

Fluoride contamination of groundwater resources in Ghana: Country-wide hazard modeling and estimated population at risk

Information Sheet

Most people in Ghana have no or only basic access to safely managed water. Especially in rural areas, much of the population relies on groundwater for drinking, which can be contaminated with fluoride and lead to dental fluorosis. Children under the age of two are particularly susceptible to the adverse effects of fluoride and can retain 80–90% of a fluoride dose, compared to 60% in adults. Despite numerous local studies, no spatially continuous picture exists of the fluoride contamination across Ghana, nor is there any estimate of what proportion of the population is potentially exposed to unsafe fluoride levels. We spatially model the probability of fluoride concentrations exceeding the country-relevant threshold of 1.0 mg/L in groundwater across Ghana to identify risk areas (Fig.1) and estimate the number of children (Fig.2) and adults exposed to unsafe fluoride levels in drinking water.

KEY MESSAGES

- 15% of the area of Ghana, mainly in the northeast, has a high probability of fluoride contamination.
- Geology and high evapotranspiration are the main drivers of fluoride enrichment in groundwater. Consequently, climate change might put even greater pressure on the area's water resources.
- About 920,000 people, including 240,000 children (0–9 years), live in at-risk areas.
- In the north live the poorest population and the highest proportion of children, who are highly dependent on groundwater.

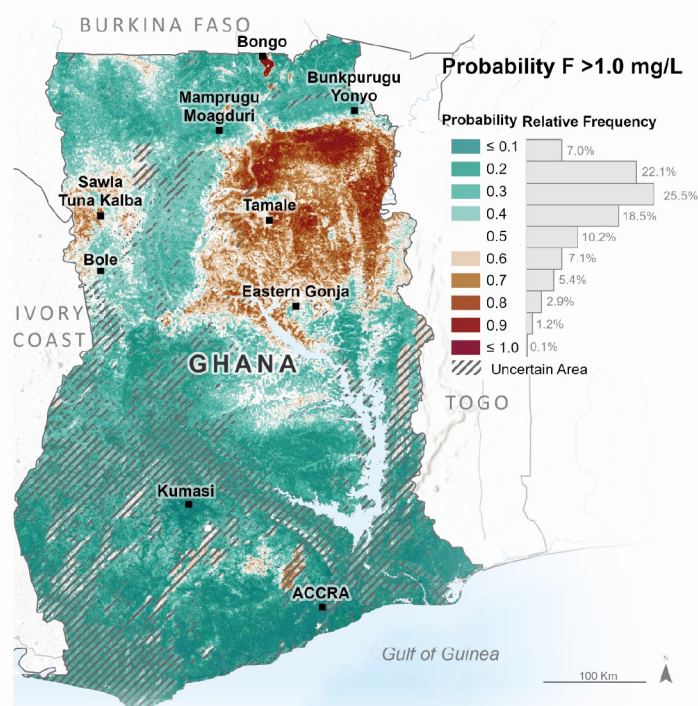
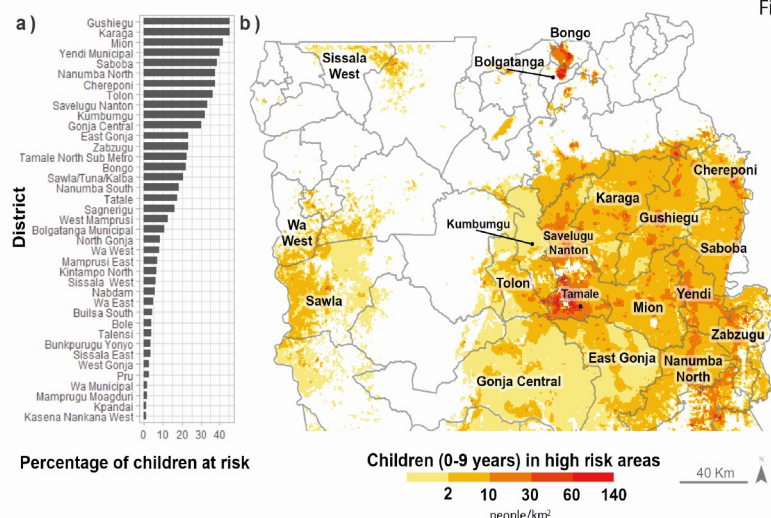


Fig. 1. Probability (hazard) map of fluoride exceeding 1.0 mg/L in groundwater of Ghana.



- In some districts, such as Karaga, Gushiegu and Mion, 4 out of 10 children are potentially exposed to fluoride poisoning.

-The Savelugu Nanton district has the largest exposed child population of about 19,000 children, followed by the Karaga district with about 17,000 children.

Fig. 2. Children in Ghana potentially exposed to high fluoride ingestion through the consumption of groundwater as drinking water. (a) Percentage of at-risk children per district. (b) Population density of children aged 0–9 years potentially exposed to high levels of fluoride.

More Info: Araya, D., Podgorski, J., Kumi, M., Mainoo, P.A., Berg, M., 2022. Fluoride contamination of groundwater resources in Ghana: Country-wide hazard modeling and estimated population at risk. *Water Res.* 212, 118083. <https://doi.org/10.1016/j.watres.2022.118083>

