

BREAST CANCER RISK AND TETRACHLOROETHYLENE-CONTAMINATED DRINKING WATER IN CAPE COD, MASSACHUSETTS: A REANALYSIS OF CASE-CONTROL DATA USING GIS, RESIDENTIAL HISTORIES, AND A MODIFIED EXPOSURE ASSESSMENT

Verónica Vieira, *Boston University School of Public Health, USA*
Lisa Gallagher, *Boston University School of Public Health, USA*
David Ozonoff, *Boston University School of Public Health, USA*
Thomas Webster, *Boston University School of Public Health, USA*
Ann Aschengrau, *Boston University School of Public Health, USA*

Background and Aims: A population-based case-control study was undertaken to investigate the association between tetrachloroethylene (PCE) exposure from public drinking water and breast cancer among residents of Cape Cod, Massachusetts. PCE, a volatile organic chemical, leached from the vinyl lining of water distribution pipes into drinking water from the late 1960s through the early 1980s. A retrospective exposure model was needed given the lack of historical environmental data and the long latency of breast cancer.

Methods: Historic PCE exposure estimates were generated by integrating residential histories with a water distribution modeling software (EPANET 2.0) using GIS. We modified the publicly available source code for EPANET to include an algorithm for the PCE-leaching component. The exposure distribution using the modified EPANET model was compared to estimates generated with a simplified location-only exposure method that did not account for water flow patterns and to PCE concentrations measured in water samples. Lastly, we reanalyzed the risk of breast cancer using the modified EPANET exposure model to determine how an improvement in exposure assessment changes the results of an earlier study.

Results: Estimates using the modified exposure model had a higher correlation with PCE concentrations in water samples (Spearman correlation coefficient =0.65, $p < 0.0001$) than estimates generated using the location-only exposure method (0.54, $p < 0.0001$). However, we found a similar modest increase in the risk of breast cancer for women with high PCE exposure levels for both exposure methods (adjusted ORs 1.3-2.0).

Conclusions: The incorporation of sophisticated flow estimates in the exposure assessment method shifted the PCE exposure distribution downward, but did not meaningfully affect the exposure ranking of subjects or the strength of the association with the risk of breast cancer found in earlier analyses. Thus, these breast cancer associations are relatively robust to refinements in exposure modeling.