultation among stakeholders to arrive at some form of consensus on the issue. Therefore, this appears to be a perfect task for the Occupational Disease Panel.

No matter what the final policy will be, it is clear that the issue of smoking cannot be ignored. Similarly, changes in workplaces where silica is encountered will also need to be considered. As a result of preemployment and annual chest X-rays for all miners between 1928 and 1983 and the enactment of the Designated Substance Regulation for Silica in 1983 to control the level of silica exposure in Ontario workplaces, the numbers of silicosis claims to the Board have decreased. In the 1940s, the Board allowed an average of about 50 silicosis claims a year. Between 1990 and 1994, the number of allowed claims dropped to about 20 per year. Therefore, it is important to ensure that any policy that is developed recognizes that data of past silica exposure is likely to be unreliable and that the nature and amount of silica exposure currently being encountered in Ontario workplaces differ from those in the past.

Concluding remarks

Ontario is the only worker's compensation jurisdiction in the world to recognize lung cancer among gold miners as an industrial disease. The gold miner policy has helped to lay the groundwork for the developments of many other workers' compensation policies in Ontario, including one on silica exposure and lung cancer. However, both the development process and the resulting policy on gold miners have their weaknesses. The process provided limited stakeholder discussion with the Board and between workers' and employers' representatives. The resulting policy, while based on scientific evidence, nevertheless, falls short of providing con-

crete guidance for adjudicators to use in making decisions on claims. In addition, it lacks advice on how to consider previous smoking in the decision making.

It is clear that future policy development for lung cancer claims among silica-exposed workers should contain wide and extensive consultation with stakeholders. Included in the process must be scientific experts, workers and their representatives, employers, and adjudicators, who must implement any policy that is approved.

Acknowledgments

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