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Epidemiological study in an area contaminated by chromium, arsenic, mercury and boron in Tuscany region (Italy)

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Background: The Cecina river valley, in Tuscany, is characterized by environmental chromium contamination; Cr(VI) concentrations in ground and surface waters exceeds the WHO limit for drinking water. Boron, arsenic, mercury contaminations, of natural or industrial origin, pesticides

use, and waste landfilling are causes of community concern.

Objective: To investigate health status of population residing in the polluted area.

Methods: A large environmental database was built collecting soil and drinkable water data from public and private sources.

Cancer and non-cancer causes of mortality, hospitalization and malformation groups of residents in municipalities included in the study area over 1980-2006 were considered. Standardized Mortality/Hospitalization Ratios (SMR/SHR) and Bayesian Mortality/Hospitalization Ratios (BMR/BHR) were calculated. Cluster analysis using the Spatial Scan Statistics was performed. To understand knowledge, awareness and risk perception a qualitative survey through interviews was carried out among local administrators, public sector technical personnel and NGOs representatives.

Results: Statistically significant mortality excesses resulted for circulatory diseases in men (Obs=1788, SMR=1.06) and women (Obs=2111, SMR=1.10), colon cancer in women (Obs=44, SMR=1.38), stomach cancer in men (Obs=42, SMR=1.43).

Statistically significant hospitalization excesses resulted for respiratory diseases in men (Obs=585, SHR=1.15), chronic respiratory diseases in women (Obs=88, SHR=1.71), digestive diseases in men (Obs=766, SHR=1.13) and women (Obs=565, SHR=1.13), lymphohematopoietic diseases in women (Obs=217, SHR=1.15).

Clustering analysis and BMRs/BHRs confirmed the evidence from SMRs/SHRs.

Other mortality/hospitalization excesses for specific cancers were observed in some subareas.

The awareness of environmental problems was found to be high in the area, with significant differences in deliveries/consequences: NGOs, with a low level of confidence towards public bodies, were critical about future management. Relationship with media was generally good, indicating a positive attitude from the public.

Conclusions: The results are useful to plan advanced environmental and epidemiological studies, to open dialogue with local representatives, to promote future remediation activities and to enforce recommendations.