



Health hazard quantification of heavy metal contaminated food crops in Chunga, Lusaka, Zambia

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This paper investigates heavy-metal contamination of urban agriculture crops irrigated by industrial wastewater in Lusaka, the capital of Zambia. Our field site is Chunga, in the NW of Lusaka. The potential health risk of heavy metal contamination can be quantified using the Target Hazard Quotient (THQ), which were developed by the United States Environmental Protection Agency to quantify potential health risk from exposure to both carcinogenic and non-carcinogenic substances. The calculation of THQ include (i) frequency of exposure (number of days per year the food is consumed), (ii) length of exposure (a person's life expectancy), (iii) average body weight, (iv) the mass of food consumed per day, (v) the metal concentration found in the food compared to a reference dose, and (vi) for non-carcinogens an average exposure time. A $THQ > 1.0$ indicates a potential concern for health. We calculate THQ values for the Chunga field site based on (i) heavy-metal concentrations from monthly food crop samples (8/04 to 7/05) and bi-monthly food basket samples (11/05 to 11/06), (ii) quantities eaten by the local population of food crops as estimated using 24-hour diet recall surveys, and (iii) average body mass of people in the region. The food crops include green vegetables (pumpkin leaves, rape leaves, spinach, Chinese cabbage, sweet potato leaves) and tomatoes. Food crops are grown year round, with Winter (October to February) being the wet season, and the rest of the year (March to September) the dry season. Preliminary THQ values as measured for adults and children, and for individual metals, were found to range during the wet season from 0.010 (Cr) to 68.6 (Cu), and during the dry season from 0.005 (Sn) to 48.7 (Tl). THQ values for individual metals are additive in the human body, giving total THQs in the hundreds for adults and children, both for the wet and dry seasons. This indicates a potential strong

concern for health for the population in this representative 'sample' site in Lusaka, Zambia.