



Quantifying health hazards from heavy-metal contaminated foodcrops at three Zambian locations

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This paper investigates preliminary values of Target Hazard Quotients (THQ) for urban agriculture crops irrigated by industrial wastewater in Zambia. THQ are a method to quantify the relative risk of heavy-metal contamination. Heavy metals are a group of elements widely discharged into the environment in wastewater, with the potential to create human health hazards when taken up by food crops. THQ have been developed by the United States Environmental Protection Agency to provide an indication of risk due to pollutant exposure for both carcinogens and non-carcinogens. The THQ takes into account (a) exposure frequency (the number of days the food is consumed per year), (b) the exposure duration (the life expectancy of the person), (c) the amount of food consumed per day, (d) the metal concentration in the food with respect to a reference dose, (e) the average body weight and (f) an average exposure time for non-carcinogens. If $THQ > 1.0$, then this can indicate a concern for health. We present target hazard quotients based on (a) a time series of heavy-metal concentrations from monthly foodcrop samples (August 2004 to July 2005 for Cu, Co, Cr, Ni, Pb, Zn) for three urban agriculture sites in Zambia, and (b) quantities eaten by the local population of foodcrops as estimated using diet-recall surveys. These foodcrops include green vegetables (pumpkin leaves, rape leaves, spinach, Chinese cabbage, sweet potato leaves) and tomatoes. Using average monthly values for heavy-metal concentrations for foodcrops eaten, and the relative amount of food eaten, preliminary THQ values are found to be $1.4 < THQ < 3.8$ for the wet season (October to February) vs $2.6 < THQ < 4.2$ during the dry season (March to September), indicating a potential concern for health in the three regions studied.