



# Agricultural Health Study

STUDY UPDATE

2024

## MESSAGE FROM THE EXECUTIVE COMMITTEE

The Agricultural Health Study (AHS) has been working for more than 30 years to understand factors that impact the health of farmers and their families. Your participation and interest in the study has played an essential role in the success of this effort. Recently, farming communities across the U.S. have been challenged by severe weather conditions including flooding and drought. These events can have many negative effects on agriculture including water quality which we highlight in this newsletter. If you would like more information about other study activities and findings, please visit <https://aghealth.nih.gov/> or call 1-800-4-AGSTUDY (1-800-424-7883).

## DRINKING WATER QUALITY

Drinking water quality can be an important concern for people who live in rural areas. At enrollment, 71% of the AHS participants used private wells, while most other participants used public water supplies. Nitrate is one of the major contaminants of concern in private wells. There are several sources of nitrate in water in agricultural regions, including nitrogen fertilizers, animal waste, and septic systems.

We estimated nitrate levels in the water of the homes of AHS participants using data from a variety of sources, including monitoring data from public water supplies. For private wells, we developed exposure models with information from the Center for Health Effects of Environmental Contamination at the University of Iowa and the North Carolina Department of Environmental Quality.<sup>1</sup> We found that estimated nitrate concentrations in private wells used by AHS participants were higher compared to levels in public water supplies. In Iowa, 12% of private wells had well water nitrate levels that were estimated to exceed the maximum contaminant level (MCL) set by the EPA for public water supplies (10 mg/L). Levels in North Carolina were lower, with fewer than 1% of wells exceeding the MCL. Among the AHS participants with private wells, 79% in Iowa reported regularly testing their wells for nitrate compared to 44% in North Carolina. We are currently studying potential associations between drinking water nitrate and a variety of health outcomes, and recently reported that higher levels of nitrate in water were not associated with kidney disease.<sup>2</sup>



Drinking water can contain other contaminants. In collaboration with researchers at the University of Iowa and the U.S. Geological Survey, we recently collected water samples from the homes of 47 Iowa AHS participants who used private wells.<sup>3</sup> Measuring levels of neonicotinoid insecticides was the major focus of this work. In samples collected from outdoor hydrants and indoor taps, at least one neonicotinoid insecticide was found in most samples, indicating that water is a potential source of environmental exposure to these insecticides. Further work is needed to better understand sources of exposure to these insecticides in water. In another analysis we showed that regulated and unregulated contaminants, such as pesticides and bacteria, were commonly detected in tap water samples.<sup>4</sup>

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## AHS EXECUTIVE COMMITTEE

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The Environmental Protection Agency regulates public drinking water, while private well owners are responsible for monitoring and maintaining their wells. To learn more about private well testing, contact your local health department in North Carolina and the Iowa Department of Natural Resources.

*North Carolina Division of Public Health:*

*Contact: 1-800-662-7030*

*Website: <https://epi.dph.ncdhhs.gov/oeep/programs/wellwater.html>*

*Iowa Department of Natural Resources:*

*Contact: 515-725-0237*

*Website: <https://www.iowadnr.gov/Environmental-Protection/Water-Quality/Private-Well-Program>*

<sup>1</sup>Manley, C. K., et al. *Environmental Epidemiology*, 2022

<sup>2</sup>Chen D., et al. *J Expo Sci Environ Epidemiol*, 2024

<sup>3</sup>Thompson, D.A., et al. *D. Chemosphere*, 2023.

<sup>4</sup>Bradley, P.M. et al. *Sci Total Environ*, 2023.

## FOURTH COHORT-WIDE FOLLOW-UP

Our most recent follow-up survey was completed in 2019-2021, and we are incorporating that information into our health studies. The survey was completed by 32,179 participants (8,724 from North Carolina and 23,455 from Iowa). Although most completed the paper questionnaire or telephone interview, about 1 in 5 participants took the survey online.

Characteristics of AHS participants who completed the survey:

- The average age: 70 years
- 55% men, most of whom (71%) reported they were currently farming
- 45% women, of whom 30% reported farming (including “helping out”)
- 29% working at least part-time off the farm.

While this survey did not include questions about specific pesticides, people told us about their current crops and livestock raised, whether they were still mixing or applying pesticides, as well as spills and pesticide-related accidental exposures on the farm in the past 10 years. Other questions on the survey focused on farm-related stressors and health conditions that are more common as people get older. We are looking forward to sharing new results with a focus on how farming and farm exposures affect healthy aging. The data provided by AHS participants in this latest follow-up are currently contributing to new and ongoing research on topics such as autoimmune diseases, depression, diabetes, end-stage kidney disease, Parkinson’s disease, and symptoms such as loss of sense of smell and problems with sleep.

## INFLAMMATORY BOWEL DISEASE

In a recently published paper including data from the latest follow-up survey, we studied pesticide use in relation to risk of inflammatory bowel disease. We found that using a greater number of different pesticides overall and some specific insecticides—dieldrin, toxaphene, parathion, and terbufos—were associated with increased rates of ulcerative colitis and

Crohn’s disease. Pesticides may influence the populations of microbes in our gut, potentially leading to intestinal inflammation and imbalances in immune response. These findings support a new direction of research on Crohn’s disease and colitis in humans and experimental studies seeking to understand environmental risk factors for these diseases.

Chen D. et al. *Environmental Research*. 2024