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A predictive model for arsenic in private bedrock wells in New England for use as a tool for exposure assessment

We developed a process-based model to predict the probability of arsenic exceeding 5 µg/L in drinking water wells in bedrock aquifers throughout New England. The model is being used for exposure assessment in an epidemiologic study of bladder cancer. Elevated bladder cancer rates in the northeastern United States are being studied and may be explained by concentrations of inorganic arsenic in drinking water. In eastern New England, a variety of data indicate that 20-30% of private wells exceed the arsenic drinking water standard of 10 micrograms per liter. Significant predictors of arsenic in bedrock water in the model include specific rock types, arsenic concentrations in stream sediments, geochemical factors related to areas of Pleistocene marine inundation, proximity to intrusive granitic plutons, and hydrologic and landscape variables relating to groundwater residence time increase the probability of arsenic occurrence in groundwater. Previous studies suggest that arsenic in bedrock groundwater may be partly from past arsenical pesticide use. Variables representing historic agricultural inputs do not improve the model, suggesting that this source does not significantly contribute to current arsenic concentrations. Due to the complexity of the fractured bedrock aquifers in the region, well depth and related variables also are not significant predictors. Enhanced spatial detail of certain data used in the model, such as geologic and bedrock hydraulic data, may improve model predictions.

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