

SCIENTIFIC ABSTRACT

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Project Title: Cadmium exposure in a gold-mining impacted community

Background: Cadmium (Cd), a carcinogenic metal associated with increased risk of breast and endometrial cancers, is a pervasive contaminant throughout the Gold Country region of northern California as a result of extensive historic gold mining. The three most populous counties in Gold Country have age-adjusted breast cancer rates that rank in the top ten of the 58 counties in California. Preliminary findings from the CHIME study (Community Health Impacts of Mining Exposure) indicate that older women who are long term residents have a significantly increased body burden of Cd compared to younger women and to women of the same age who are recent arrivals. This project seeks to expand this investigation by looking at the link between body burden of Cd and breast cancer incidence, and by measuring Cd contamination in the home environment.

Hypothesis/Questions: The primary hypotheses of this proposal are that Cd body burden is elevated in women with a history of breast cancer, and that body burden is associated with household environmental exposures.

Specific Aims: 1) Recruit new and follow-up with previously enrolled CHIME study participants to compare Cd body burdens in women with a history of breast cancer to those of women without breast cancer and 2) Measure Cd levels in household samples of soil, dust and water collected by participants trained as citizen scientists, with the goal of connecting residential environmental contamination to measured body burden levels.

Methods: A minimum of 60 women who are residents of western Nevada County will be recruited for the study, with 30 women being breast cancer cases and the remainder age-matched and younger non-cases. In order to match the CHIME dataset, participants who were not part of the prior CHIME study will provide a biological sample consisting of first morning urine for the measurement of Cd and 9 other metals and will complete a questionnaire to elicit basic demographic, residential and activity data, along with breast cancer status and exposure to breast cancer risk factors. Participants recruited from the prior CHIME study will complete a survey regarding breast cancer status and exposure to breast cancer risk factors. All participants will also be trained to collect soil and water samples from their homes. Statistical analyses of the measured concentrations of Cd in the biological and environmental samples will be conducted to determine the contribution of home environmental levels of Cd on body burden; assess whether there is an association between Cd body burden and breast cancer status; and confirm the association identified in the CHIME study between length of residency and Cd body burden.

Impact: The study will evaluate whether the increase in exposure to Cd as a result of residence in Gold Country impacts the risk of breast cancer, and will begin an investigation into possible transmission routes by measuring contamination in the home environment. Findings from the study will set the stage for future epidemiological research into breast cancer risk throughout Gold Country, and inform evidence-based policy and health outreach efforts to identify opportunities for minimizing exposure and for environmental remediation.

Community involvement: The project was conceived at the community level, prompted by concern among local residents about the health effects of their mining legacy in light of efforts to reopen mining operations locally, and environmental assessments by SSI and others that reveal widespread heavy metal contamination. The primary aim of CHIME was to establish a community dialog and to involve the community in all aspects of the study, guided by a CAB. The present proposal seeks to build on this high level of community engagement. A key element of the project is to train participants as citizen scientists to collect environmental data, an approach that is central to SSI's stewardship model. With fifteen years of citizen-generated validated environmental data, SSI will lead the environmental data collection effort by designing rigorous protocols and training participants in their use.

Future Plans: Further research is expected to include: expanding biological specimen collection to include a larger geographic area within Gold Country to assess breast cancer risk associations; expanding environmental sampling and identification of transmission routes for Cd body burden; and studying other outcomes related to mining contaminants such as other cancers, birth outcomes, and overall mortality. This planned future research will benefit residents of the target

Co-Principal Investigators: Jane Sellen, Joanne Hild, Peggy Reynolds

community by empowering the work of citizen scientists, determining and disseminating strategies that will minimize exposure, engaging the community in cleanup efforts and information campaigns, and supporting requests for funding to clean up mining's toxic legacy.