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Cancer mortality in Chinese populations surrounding an alloy plant with chromium smelting operations

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This report is a further characterization of data from an ecological cancer mortality study of a population (about 10,000) exposed to groundwater contaminated by hexavalent chromium [Cr(VI)] up to 20 mg/L near JinZhou City in the LiaoNing Province of China between 1960 and 1978. Prior reports showed an elevation in all-cancer mortality from 1970 to 1978 averaged across five agricultural villages with Cr(VI) in groundwater relative to average cancer rates for the district and province. The current study compares the cancer rates during the same time period for the same five exposed villages to those of four nearby areas with no Cr(VI) in groundwater. The use of a local comparison group is considered superior to the use of district or province averages because of the expected improved similarity among unmeasured covariates in nearby areas. The average lung-, stomach-, and all-cancer mortality rates for the three agricultural villages without Cr(VI) in groundwater were not statistically different from those of the five agricultural villages with Cr(VI) in groundwater.

Also, three surrogate measures of village drinking-water Cr(VI) dose did not significantly correlate with cancer mortality rates in the five exposed villages. Further, the industrial town in which the Cr(VI) source was located had different demographics and a different pattern of stomach and lung cancers compared to the adjacent agricultural villages, regardless of Cr(VI) groundwater exposure. The results of other local investigations on cancer mortality and genotoxicity in the exposed populations are reviewed. The overall findings in the studied population do not indicate a dose-response relationship or a coherent pattern of association of lung-, stomach-, or all-cancer mortality with exposure to Cr(VI)-contaminated groundwater.