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## Background and Development of the WSIB Lung Cancer-Gold Miners Policy 16-02-07

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## Introduction

The current WSIB Lung Cancer in Gold Mines Policy 16-02-07<sup>1</sup> (Appendix 1) sets out the guidelines that are considered in the adjudication of lung cancer claims from Ontario gold miners. In brief, the exposure criteria are based on the number of years of “dusty gold mining” and to satisfy the condition of sufficient and consistent evidence of such exposure, a miner must show that he had a weighted dust exposure index of 60 or more. The weighted dust exposure index is calculated as the sum of years worked in “dusty gold mining” with different periods of exposure weighted as follows;

- pre 1936 x 4
- from 1936 to 1944 x 3
- from 1945 to 1954 x 2
- after 1954 x 1

To achieve the weighted dust exposure index of 60 or more would require 15 years of exposure prior to 1936 or 20 years of exposure between 1936 and 1944 or 30 years of exposure between 1945 and 1954. This also means that any gold miner who started working after 1954 would require 60 years of dust exposure to meet this exposure index.

Greater weight is given to dust exposures in earlier years before 1954 since the policy assumes that dust exposures in gold mines before 1954 were generally greater than exposures after 1955.

The exposure criteria for the current WSIB Lung Cancer in Gold Mines Policy 16-02-07 are based on:

- 1987 Industrial Disease Standards Panel (IDSP) “Report to the Workers’ Compensation Board on the Ontario Gold Mining Industry”<sup>2</sup>
- 1991 Kusiak et al paper “Carcinoma of the lung in Ontario gold miners: possible aetiological factors”<sup>3</sup>
- WSIB Board of Directors Minute #5, August 29, 1991

## **1987 Industrial Disease Standards Panel (IDSP) “Report to the Workers’ Compensation Board on the Ontario Gold Mining Industry”**

In August 1986 the IDSP was asked by WCB<sup>A</sup> to review the evidence on the association between experience in Ontario gold mines and excess mortality from lung cancer and to provide criteria for compensating lung cancer claims from Ontario gold miners.

The IDSP consulted the following studies and reports:

- 1983 Muller et al study “Study of Mortality of Ontario Miners 1955-1977 Part 1”<sup>4</sup>
- 1986 Muller et al study “Study of Mortality of Ontario Gold Miners: 1955-1977”<sup>5</sup>
- 1987 Report of the Special Panel on Ontario Gold Mining Industry<sup>6</sup> (commissioned by the IDSP)
- 1987 Report of the Miller et al Scientific Panel on “Mortality from Cancer among Ontario Gold Miners 1955-1977”<sup>7</sup> commissioned by the WCB

The first mortality study on Ontario miners was published by Muller et al in 1983<sup>3</sup>. This case-control study examined mortality rates for various diseases among uranium and non-uranium miners. For uranium miners, exposure data for radon was used to estimate the cause-specific effect mortality rates. However, for non-uranium miners, no quantitative assessment was made for silica or other non-radioactive dusts. A statistically increased mortality rate for lung cancer was observed in the cohort of gold miners. The gold mining cohort was then redefined slightly and analyzed in more detail in the Muller et al 1986 study. The Report of the Special Panel on Ontario Gold Mining Industry<sup>6</sup> reviewed the 1983 and 1986 Muller reports<sup>4,5</sup> and expanded the gold mining cohort to include miners previously labelled as “mixed ore exposure”<sup>B</sup> in the Muller studies and also included some surface workers in dusty occupations. In December 1986 The WCB commissioned Miller et al to provide independent advice on the issue of compensation among gold miners for lung cancer<sup>7</sup>.

Despite the differences in the definition of the gold mining cohorts, the statistically significant lung cancer risk estimates were similar among the various reports and are summarised in Table 1.

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<sup>A</sup> WCB = Workers’ Compensation Board later became the WSIB

<sup>B</sup> “Mixed ore exposure” referred to those miners who worked in other types of mines (e.g. nickel or copper) in addition to gold mines.

<b>Table 1 Comparison of Lung Cancer Mortality from Muller, Special Panel and Miller Gold Mining Cohorts</b>			
	<b>Observed Deaths (O)</b>	<b>Expected Deaths (E)</b>	<b>Standardized Mortality Ratio SMR (O/E) [95% Confidence Interval]</b>
<b>Muller et al 1983</b>	196	134.90	145 [126-166]
<b>Muller et al 1986</b>	165	117.5	140 [120-163]
<b>IDSP Special Panel Report 1987</b>	209	148.5	141 [123-161]
<b>Miller Scientific Panel Report 1987</b>	237	171.5	138 [121-156]

In the absence of quantitative dust exposure information, the IDSP Special Panel constructed a crude index of weighted duration of exposure to estimate an exposure-response relationship. By weighting different periods, the Panel concluded that this would take into account both the length of exposure and intensity of exposure. The intensity of exposure would be reflected by giving greater weight to the earlier periods (before 1954) when dust concentrations were greater. The index of weighted duration of exposure proposed by the Special Panel were as follows:

- years of exposure pre 1936 x 4
- years of exposure from 1936 to 1944 x 3
- years of exposure from 1945 to 1954 x 2
- years of exposure after 1954 x 1

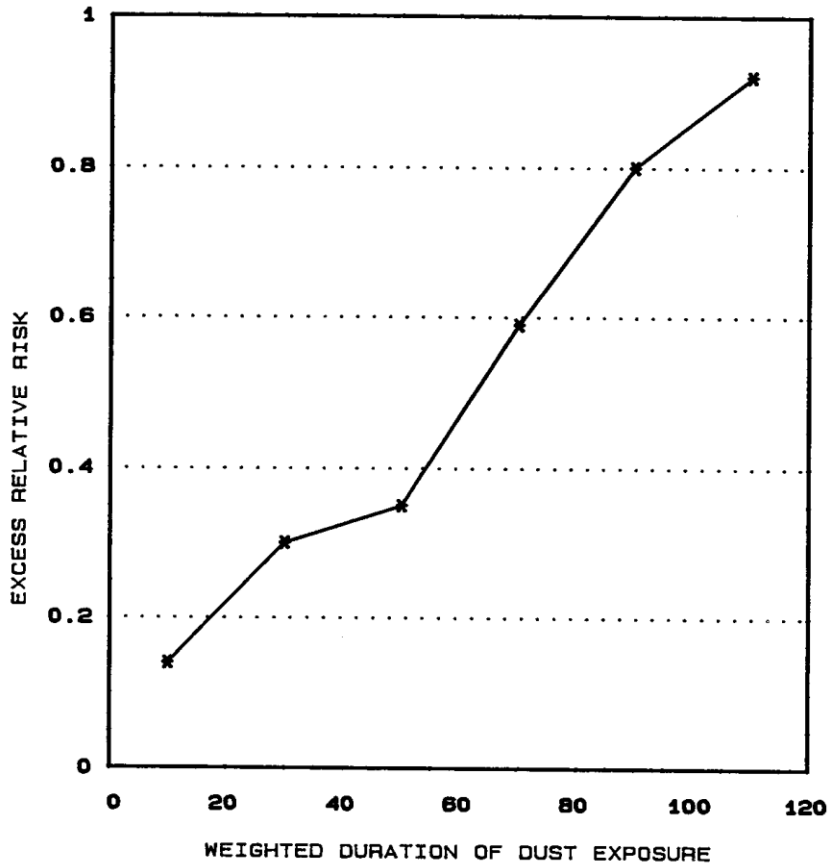
Using these weighting factors, the Special Panel found a trend of increasing lung cancer mortality with increasing weighted duration of exposure. Figure 1 reproduced from the Special Panel Report illustrates the exposure-response relationship.

The Special Panel also emphasized that the likely cause of the excess lung cancers could not be identified because of the lack of information on specific contaminants.

The full Special Panel Report appears as Appendix A in the 1987 IDSP Report<sup>2</sup>

**Figure 1 Excess Relative Risk of Lung Cancer by Weighted Duration of Exposure**

(Source: Figure 2 in Appendix A of the IDSP "Report to the Workers' Compensation Board on the Ontario Gold Mining Industry")



**Eligibility Rule**

On April 22, 1987, the IDSP provided "Report in the Ontario Gold Mining Industry" to WCB. Based on the findings of the Special Panel, the IDSP proposed that the following eligibility rule be adopted by the WCB:

***"Eligibility Rule 1: That lung cancer cases among Ontario gold miners in dusty occupations (Appendix A, Table 5) whose weighted dust exposure is 60 or more be compensated."***

Table 5 from Appendix A of the IDSP report is reproduced below:

DUST EXPOSURES DEFINED BY OCCUPATION CODES  
(Based on Worker's Compensation Board Codes)

WCB CODE	DEFINITION
11	Full time in dust exposure - Mill
12	Full time in dust exposure - Other surface
13	Full time in dust exposure - Shaft sinking
14	Full time in dust exposure - Other underground
15	Full time in dust exposure - Surface and underground
16	Full time in dust exposure - Open pit
21	Part time in dust exposure - Mill (including Mill in Open Pit)
22	Part time in dust exposure - Other surface
25	Part time in dust exposure - Surface and underground
26	Part time in dust exposure - Open pit
97	Dust exposure, specifics unknown

By adopting this eligibility rule and a weighted dust exposure index of 60, the IDSP concluded that this would have the effect of compensating those cases of lung cancer with the following years of exposure to dusty gold mining;

15 years of exposure prior to 1936 – weighted dust exposure index; 15 years x 4 = 60

17 years of exposure prior to 1945 – weighted dust exposure index; (8 years prior to 1936 x 4 = 32) + (9 years 1936-1944 = 9 x 3 = 27) = 59 (~60)

22 years of exposure prior to 1955 – weighted dust exposure index; (3 yrs prior to 1936 x 4 = 12) + (9 years 1936-1944 = 9 x 3 = 27) + (10 years between 1945-1954 x 2 = 20) = 59 (~60)

The IDSP estimated that if the WCB used this approach, 82 lung cancer cases would be compensated which would represent 90% of the estimated excess number of lung cancer deaths in the all gold miners cohort between 1955 and 1977.<sup>C</sup>

<sup>C</sup> The IDSP estimated the burden of excess lung cancer deaths in the all gold miners cohort between 1955 and 1977 from the SMR calculated by the Special Panel in Table 1. Based on 209 observed deaths (O) and 148.5 expected deaths (E) the Special Panel calculated the SMR (O/E) = 141 (95% CI 123-161). The IDSP concluded that it was appropriate to use the 95% rule as its policy basis for the true estimate of the burden of occupational disease. This means that the upper bound of the 95% CI was used to estimate the true value of the SMR for occupational disease. Therefore, if the true SMR (O/E) is taken as 161 (upper bound of the 95% CI), then O = 239.3 and O-E = 90.8 (or rounded to 91) cases. Then 90% of 91 cases = 82 cases that the IDSP estimated would be compensated using this approach.

## **Generic Criteria**

The IDSP also made recommendations for the following 12 generic criteria within which each claim may be assessed. The IDSP acknowledged that the specificity of available information for individual cases or groups of cases under the different criteria will vary “enormously”.

1. Geology
2. Mine Design
3. Mine Operation – Technology
4. Mine Operation – Work Practices
5. Mine Operation – Production
6. Mine Operation – Mine Environment
7. Work History – Occupations
8. Work History – Year of Start Mining
9. Work History – Age at Start of Mining
10. Work History – Years in Mining and other Occupations
11. Personal Medical History
12. Other Worker Populations

The IDSP Report should be consulted for full details of these criteria.

## **Dissenting Opinion**

Two members of the IDSP Panel did not agree with the majority view put forward in the “Report on the Ontario Gold Mining Industry”<sup>2</sup> and in a memo dated April 22, 1987<sup>D</sup> provided a dissenting opinion to the WCB. The dissenting opinion raised several concerns about the IDSP Report and the recommended eligibility rule:

- 1) Compensable lung cancer should not be limited only to those miners who fall within the statistical excess. Since the Special Panel exposure-response analysis (Figure 1) suggested that there was no identifiable threshold, every exposure above zero contributes to a miner’s risk of lung cancer and should be considered.
- 2) The follow-up period (1955 to 1977) was probably too short to identify all the lung cancer cases in this cohort of gold miners.
- 3) Potential causative agents should not be limited to just silica since radon, arsenic and other carcinogens were present in the gold mines and may account for the increased risk of lung cancer.

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<sup>D</sup> The memo of the Dissenting Opinion appears as Part 4 in the 1987 IDSP Report “Report to the Workers’ Compensation Board on the Ontario Gold Mining Industry”



- 4) The statistical studies considered by IDSP should not be used to produce rigid eligibility rules for determining individual cases.
- 5) The weighted dust exposure index of 60 is neither supportable nor appropriate. According to the weighting factors, a gold miner starting work after 1955 would never be eligible under rule since it is very unlikely that he could achieve 60 years of employment after 1955.<sup>E</sup>

The dissenting members recommended that the WCB enter lung cancer and gold mining into Schedule 3 of the Workers' Compensation Act:

***“Eligibility Rule: That lung cancer and gold mining be entered into Schedule 3 of the Workers' Compensation Act, and that lung cancer shall be deemed to have been due to the nature of gold mining unless the contrary is proved.”***

**Kusiak et al 1991 study “Carcinoma of the lung in Ontario gold miners: possible aetiological factors”<sup>3</sup>**

In 1991 Kusiak et al published a study that extended the follow-up of the original 1983 Muller cohort of Ontario gold miners from 1977 to the end of 1986. The longer period of follow-up was used to examine whether an excess of lung cancer existed in Ontario gold miners who started work after 1945. It also allowed for the reconsideration of the role of radon and arsenic from surveys of concentrations of radon and arsenic content in the rocks and tailings of many Ontario gold mines<sup>8</sup>.

Assumptions about the dust concentrations were taken from the summary data for dust levels in gold mines reported in the 1968 MAPAO Annual Report<sup>9</sup>:

*“Dust concentrations*

The few dust concentration measurements that were made in gold mines before 1950 and which are still available indicate that dust concentrations for some occupations in the 1930s and 1940s were often above 1000 particles/ml (p/ml). Dust concentrations were as low as 500 p/ml<sup>F</sup> for other occupations in the same mine at the same time. By 1959 the average dust concentration in Ontario gold mines was about 400 p/ml, and by 1967 the average was under 200 p/ml. In later years, the variation of dust concentrations between different jobs in the same mine was much less.”

The 1991 Kusiak et al study<sup>3</sup> found a statistically significant excess of lung cancer for miners who began gold mining before 1946 (SMR = 129; 95% CI 115-145). No increase in mortality from lung cancer was evident for men who began mining gold after the end of 1945. The authors concluded that the excess of

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<sup>E</sup> For example, according to this criteria a gold miner would have to have worked continuously for 60 years from 1955 to 2015 at a concentration of 500 ppcc or greater in order to have a claim for lung cancer accepted as result of “dusty gold mining” exposure.

<sup>F</sup> p/ml = ppcc

lung cancer mortality in Ontario gold miners was associated with exposure to high dust concentrations before 1946, with exposure to arsenic before 1946 and with exposure to radon decay products.

This study proposed that the increased risk of lung cancer in Ontario gold miners could be estimated from the combined exposure to dust containing silica, arsenic and radon. At that time, arsenic and radon were known lung carcinogens and silica was a suspected lung carcinogen. The combined risk model in the Kusiak paper used years of “dusty years” (i.e. konimeter counts >500ppcc) as a surrogate for silica exposure and also included an arsenic exposure index and the number of Working Level Months (WLM) of exposure to radon. The arsenic exposure index was calculated by multiplying the arsenic concentration in the rock with the mine-specific years of dusty gold mining exposure and the WLM was calculated by multiplying the mine-specific working level value of radon with the miner’s months of dusty gold exposure.

The best fitting combined risk model was summarised in the following equation:

$$\text{Risk} = 1.00 + (0.05 \times \text{dusty exposure years}) + (0.14 \times \text{arsenic index}) + (0.0005 \times \text{WLM})$$

This combined risk equation is used by the WSIB in assessing lung cancer claims from gold miners as outlined in the 1993 Kabir et al paper<sup>10</sup>.

For example, the risk of lung cancer for a miner with 20 years of dusty gold mining exposure at the Kerr Addison gold mine can be estimated by using values from Table 1 of the 1991 Kusiak et al paper<sup>1</sup> for the percentage of arsenic in the rock (0.068%) and average radon exposure (0.003 WL) for this mine.

$$\text{Risk} = 1.00 + (0.05 \times 20) + [(0.14 \times (0.068 \times 20 \text{ years}))] + [(0.0005 \times (240 \text{ months} \times 0.003 \text{ WL})]$$

$$\text{Risk} = 1.00 + 1.00 + 0.19 + 0.0004 = 2.19$$

According to this equation, 20 years of “dusty gold mining” exposure would result in a doubling of the risk for lung cancer, ignoring any contribution from arsenic or radon exposure:

$$\text{Risk} = 1.00 + (0.05 \times \text{dusty exposure years})$$

$$\text{Risk} = 1.00 + (0.05 \times 20 \text{ years exposure at } 500 \text{ ppcc}) = 2.0$$

The additional contribution from arsenic and radon exposure is small compared to the risk from the “dusty gold mining” exposure and adds less than 20% to the combined risk. This is because the percentage of arsenic in the rock and radon exposures in Ontario gold mines is low.

### **WSIB Board of Directors Minute #5, August 29, 1991**

The current WSIB policy cites Board of Directors Minute #5, August 29, 1991, pg. 5471. This document reviewed the history of the gold mining policies, took into account the 1991 Kusiak et al study and described the 500 ppcc criteria for “dusty gold mining”. The most relevant section is reproduced below.

#### *3) The role of significant new information from Ontario Miners’ Study*

*In March 1991, the study team of the Ontario Miners Study, a study founded by the Atomic Energy Control Board of Canada, the Ministry of Labour and the Workers’ Compensation Board of Ontario, submitted a paper on lung cancer among gold miners to the British Journal of Industrial Medicine.*

*Based on 334 lung cancer deaths from 1955 to 1986, the paper confirmed previous findings that the excess of lung cancers occurred mainly among those who started work before 1946, and postulates that radon progeny and arsenic are probable causal agents of lung cancer.*

*International studies had demonstrated that radon exposures in uranium mines cause lung cancer. The relationship between the level of risk and the level of exposure has been established as well.*

*For arsenic, one type (the trivalent compounds) is classified clearly as a human carcinogen by international scientific communities. The type that is predominant in gold mines (pentavalent compounds) has not been thoroughly studied in humans but it has been shown in animals that pentavalent compounds can be converted to the carcinogenic trivalent compounds.*

*The Ontario Miners Study paper suggests that there is a dose-response relationship (i.e. the higher the exposure the higher the risk) between the arsenic index developed by the study team in lung cancer risk. The arsenic index of a gold mine is computed by multiplying the percentage of arsenic in the rocks of the mine in which he worked, by the number of years, calculated up to 1945, he worked in the mine. The arsenic index calculated for the year 1946 and after is not shown to be associated with increased lung cancer risk. This indicates that arsenic exposure was effective in causing lung cancer only in dusty mining conditions.*

*The Steering Committee of the Ontario Miners Study sent the paper to three prominent scientists in the field to be reviewed. The review has had similar opinions on the findings of the study. In brief, they state that:*

- Although no statistically significant excess was observed among those who did not start mining gold before 1946, the possibility that an increased risk might exist cannot be ruled out;*

- *Arsenic and radon are known carcinogens, the fact that they were found to be present in some gold mines suggests they could be the causes of the excess lung cancer; however, the actual risk level and pattern among gold miners have not been clearly determined by the study and various strategies to explore this issue further were recommended;*
- *Since “duration of pre-1946 mining” itself correlates well with lung cancer risk, it is probable that arsenic and radon exposure do not fully account for the increased lung cancer risk among gold miners.*

*Excess lung cancer deaths of about 50% was observed among gold miners who mined gold before 1946, but the excess almost disappeared among those who started mining in or after 1946; in fact, a deficit in lung cancer deaths of 5% was observed in this group. Around that time, many new practices (such as better ventilation, improved blasting techniques and wetting down) were implemented to reduce the dust levels of the mines. Therefore, it was postulated that the excess of lung cancer was associated with dust level. It is possible, though not proven, that silica dust itself may be the cause. It is also possible that the dust facilitates the inhalation of other causal agents (such as radon progeny and arsenic) and the inhalation of such substances was reduced as dust levels were reduced.*

*Thus, it is emphasised that although no statistically significant excess was observed among those who did not start mining gold before 1946, the possibility that an increased risk might exist cannot be ruled out.*

*Therefore, for claimants who do not have mining experience before 1946, an adjudicator should explore whether the claimant was exposed to high levels or has worked in a mine where dust is known to have carried high levels of arsenic and radon progeny. If any of these circumstances is found, this would constitute evidence equivalent to having “worked during the earliest years of gold mining.”*

*Information on the dust levels of Ontario mines for the period before and after 1946 have been obtained from the Ontario Miners Study. The occupational Hygienist in the Complex Case (Disease) Unit of the WSIB will be able to provide Adjudicators with such information on individual claims.*

*Example: a claimant worked from 1950 to 1955 as a drift driller in a mine in which the dust levels for that mine period was 779 p/cc. 500 p/cc was considered a high dust level by the Ontario Miners Study investigators. Therefore, this claimant could meet the conditions of having “dusty mining exposure”.*

*...*

*Mining in 1946 or later in mines that had high dust levels (500 p/cc) should be considered in the same way as pre-1946 mining. That is, five years of mining in these mines is equivalent to five*

*years of pre-1946 mining. In addition, a shorter duration of mining in a more dusty mine could give rise to the same risk of developing risk as a longer duration of mining in a less dusty mine. Therefore, if the claimant worked in usually dusty mines (whether before or after 1946) confers an equivalent risk of developing lung cancer as five years of “dusty mining” (whether before or after 1946) and start mining before the age 30 (sic)<sup>6</sup>.*

**Therefore, based on the WSIB Board of Directors (B of D) Minute #5, August 29, 1991, “dusty gold mining”, is implicitly defined as 500 ppcc. This level has also been accepted in WSIAT Tribunal decisions on gold mining and lung cancer as the dust exposure threshold likely referred to by the policy (WSIAT Decisions 828/02, 2825/0112, 2061/01). The B of D Minute also allows for the consideration of equivalent cumulative exposures (i.e. risk of lung cancer from a shorter duration in a dustier mine is equivalent to a longer duration in a less dusty mine.**

### **Smoking as a Confounder**

It is important to note that the 1983 and 1986 Muller studies<sup>4,5</sup> and the 1991 Kusiak et al study<sup>3</sup> concluded that smoking was an unlikely explanation for the excess of lung cancer mortality among Ontario gold miners. These studies observed that although the smoking histories among Ontario gold miners were similar to those for Ontario copper or nickel miners, gold miners had an increased risk of lung cancer whereas, no increased risk was observed for copper or nickel miners. Moreover, the case-control study by Muller<sup>5</sup> found that after taking smoking into account, a statistically significant association persisted between duration of exposure to high concentrations of dust and increased risk of lung cancer among Ontario gold miners.

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<sup>6</sup> *This sentence is as intentionally written in the policy.*

## Discussion

The main criteria of the WSIB Lung Cancer - Gold Miners Policy is the weighted exposure index of 60 that assigns different weighting factors to different periods of exposure. However, as pointed out in the Dissenting Opinion of the IDSP Panel Report,

*“The weighted dust exposure index of 60 is neither supportable nor appropriate. According to the weighting factors, a gold miner starting work after 1955 would never be eligible under rule since it is very unlikely that he could achieve 60 years of employment after 1955.”*

For example, this criterion would require a gold miner to have worked continuously for 60 years from 1955 to 2015 in order to have an allowable claim for lung cancer as a result of “dusty gold mining” exposure.

Based on a review of the basis for the exposure criteria in the WSIB Lung Cancer - Gold Miners Policy 16-02-01, establishment of 500 ppcc as the dividing line between allowable “dusty years” and “non-dusty years” of gold mining is somewhat arbitrary. Using this definition, a gold miner who worked for 20 years at 500 ppcc would have a cumulative exposure of 10,000 ppcc-years (500ppcc x 20 years) and would be considered to have a 2-fold increased risk of lung cancer. But if the same gold miner worked for 30 years at 400 ppcc he would not be considered to have an increased risk of lung cancer, since he did not meet the threshold of “dusty exposure” defined as 500 ppcc, even though the cumulative exposure to dust would be greater (30 years x 400 ppcc = 12,000 ppcc-years). However, the B of D Minute #5 allows for the consideration of cumulative exposure regardless of when the exposure occurred (i.e. shorter duration in a dustier mine is equivalent to a longer duration in a less dusty mine).

One of the criteria in the WSIB policy to satisfy the condition of “sufficient and consistent evidence of occupational exposure” is “(6) the equivalent of 10 years of “dusty gold mining” if no arsenic or radon exposure is present”. As shown in the example on page 8, the contribution to the risk of lung cancer from exposure to arsenic or radon in Ontario gold mines is low compared to the contribution from “dusty gold mining” exposure.

A major limitation of using the time period approach as a criterion to determine exposure to dust, is that it assumes the overall mine dust averages reported by MAPAO in their semi-annual reports are representative of the conditions in all Ontario gold mines. This surrogate exposure measure does not allow for between-mine and between-job or task variability in the dust exposures.

The MAPAO semi-annual reports were based on konimeter measurements made by each mine and reported to MAPAO. The measurements made by the mines were intended to be used to assess the amount of dust generated by different processes or in areas of the mine and to judge the effectiveness of the ventilation or other control measures such as using water sprays. They were not intended for assessing personal exposures for individual miners. MAPAO summarised the results for similar mines so

that each mine could compare their results to similar mines (e.g. Gold Mine X could compare their results against other gold mines). MAPAO also reported the summary results to the MOL who used these reports for compliance purposes and the WSIB used these for compensation purposes.

Examination of individual semi-annual MAPAO reports for some individual gold mines have found that although overall averages for a particular gold mine were below 500 ppcc; the individual konimeter measurements show a) there was a wide range in the dust count measurements for each work area or task and b) a considerable number of samples were above the MAPAO guideline of 300 ppcc for gold mines, above 500 ppcc (WSIB definition of “dusty gold mining”) and even above 800 ppcc which is near the limit of detection for konimeter measurements.

Another limitation of this approach is the generally held belief that there was a rapid improvement in dust exposure conditions in Ontario mines after introduction of legislation in the early 1960s requiring better ventilation and occupational health and safety legislation such as the Occupational Health and Safety Act in 1978. However, while improvements may have been taking place on an industry wide basis, it is unlikely that improvements in exposure controls such as increased mechanical ventilation, using water sprays to control dust generated by tasks such as drilling or handling of the broken rock, use of respirators etc. were implemented uniformly across all Ontario mines either in terms of effectiveness or in terms of timeline. Unless information is available about the details of when and what types of controls were introduced and their effectiveness at a specific mine, then it has to be assumed that dust concentrations remained unchanged from earlier periods when controls were not in place.

# Appendix 1 WSIB Gold Mining and Lung Cancer Policy 16-02-07



Document  
Number

16-02-07

Operational  
Policy

Section  
Occupational Diseases

Subject  
Lung Cancer - Gold Miners

## Policy

Primary cancer of the trachea, bronchus or lung is accepted as an occupational disease under s.2(1) and s.15 of the *Workplace Safety and Insurance Act* as characteristic of gold mining in Ontario.

## Guidelines

The following sets out categories of persuasive evidence to establish work-relatedness. In assessing entitlement, the decision-maker weighs all the work and non-work factors and determines the individual merits of the case.

Condition	Necessary evidence
The worker has worked in Ontario gold mine. AND	Substantiated occupational history.
The gold miner has been diagnosed with primary cancer of the trachea, bronchus or lung. AND	Medical evidence establishing the presence of primary cancer of the trachea, bronchus or lung.
	<b>Persuasive evidence</b>
A biologically plausible latency period is present. AND	Latency can vary with intensity and type of exposure. Usually it is biologically plausible that the disease occurs - 15 years after first employment in a "dusty occupation" OR - 5 years between first employment in mines with radon progeny and the diagnosis of the disease.
The gold miner has during the dustiest years of gold mining. AND	Evidence of "dusty gold mining" experience in Ontario prior to December 31, 1945. OR Evidence of "dusty gold mining" experience in Ontario in mines.



<p>Sufficient and consistent evidence of occupational exposure must be present.</p>	<p>To satisfy this condition the gold miner has,</p> <p>1.) a chest x-ray rating of 4 or more as rated by the Ontario WSIB chest x-ray classification system and weighted dust exposure index of 60 or more. Weighted dust exposure is the sum of years worked in "dusty gold mining" in Ontario</p> <ul style="list-style-type: none"><li>• pre 1936 x 4</li><li>• from 1936 to 1944 x 3</li><li>• from 1945 to 1954 x 2</li><li>• after 1954 x 1.</li></ul> <p>OR</p> <p>2) a chest x-ray rating of 4 or more as rated by the Ontario WSIB chest x-ray classification system and was first employed in "dusty gold mining" in Ontario before attaining age of 30.</p> <p>OR</p> <p>3) worked in mines which were dusty and had significant arsenic levels.</p> <p><b>NOTE</b> The duration of mining such mines which sufficient exposure depends on arsenic levels in the mines. The most current scientific information is used to assess whether the exposure to arsenic is to establish work-relatedness.</p> <p>OR</p> <p>4) worked in mines which had significant levels of radon progeny.</p> <p><b>NOTE</b> The policy on lung cancer and uranium mining (see 23-02-03, Lung Cancer among Workers in Uranium Mining Industry) and the Ontario Miners Study is consulted to determine whether the exposure is sufficient to establish work-relatedness.</p> <p>OR</p>
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Operational  
Policy

Section  
Occupational Diseases

Subject  
Lung Cancer - Gold Miners

	<p>5) the equivalent of 5 years of "dusty gold mining" and was first employed in an Ontario gold mine before attaining 30 years of age, if no arsenic or radon exposure is present</p> <p>OR</p> <p>6) the equivalent of 10 years of "dusty gold mining" if no arsenic radon exposure is present.</p>
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The above guidelines identify persuasive evidence which would indicate that the conditions for work-relatedness are met. All decisions are made in accordance with the real merits and justice of the case, and all available evidence of work and non-work factors is considered to make a determination of work-relatedness in each individual case.

\*\*dusty occupation\* and

\*\*\*Dusty gold mining\* is defined by the Ontario WSIB coding system which follows.

Dust exposure defined by occupation codes (based on WSIB codes)

WSIB Code	Definition
11	Full time in dust exposure - mill
12	" " " " " - other surface
13	" " " " " - shaft sinking
14	" " " " " - other underground
15	" " " " " - surface and underground
16	" " " " " - open pit
21	Part time in dust exposure - mill (including mill in open pit)
22	" " " " " - other surface
25	" " " " " - surface and underground
26	" " " " " - open pit

Operational  
PolicySection  
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Lung Cancer - Gold Miners

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Dust exposure, specifics unknown

## Retroactivity

For all allowed claims, past and future, considered under the WSIB policy on lung cancer among goldminers (either Minute No. 3, January 8, 1988, Page 5216 or Minute #5, August 29, 1991, Page 5471), eligibility for entitlement and benefits shall be retroactive to the date of accident or to the date of the worker's death in the case of survivors' benefits, and paid in accordance with the provisions of the *Workers' Compensation Act* or *Workplace Safety and Insurance Act* in effect at that time and thereafter. There is no restriction to entitlement to benefits based on whether the worker, spouse or dependants are or were alive as of a specific date.

In disease claims, the date of accident is the date of diagnosis or the date of the first medical report of related symptoms, whichever is the earlier.

## Document history

This document replaces 04-04-08.

## References

### Legislative authority

*Workplace Safety and Insurance Act, 1997, as amended*

Sections 2(1), 15, 119(1)

### Minute

Board of Directors

#8(XX), June 10, 2004, Page 6620

## References

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3. Kusiak, RA, Springer J, Ritchie AC, Muller J, Carcinoma of the lung in Ontario Gold Miners: possible aetiological factors. British Journal of Industrial Medicine, Vol 48, 1991 pg. 808-817.
4. Muller J, Wheeler WC, Gentleman JF, Suranyi G, Kusiak RA. Study of mortality of Ontario miners 1955-1977, Part I. Toronto and Ottawa: Ontario, Ministry of Labour; Ontario Workers' Compensation Board; Atomic Energy Control Board of Canada, 1983.
5. Muller J. Kusiak RA, Suranyi G, Ritchie AC. Study of Mortality of Ontario gold miners 1955-1977. Ontario: Ministry of Labour; Ontario Workers' Compensation Board; Atomic Energy Control Board of Canada, 1986.
6. Report of the Special Panel Report on Ontario Gold Mining Industry. [Appendix A](#) in Report to the Workers' Compensation Board on the Ontario Gold Mining Industry. Industrial Disease Standards Panel (IDSP), [IDSP Report #1](#). Toronto, April 1987.
7. Report of the Scientific Panel on "Mortality from Cancer Among Ontario Gold Miners 1955-1977. Report of the Miller et al Scientific Panel. [Appendix C](#) in Report to the Workers' Compensation Board on the Ontario Gold Mining Industry. Industrial Disease Standards Panel (IDSP), [IDSP Report #1](#). Toronto, April 1987.
8. See references 9-11 in Kusiak, RA, Springer J, Ritchie AC, Muller J, Carcinoma of the lung in Ontario Gold Miners: possible aetiological factors. British Journal of Industrial Medicine, Vol 48, 1991 pg. 808-817.
9. Mines Accident Prevention Association (MAPAO). 37<sup>th</sup> Annual Report. North Bay, Ontario: MAPAO 1968.
10. Kabir H, Bilgi C., Ontario gold miners with lung cancer. Occupational exposure assessment in establishing work-relatedness. J Occup Med. 1993 Dec;35(12):1203-7.