Agricultural Health Study
(http://aghealth.nih.gov//)

About the Study

The Agricultural Health Study (AHS) is a prospective study of cancer and other health outcomes in a cohort of licensed pesticide applicators and their spouses from Iowa and North Carolina. The AHS began in 1993 with the goal of answering important questions about how agricultural, lifestyle and genetic factors affect the health of farming populations. The study is a collaborative effort involving investigators from National Cancer Institute, the National Institute of Environmental Health Sciences, the Environmental Protection Agency, and the National Institute for Occupational Safety and Health.

More than 89,000 farmers and their spouses in Iowa and North Carolina have participated in the study. Their participation has provided, and continues to provide, the data that researchers need to help the current and future generations of farmers and their families live healthier lives.

Study Participants

Between 1993 and 1997, 52,394 licensed private pesticide applicators (mostly farmers) from Iowa and North Carolina enrolled, as did 32,345 of their spouses. The study also included 4,916 commercial pesticide applicators in Iowa in its first two phases. The average ages at enrollment were 47.1 years, 38.0 years, and 46.9 years for private applicators, commercial applicators and spouses.

	Private Applicators (%)	Commercial Applicators (%)	Spouses (%)
Gender			
Male	**97**	**96**	**1**
Female	**3**	**4**	**99**
Race			
White	**97**	**99**	**98**
Other	**3**	**1**	**2**
State			
Iowa	**61**	**100**	**67**
North Carolina	**39**	**0**	**33**
Education			
≤ High School	**59**	**46**	**46**
> High School	**41**	**54**	**54**
Smoking Status			
Never Smoked	**53**	**48**	**72**

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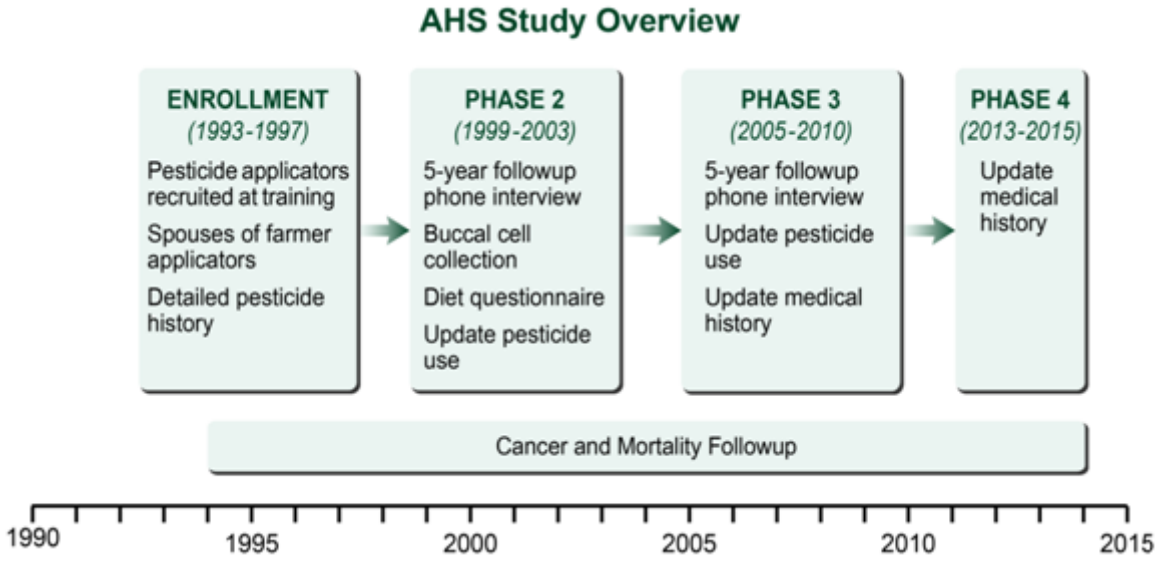
	Private Applicators (%)	Commercial Applicators (%)	Spouses (%)
Past Smoker	**31**	**26**	**17**
Current Smoker	**16**	**26**	**10**
Pesticides			
Mix or Apply Pesticides	**99**	**92**	**56**

Phases of the Study

The study began by collecting baseline information from participants when they enrolled (1993-1997). Follow-up telephone interviews were conducted in the second (1999-2003) and third phases (2005-2010) of the study. The Phase 2 interview was completed by 64% of private applicators, 59% of commercial applicators, and 74% of spouses. Participants provided updated information on farming practices, lifestyle, and health and were asked to complete a dietary questionnaire and provide a sample of cheek cells as a source of DNA. The Phase 3 interview also updated information on farming practices, lifestyle, and health. It was completed by 46% of enrolled private applicators and 62% of enrolled spouses. All participants who were eligible to participate at Phase 3 were asked to provide information updating health and farming status in Phase 4. Participants completed the questionnaires either by mail, telephone or through the Internet; for the first time, next-of-kin were able to provide general health update information for those who could not complete the questionnaires themselves. Data collection began in 2013 and ended 2015; 61% of eligible cohort members (applicators and spouses) participated.



The cohort is also followed for mortality and cancer incidence through periodic linkage with vital statistics and state cancer registries.

Study Findings

Findings (http://aghealth.nih.gov//news/index.html) from the AHS are shared in the scientific literature (http://aghealth.nih.gov//news/publications.html), through newsletters (http://aghealth.nih.gov//news/updates.html), and other publications. Some key recent findings include:

- Farmers have lower rates of many disease compared to the rest of the population, perhaps because they are less likely to smoke and are more physically active.
- Farmers have a higher risk for developing some cancers, including prostate cancer.
- Gloves matter. Use of chemically resistant gloves can reduce pesticide exposure 50 to 80%.
- Rotenone and paraquat are linked to increased risk of developing Parkinson's disease.

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- Allergic asthma in men and women may be associated with use of some organophosphate insecticides.
- Accidental high pesticide exposure events may affect health later in life.
- Diabetes and thyroid disease risk may increase for users of some organochlorine chemicals.

Special Studies

In addition to the main study, the AHS encourages researchers to conduct add-on studies that focus on specific related health issues. These studies are designed to leverage the data collected from participants to ask important questions about the health of farm families. Examples of recent and current focused studies include:

Farming and Movement Evaluation (FAME) Study
The FAME Study focused on possible links between pesticides and risk of developing Parkinson's disease. It included 115 participants with Parkinson's disease and 381 participants from the AHS who did not have this condition. Participants were examined by movement disorder specialists, completed additional questionnaires, and provided samples of blood and dust from their farm.

Neurobehavioral Testing Study
This study was designed to assess the impact of chronic low level pesticide exposure on neurobehavioral function. A total of 701 farmers completed standardized tests of neurobehavioral function and provided blood samples for related research.

Biomarkers of Exposure and Effects in Agriculture (BEEA)
The BEEA study was designed to investigate the biologic plausibility and potential mechanisms of action through which agricultural exposures influence risk of cancer and other chronic diseases. Biospecimens, including blood, urine, and buccal cells, as well as house dust samples and updated information on pesticide use and other agricultural exposures were collected from 1,681 male AHS farmer/applicators and 211 demographically similar unexposed controls enrolled between 2010-2018.

Lung Health Study
The Lung Health Study is designed to study the impact of farm exposures and genetic factors on lung function and asthma. Between 2009 and 2013, more than 3,000 AHS participants completed a home visit that included tests of lung function, collection of vacuum dust, and collection of blood and urine samples. Participants also completed a telephone interview about their history of respiratory diseases and lifetime farm exposures.

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