

# **Cancer and Migration: Epidemiological Studies on Relationship between Country of Birth, Socio-economic Position and Cancer**

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**Background:** Migrant studies offer a unique opportunity to analyze variation in disease occurrence due to background factors. The role of environmental and lifestyle exposures are of particular interest in cancer research, and migrant studies can be considered as natural experiments in epidemiological research. Large numbers of immigrants from different regions of the world and the availability of comprehensive demographic and health-related registers in Sweden have prompted us to conduct migrant studies on the epidemiology of cancer. Breast cancer and genital tract cancers were selected for study since the role of environmental and lifestyle risk factors are debated for these disorders.

**Objectives:** To compare the risk and survival of the female breast, cervical, ovarian and endometrial cancers and male prostate and testicular cancers among immigrants to those among Swedish-born individuals to elucidate the importance and the potential timing of environmental and genetic factors in cancer etiology.

**Methods:** We established different cohorts by linkages between Swedish national registers, including Cancer and Cause of Death registers, through personal identity number. The main exposure variable was country of birth with Swedish-born persons with both parents born in Sweden as reference group. Each cohort was followed from start date of follow-up period, date of birth or first immigration date, whichever occurred last, until exit date from the cohort, which was diagnosis of primary outcomes of interest, first emigration, or end of follow-up, whichever came first. We calculated incidence rate ratios and hazard ratios with 95% confidence intervals adjusted for age and calendar period of follow-up using Poisson and Cox proportional hazards regression models.

**Results:** First-generation immigrants in Sweden had an overall lower risk of cancers studied compared with Swedish-born people. However, we found remarkable variations in cancer risks and survival by country of birth. Age at immigration and duration of residence of first-generation immigrants were important factors affecting risk of cervical, breast, prostate, and testis seminomas. An increasing trend in incidence of prostate cancer among first-generation immigrants similar to either Sweden or country of birth was observed. Second generation immigrants showed a risk converging toward the risk in Sweden for testicular and breast cancers. Education, as an indicator of socio-economic position, differentially affected the risk of cervical cancer among first-generation immigrants and Swedish-born women. Among both immigrants and Swedish-born women, breast cancer risk increased, while its mortality decreased with increasing level of education.

**Conclusions:** Country of birth was a major determinant for cancer risk. Variation of risk by age at immigration or duration of residence highlights the effect of environmental and lifestyle factors on cancer risk. The observed patterns of prostate cancer risk imply the importance of both genetic and environmental factors in the etiology of this cancer. Patterns of testicular cancer risk indicate the importance of early environmental risk factors acting even after the intrauterine period.