

## Study Update 2004

**T**he Agricultural Health Study (AHS) is a long-term study of agricultural exposures and chronic disease (especially cancer) among commercial and private pesticide applicators (and their spouses, if married) in Iowa and North Carolina.

In the first five years, 89,658 subjects (58,564 in Iowa and 31,094 in North Carolina) were enrolled in the study. In Iowa, this included 31,877 private applicators, 21,711 spouses of private applicators, and 4,916 commercial applicators. No commercial applicators were enrolled in North Carolina. The Iowa Department of Agriculture and Land Stewardship and the Iowa State University Extension helped in enrolling participants through Iowa's Pesticide Applicator Certification Program. Participation in the AHS has been outstanding.

**Table 1. Key Characteristics at Enrollment by Study Group**

(Source: Alavanja MCR et al. Presentation at the Oxford Symposium on Pesticides and Cancer, November 2002)

Characteristic	Private (n=52,395)	Spouses of Private (n=32,347)	Commercial (n=4,916)
Average age in years	47.3	47.2	38.5
% female	2.6	99.3	4.2
% current smokers	15.4	16.5	25.3
% alcohol > 1 time per week	19.6	5.5	37.4
% > 10 years applying pesticides	65.2	18.1	32.6
% > 40 days per year applying pesticides	8.3	1.3	33.6

The Iowa Field Station is currently in the second phase of the study, focusing on commercial applicators. This phase has involves: 1) a telephone interview, 2) a mailed dietary questionnaire, and 3) a cheek cell sample. As of September 1, 2004, 1,269 commercial applicators have completed some or the entire telephone interview, 725 have provided cheek cells, and 652 returned the dietary questionnaire. Completion of this phase will occur in 2005 or 2006. Multiple safeguards have been put in place to protect patient confidentiality.

Between 1999 and 2003 the Iowa Field Station completed telephone interviews with 51,357 eligible private applicators and their spouses; of these 38,020 completed some or the entire interview, 23,837 provided cheek cells, and 24,466 returned the dietary questionnaire.

For the last several years, cohort member data have been linked to cancer registry databases in both states. Table 2 shows the number of new cancers since enrollment experienced by members of the study cohort. The table also shows a number called the Standardized Incidence Ratio (SIR). A value of 1.0 for the SIR means the cancer experience of the study group was the same as the general populations of Iowa and North Carolina. A value less than 1.0 for the SIR indicates the cancer experience is less than what is expected from the whole populations. A value greater than 1.0 indicates the cancer experience is more than what is expected.



[www.aghealth.org](http://www.aghealth.org)

**The Agricultural  
Health Study  
seeks to identify  
factors that  
promote  
good health.**

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Overall, private applicators and their spouses experienced significantly less cancer risk than expected based on age, sex, and race-specific cancer incidence rates of Iowa and North Carolina. Significantly fewer respiratory cancers were observed in these two study groups, probably because of lower smoking percentages. For likely the same reason, urinary system cancers were significantly lower in private applicators. Digestive system cancers were also significantly lower among private applicators and their spouses as were oral cavity cancers among private applicators, possibly because of less smoking and alcohol consumption and more physical activity.

Among commercial applicators the overall cancer incidence rate was similar to that of the whole population of Iowa. Interpretation of these findings is limited because of the relatively young age and small numbers of commercial applicators.

Prostate cancer was elevated among both private and commercial applicators. In evaluating this further, AHS researchers have discovered that methyl bromide, a widely used fumigant, was consistently associated with prostate cancer risk at higher levels of exposure. Several other pesticides were identified as risk factors for prostate cancer among those with a family history of prostate cancer.

Melanoma, the most serious form of skin cancer, was significantly elevated among spouses of private applicators but not among private or commercial applicators. This was an unexpected finding that requires further evaluation.

Cancers that have been shown to be elevated in farmers in previous studies, such as Hodgkin's disease, non-Hodgkin's lymphoma, multiple myeloma, leukemia and brain cancer, were not significantly elevated in this initial analysis of cancers in the AHS. This type of analysis will be repeated on a periodic basis as the AHS cohort continues to be followed for their cancer experience.

**Table 2. Newly Diagnosed Cancers since AHS Enrollment through 1999**

Cancer Site	Private		Spouses of Private		Commercial <sup>c</sup>	
	Obs <sup>a</sup>	SIR <sup>b</sup>	Obs <sup>a</sup>	SIR <sup>b</sup>	Obs <sup>a</sup>	SIR <sup>b</sup>
All Sites	1,686	0.8 <sup>d</sup>	745	0.8 <sup>d</sup>	92	1.0
Brain	23	0.8 <sup>d</sup>	12	1.1	4	2.0
Digestive system	300	0.8 <sup>d</sup>	102	0.8 <sup>d</sup>	19	1.1
Female breast	15	0.8	318	1.0	0	0.0
Hodgkin disease or non-Hodgkin lymphoma, leukemia, multiple myeloma	150	0.9	52	0.9	7	0.7
Melanoma	62	0.8	42	1.5 <sup>e</sup>	5	1.0
Oral cavity	45	0.6 <sup>d</sup>	12	0.9	4	1.1
Prostate	672	1.2 <sup>e</sup>	4	1.3	26	1.3
Respiratory system	193	0.4 <sup>d</sup>	39	0.3 <sup>d</sup>	9	0.6
Urinary system	116	0.6 <sup>d</sup>	29	0.8	9	1.1

<sup>a</sup> Obs = observed number of newly diagnosed cancers in the study group.

<sup>b</sup> SIR = observed divided by expected, where the expected is the number of cases predicted for private and spouses of private based on the age, sex, and race-specific cancer incidence rates of the statewide populations of Iowa and North Carolina.

<sup>c</sup> Expected number of cases predicted based on the age, sex, and race-specific cancer incidence rates of only the Iowa population because all commercial applicators are from Iowa.

<sup>d</sup> Observed number of cancers is significantly less than what was expected.

<sup>e</sup> Observed number of cancers is significantly more than what was expected.

More specifics regarding AHS findings are available at: [www.aghealth.org](http://www.aghealth.org).

**The Agricultural Health Study** is a long-term study to investigate the effects of environmental, occupational, dietary, and genetic factors on the health of the agricultural population. This study will provide information that agricultural workers can use in making decisions about their health and the health of their families. The study is conducted in Iowa by the Department of Epidemiology at the University of Iowa and in North Carolina by Battelle CPHRE. The study is directed by the National Cancer Institute, the National Institute of Environmental Health, and the US Environmental Protection Agency.

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