

Cancer risk by occupation and socioeconomic group among men — a study by The Association of Swiss Cancer Registries

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Abbreviations

AIDS	acquired immunodeficiency syndrome
ASCR	The Association of Swiss Cancer Registries
C	concordance coefficient for reliability
CI	confidence interval
HIV	human immunodeficiency virus
ICD-O	International Classification of Diseases for Oncology
ISCO	International Standard Classification of Occupations
NHL	non-Hodgkin's lymphoma
OR	odds ratio
GS	Georges Schöler's "Recent Analyses of Swiss Mortality Data" (unpublished)
SES	socioeconomic status

Single copies of this issue (volume 28, supplement 1) can be obtained from the following address: Scandinavian Journal of Work Environment & Health, Topeliuksenkatu 41 a A, FIN-00250 Helsinki, Finland. [telephone: +358-9-4747 2694; telefax: +358-9-878 3326; email: Johanna.Parviainen@ttl.fi]. The price for supplement 1 of volume 28 is EUR 34.00 (plus postage and handling charges).

Background For more than 200 years, it has been known that exposure incurred during worklife can lead to increased cancer risk. In Switzerland, only mortality risks by occupation have been studied systematically so far. Five of the eight Swiss regional cancer registries, covering approximately 40% of the Swiss population, record the occupation for cancer patients systematically. Based on these incidence data, the current study presents an overview of cancer risk patterns by socioeconomic status and occupation in Switzerland.

Materials and methods The study comprised all male patients ≥ 25 years of age with invasive cancer recorded in the cantons of Basel, Geneva, St Gall, Vaud, and Zurich. The study included 58 134 incident cancer cases for the period 1980–1993, the length of participation varying by registry. Because of the lack of concordance in both the definition and sources of information on occupation between the census and incident case data, population denominators were not available. Consequently, analyses were performed by the case-referent approach, considering the cancers of interest as cases and all other cancers as referents. The odd ratios for cancer were adjusted for age, registry, type of residence area, and nationality. Socioeconomic status was represented by an indicator based on the grouping of occupations by their alleged status. With the use of this indicator, socioeconomic variations in cancer risk and residual occupational variation after adjustment for socioeconomic status were calculated.

Results and discussion by site Large socioeconomic differences in cancer risks were observed. Risks of tobacco- and alcohol-related cancers correlated negatively with socioeconomic status. On the contrary, risks of melanoma and other cancers of the skin, colon, prostate, testis, and kidney were associated with a high socioeconomic status. In general, adjustment for socioeconomic status attenuated the range of the occupation-specific risks. Farmers had the highest risk of lip cancer; indoor occupations typically showed a lower risk. This finding fits the actual knowledge on lip cancer etiology. Elevated risk for upper aerodigestive cancers was observed among workers with easy access to alcoholic beverages at the workplace, such as cooks, and generally also in occupations related to construction. Professionals and teachers showed a particularly low risk. After adjustment for socioeconomic status, increased risks appeared for artistic occupations. The higher risks of stomach cancer were observed for farmers and workers in the building and chemical industries. White-collar occupations typically showed lower risks. After adjustment for socioeconomic status, only the excess risk for

chemical workers persisted. Slightly elevated risks for colon cancer were generally found for sedentary occupations, such as engineers, entrepreneurs, managers and teachers, in contrast to lower risks for farmers and construction workers. The highest risks for liver cancer were observed for workers in hotel and catering and for cooks and plasterers. Adjustment for socioeconomic status enhanced the elevated risk for dentists. Very high relative risks for sinonasal cancer were observed for leather workers, joiners, and cabinetmakers and, to a lesser extent, for turners. The sinonasal cancers were mainly adenocarcinomas among wood-exposed workers and tumors of epidermal origin among turners. High risks were observed for lung cancer in all the blue-collar occupations. Low risks were found for farmers, teachers, and health and science professionals. After socioeconomic status was accounted for, the excess risk persisted for bricklayers, foundry workers, and machinists. Pleural cancer risk was strongly increased for trades related to stone and earth and, to a lesser extent, for joiners and cabinetmakers. Elevated risks were also seen in other occupations known to be exposed to asbestos, such as for electrotechnical and railway workers. An elevated risk for bone cancer was observed for railway-related workers, evoking a role of chlorophenoxy herbicide exposure. A clear excess of Kaposi's sarcoma was observed for artists, hairdressers, and male nurses and related occupations. The propensity of homosexuals to choose certain occupations probably explains these risks. Higher risks of melanoma of the skin were observed for architects, engineers, managers, lawyers, and physicians. Risk was elevated for melanomas of the skin and neck among farmers and for melanoma of the trunk among watchmakers. With regard to squamous-cell skin carcinoma, the highest risk was observed for farmers, and it was also limited to the head and neck. Risk was also elevated for machinists and locomotive engineers. The risk of basal-cell skin cancer was elevated for engineers, teachers, and health and science professionals. Risk was generally low for blue-collar occupations. A better diagnostic ascertainment among the well-educated may explain part of the observed patterns. The results for ocular cancer, mainly eye melanoma, were very similar to those for skin melanoma. The risk of prostatic cancer was moderately elevated among entrepreneurs, managers, and law, security and teaching professionals. Life-style correlating with socioeconomic status, rather than occupation, seems to be relevant for this tumor. This finding seems also to apply to testicular cancer. Penile cancer risk was increased among artists. A cluster of bladder cancers was observed for mechanics, policemen, occupations related to cleaning, and hairdressers. Risk

was low in agricultural occupations. An elevated risk of thyroid cancer was observed for farmers and physicians. The risk for farmers concerned follicular types, which probably reflects previous iodine deficiency in Switzerland. The risk of non-Hodgkin's lymphoma was elevated for white-collar occupations. After adjustment for socioeconomic status, a higher risk appeared for butchers and farmers. Higher risks of leukemia were observed for graphic arts workers, locomotive engineers, physicians, and chemists.

Results and discussion by occupation In order to avoid overinterpretations for the multitude of results, a priori hypotheses based on the literature on expected associations between occupation and cancer risk served as a basis for the critical evaluation of the risks found. Farmers presented higher risks of lip cancer, head and neck melanoma, thyroid cancer, and soft-tissue sarcoma. Also observed was a cluster of four bone sarcomas among horticulturists. Butchers and related occupations presented a slight excess of non-Hodgkin's lymphomas and chronic lymphocytic leukemia. A strong excess of sinonasal cancer and a slight excess of leukemia were observed for leather and fur workers. As expected, stone and earth trade workers experienced a strong excess risk of pleural mesothelioma and an almost doubled risk of lung cancer. The almost twofold risk of lung cancer among foundry workers persisted after socioeconomic status was accounted for. These workers also experienced about a threefold excess risk of pleural mesothelioma and acute leukemia. Electricians showed an excess of pleural mesothelioma and lung cancer. Also observed was about a twofold increased risk of acute

leukemia and biliary duct cancer. Joiners and cabinet-makers experienced a strong excess of sinonasal cancer and pleural mesothelioma. A slight excess of leukemia was observed for the whole group of graphic art workers. Reassuringly, no elevated risks were observed for lymphatic or hematopoietic cancers among chemical workers. Machinists and professional drivers experienced an elevated risk of lung cancer. Also documented was an excess of esophageal cancers. Locomotive engineers showed an excess risk of leukemia, and other railway workers had a doubled risk of pleural mesothelioma and about a threefold increased risk for bone cancer. Hotel and restaurant managers were at a high risk for all alcohol-related cancers. Chimney sweeps presented an excess risk of squamous-cell lung carcinoma. Hairdressers experienced a slight elevated risk for bladder cancer. Physicians had an excess of basal-cell carcinoma and melanoma and a lower risk of cancer at ill-defined sites. They also experienced higher risks of thyroid cancer and leukemia. Professors and teachers experienced a slight excess of myeloma. Both non-Hodgkin's lymphoma and leukemias were elevated for chemists. Also observed was an excess of uncommon cancers, such as bone and peritoneal cancers.

Conclusions This study presents the results of the first systematic analysis of incidence data on socioeconomic and occupational variations of cancer risks in the Swiss cancer registries. Despite limitations linked to occupational definitions, lack of national coverage, and statistical approach, this study provides interpretable results for additional research and public health surveillance.

Key terms cancer registry, cancer risk, environment, malignant neoplasms, occupation, social class.