

The compression force on lumbar disc was estimated by using the 3-Dimension Static Strength Prediction Program (3D-SSPP, Center for Ergonomics, University of Michigan) software system. For each job described, the load on lumbar disc was calculated as the product of the compression force and the duration of lifting in hours. The lifetime cumulative load (Newton*hours, Nh) for each participant was then estimated by summing up the load on lumbar disc for all jobs. Logistic regression was used to assess association between MRI abnormalities and lifetime cumulative lifting load.

Results The subjects were categorised into tertiles by lumbar cumulative lift load, i.e., $<4.0 \times 10^5$, $4.0 \times 10^5 \sim <8.9 \times 10^6$, and $> = 8.9 \times 10^6$ Nh. The prevalence rates of LDD findings varied by disc level. Observed LDD findings increased with cumulative lift load. At the L5-S1 disc level, MRI findings of disc height narrowing (Odds ratio, OR = 4.1, 95% Confidence interval, CI 1.9~10.1), dehydrationin (OR = 2.5, CI 1.5~4.1), disc protrusion (OR = 2.2, CI 1.2~4.1), annulus tear (OR = 2.2, CI 1.2~4.2), disc bulging (OR = 1.9, CI 1.2~3.1) was found among those with cumulative lifting load of $> = 8.9 \times 10^6$ Nh as compared to those with $<4.0 \times 10^5$ Newton-hours. The tests for trend were significant ($p < 0.05$) for all above-mentioned disc conditions.

Conclusions Our results suggest a dose-response relationship between cumulative lift load and LDD.

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340 CANCER INCIDENCE AND MORTALITY AMONG UNDERGROUND AND SURFACE GOLD MINERS IN WESTERN AUSTRALIA

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Background The Kalgoorlie gold miners' cohort was established in 1994, consisting of all workers (males only) who attended workplace health surveys in 1961, 1962, 1974, and 1975. In this study the follow-up of the cohort has been extended to 2011. Our objectives were (i) to estimate cancer mortality and incidence, for both surface and underground miners; and (ii) to examine the hypothesis that (underground) mining may be protective against prostate cancer.

Methods Standardised mortality and incidence ratios (SMRs and SIRs) and 95% confidence intervals (95% CI) were calculated to compare cancer mortality and incidence of the former Kalgoorlie miners with that of the Western Australian male population. Internal comparisons on duration of underground work were examined using Cox regression.

Results During 52,440 person-years of follow-up, 1,922 deaths were observed. Increased mortality from any cause was observed for the miners (SMR = 1.34, 95% CI 1.28–1.40), with hazard ratios indicating a trend for duration working underground ($p = 0.02$). For any cancer, mortality was increased for the total group of miners (SMR = 1.25, 95% CI 1.14–1.37). In the Cox models, lung cancer mortality and incidence were particularly increased among underground miners, even after adjustment for smoking. The SMR for prostate cancer suggested a lower risk for underground miners, but this was not supported by the incidence data with a significantly increased incidence of prostate cancer (SIR = 1.26, 95% CI 1.03–1.54) among underground miners.

Conclusions Overall cancer mortality and incidence was higher among Western Australian gold miners compared with the

general population, especially for lung cancer and particularly for underground mining. This study does not support the hypothesis that miners have a decreased risk of prostate cancer: the results indicate a positive association between working as a miner and prostate cancer.

341 RISK OF LUNG CANCER IN MINERS AND QUARRY WORKERS IN A POOLED ANALYSIS OF CASE-CONTROL STUDIES

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Objectives Epidemiological studies have indicated an increased lung cancer risk among miners. We present estimates of the lung cancer risk in miners and quarry workers using a pooled database of case-control studies (<http://synergy.iarc.fr>).

Methods This analysis included occupational and smoking histories of 15,483 male lung cancer cases and 18,388 controls from 16 case-control studies of the SYNERGY project. Miners and quarry workers were identified from the International Standard Classification of Occupations (ISCO 1968). We differed between coal and ore mining using the International Standard Classification of Industries (ISIC Rev. 2). Odds ratios (OR) and 95% confidence intervals (CI) for developing lung cancer were estimated by logistic regression, adjusted for age, study centre, smoking and working in occupations known to entail a lung cancer risk.

Results A total of 696 lung cancer cases and 440 controls had worked for at least one year as miner. Ever working as miner was associated with an OR of 1.58 (95% CI 1.33 to 1.74). The majority of miners (472 cases, 311 controls) had worked in coal mining. Ever working in coal mining was associated with an OR of 1.43 (95% CI 1.20–1.70). The corresponding OR in ore mining was 1.65 (95% CI 1.03 to 2.63). Working for at least one year in quarries (79 cases and 45 controls) was associated with an OR of 1.61 (95% CI 1.05 to 2.46). We could not observe trends with duration or time since last employment as miner or quarry worker.

Conclusions Working in mines or quarries was associated with an elevated lung cancer risk. We found no trend by duration of employment. These results were derived from job titles and industry codes with detailed information on smoking and other occupations hold during lifetime. Exposure to quartz or coal dust and the prevalence of silicosis could not be evaluated.

342 MORTALITY AND PROPORTIONAL CANCER INCIDENCE IN MINNESOTA TACONITE WORKERS

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Objective In response to public concerns about health in Minnesota taconite mining workers, we evaluated the mortality and cancer experience in this population.

Methods From a cohort of 44,159 taconite workers born in 1920 or later, we selected 30,360 with at least one year of documented employment. Vital status and causes of death from death