

# Pesticide-Related Illness and Injury

## Summary

**The Washington State Department of Health actively tracks and investigates pesticide-related human illnesses. A total of 1,762 cases were investigated during 2000–2005, resulting in the classification of 1,120 cases. On average, 187 cases a year were attributed to pesticide exposure, and most people exposed (61%) were men. Thirty-two percent of the cases occurred among agricultural workers. Over the past five years, an increasing proportion of reported cases has been attributable to non-agricultural exposures.**

## Introduction

Today more than 20,000 registered pesticide products derived from more than 600 active ingredients are in use.<sup>1</sup> According to the U.S. Environmental Protection Agency (EPA), national pesticide use peaked about 1980 at more than a billion pounds, with agricultural use accounting for approximately 74%. An estimated three-fourths of all U.S. households use some form of pesticides.<sup>2</sup> According to the 2005 [Washington State Behavioral Risk Factor Surveillance System](#), 50% of households reported having used pesticides outside their homes, and 16% reported indoor use during the past year.

Pesticide products can be composed of single pesticides or mixtures of pesticides and other ingredients. Symptoms of pesticide exposure can vary depending on the route, the magnitude of the dose, and the level of toxicity of the agent. People exposed to pesticides can manifest a wide variety of health problems, ranging from non-specific symptoms that mimic the flu to

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**Definition:** Pesticide-related illness (referred to as pesticide poisoning in WAC 246-100-217) means the disturbance of function, damage to structure, or illness in humans resulting from the inhalation, absorption, ingestion of, or contact with any pesticide. For this analysis we define a case as a pesticide-related illness as that which was classified as “definitely, probably or possibly” related to pesticide exposure. Suicides, attempted suicides, and intentional malicious use were excluded.

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serious systemic illness, neurological effects, and in some circumstances, death.

Severity of the pesticide-related illness can be influenced by individual susceptibilities. Children and the elderly are among those at higher risk of serious effects. People with asthma or respiratory illnesses can be more sensitive to exposure effects. There is particular concern for farm workers and their children, many of whom face chronic exposure to a variety of products.<sup>2</sup>

The EPA requires that pesticide products undergo extensive testing prior to marketing. But this testing does not address all environmental conditions, mixtures of chemicals, and chronic exposure patterns that can occur in actual use. Pesticide-related illness surveillance is important to identify potential problems that might not be detected during manufacturer testing, including problems associated with the environmental application of these chemicals.

In response to public concern, the Washington State Department of Health has since 1990 collected pesticide exposure and acute injury data. These data are maintained in the Pesticide Illness Monitoring System (PIMS). PIMS data have been used to identify high-risk pesticides and intervention activities, regulatory change, public outreach, and education efforts.

As a surveillance system, it is likely that data contained in PIMS under-represent the actual number of pesticide exposure and injury cases in Washington State due to: (1) exposed and injured individuals failing to seek health care, (2) health care providers failing to recognize pesticide exposure-related injuries, and (3) failure to report pesticide-related injuries to PIMS. According to a study conducted by the department in 2004, only about 60% of eligible cases among agricultural workers were captured by PIMS.<sup>3</sup>

## Description of Potential Indicators

Pesticide-related illness monitoring is a useful tool for developing and evaluating strategies to protect the public from adverse health effects.

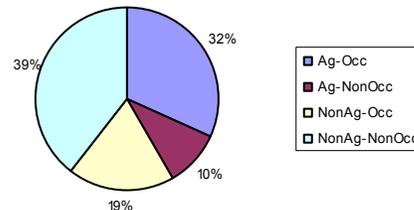
**Hazard indicators.** Information on the amount and types of pesticides used in Washington is not available because no regulations require collection of pesticide use data.

**Exposure indicators.** Exposure to some pesticides can be measured by biomarkers in blood or urine. One common biomarker is cholinesterase activity, which is used to assess exposure to organophosphate pesticides. Rules promulgated by the state Department of Labor and Industries require occupational cholinesterase monitoring for agricultural workers involved in mixing, loading, and applying some organophosphate and carbamate insecticides.

**Protective indicators.** The number of farm workers using or trained in the use of personal protective equipment is a protective indicator. Indicators of other educational interventions could also be used.

**Health outcome indicators.** Pesticide illness is a reportable condition in Washington. The state Pesticide Program collects information on cases of pesticide-related illnesses. Each case is investigated and classified by severity of the illness and probability that the illness was due to pesticide exposure. While the total number of cases deemed “definitely, probably, or possibly” related to pesticide exposure could be used as a health outcome indicator, there are significant differences in the risk factors and intervention strategies for pesticide-related illnesses occurring in occupational and agricultural settings as compared to cases that are not. Because of these differences, four separate classifications are used: non-occupational/non-agricultural, non-occupational/agricultural, occupational/non-agricultural, and occupational/agricultural. The following chart shows the proportion of cases these classifications represent.

Pesticide Program PIMS Case  
Classification 2000-2005  
WA State PIMS



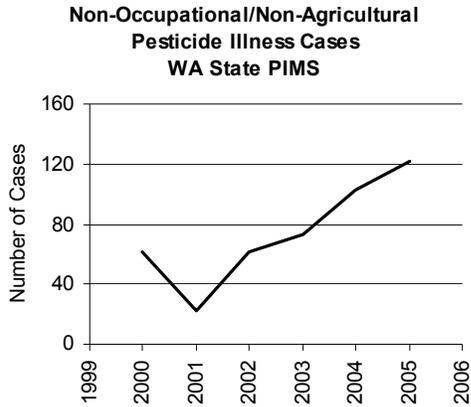
## Time Trends

### Non-Occupational/Non-Agricultural

During 2000–2005, Washington State experienced an average of 74 cases of non-agricultural/non-occupational pesticide-related illnesses per year. These were illnesses that occurred in people who were not working when they were exposed, and the pesticide was not being used for agricultural purposes. These include illnesses resulting from homeowner application of pesticides and non-occupational exposure from commercial applications (e.g., for ants or termites).

Forty-eight percent of illnesses in this category were related to exposure during pesticide mixing or application activities, and 34% occurred among individuals indoors not involved with a pesticide application. Ninety percent of the non-occupational/non-agricultural cases resulted in mild illness, and 10% were moderate. After 2001, an increase in the number of cases occurred in part because of electronic enhancements in case reporting from the Washington Poison Center.

Of the 442 cases identified during 2000–2005, 17% were children younger than 10 years of age, 59% were adults 25–64 years of age, and 14% were adults 65 and older. Slightly more women (54%) experienced illnesses than men.

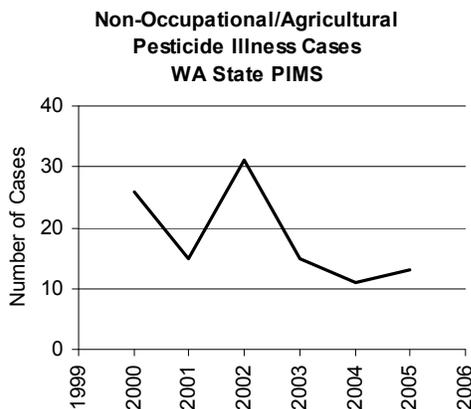


**Geographic Variation**

The greatest number of illnesses occurred in the most populous counties—King, Pierce, and Spokane counties, which together accounted for 46% of the cases.

***Non-Occupational/Agricultural Cases***

During 2000–2005, an average of 19 cases of non-occupational/agricultural pesticide-related illnesses was reported per year. These were illnesses that occurred in people who were not working when they were exposed and when the pesticide was used for agricultural purposes. Ninety-one percent of these illnesses were related to pesticide drift exposure, and 5% were related to pesticide residues (see Technical Notes). Ninety-three percent of illnesses were mild, and there were no severe illnesses.



The fewest number of pesticide-related illnesses occurred in this category. Overall, the annual number of cases has been dropping.

Of the 111 cases identified during 2000–2005, 11% were among children younger than 10, 23% were among 10–19 year-olds, and 63% were among adults 25 years and older. Women accounted for 58% of the cases.

**Geographic Variation**

Thirty percent of the cases in this category occurred in Grant County, and 17% and 14% occurred in Okanogan and Yakima counties, respectively. These regions are associated with intense agricultural production.

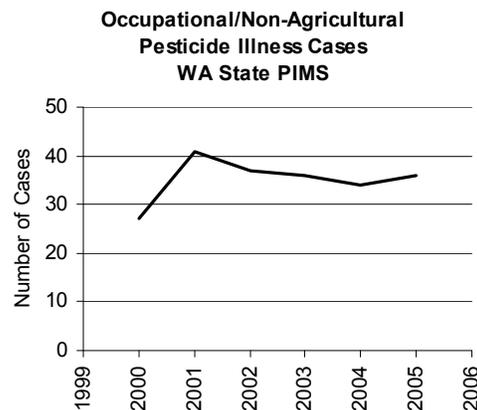
***Occupational/Non-Agricultural Cases***

During 2000–2005, an average of 35 cases of occupational/non-agricultural pesticide-related illnesses occurred annually in Washington. Forty-three percent of cases involved non-agricultural work with pesticides or pesticide-related equipment, and the remainder were cases where people were inadvertently exposed while they were at work but whose jobs were not associated with pesticide application.

Of the 211 cases identified during 2000–2005, 36% were among 15–34 year-olds, 53% were among 35–54 year-olds, and 12% were among people 55 years and older. Sixty-nine percent of cases occurred among men. Eighty-seven percent of the cases involved low to mild symptoms, which typically resolve without treatment; 12% of the cases were of moderate severity.

**Geographic Variation**

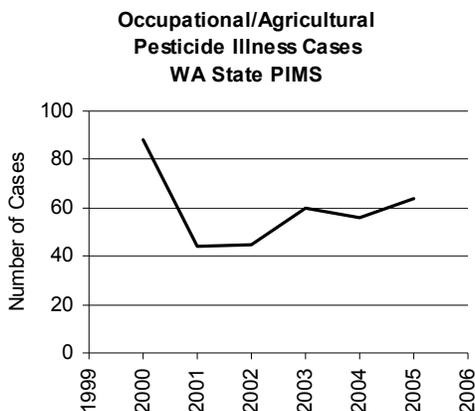
Twenty-five percent of illnesses occurred in King County, followed by Benton (7%), Pierce (7%), Spokane (7%), and Clark (7%) counties. Little change has occurred in the number of cases in this category reported annually during the six-year period.



## Occupational/Agricultural Cases

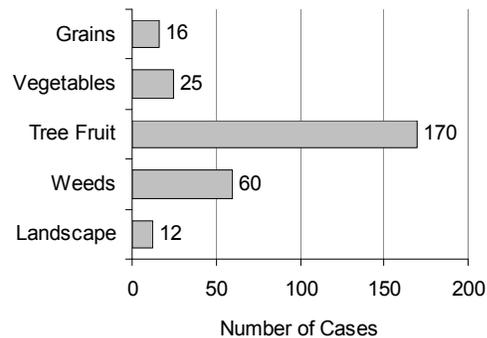
On average, 59 cases of occupational/agricultural pesticide-related illness occurred annually during 2000–2005. Most were among agricultural workers, including people employed in greenhouse, nursery, bulb farm, shellfish, and forest operations. Fifty-one percent of illnesses occurred among workers applying or working with pesticides or application equipment. The remainder of illnesses occurred among people whose work did not involve pesticides but were exposed to pesticide drift (28%) or residues (19%).

Of the 356 cases reported during 2000–2005, 54% occurred among workers ages 15–34, 27% among workers ages 35–44, and 12% among workers ages 45–54. Eighty-one percent of illnesses occurred in men. Eighty-eight percent of the cases involved low to mild symptoms and 12% percent of the cases resulted in moderate to severe injuries. The most frequently reported symptoms were eye-related (e.g., eye irritation or visual disturbances) followed by systemic symptoms (e.g., headache, dizziness, nausea/vomiting, and numbness). Skin irritation or rash was also a frequent complaint.



Forty-eight percent of illnesses occurred in the fruit tree industry, 17% for control of weeds, and 7% for the production of vegetables.

**Occupational/Agricultural  
Cases By Pesticide Target  
WA State PIMS**



## Geographic Variation

The highest percentage of cases in this category occurred in Yakima (23%), Grant (21%), and Benton (11%) counties. These are regions with intense agricultural production. In six incidents, more than three people were involved in the pesticide exposure.

In summary, over the six-year period from 2000 to 2005, Washington State experienced 653 (58%) non-agricultural cases and 467 (42%) agricultural cases. The occupational cases, whether agricultural or non-agricultural, were associated with a greater proportion of severe illnesses.

## Disparities

Hispanics composed 8.5% of the total Washington population in 2005. But Hispanics accounted for 83% of occupational/agricultural cases and 9% of occupational/non-agricultural cases that year. If no bias or disparity existed, these percentages should closely approximate the population percentage. The greater representation of Hispanics among occupational pesticide illness cases is likely due to the fact that in Washington, a high percentage (about 78%) of agricultural workers are of Hispanic origin.

## Year 2010 Goals

Objective 8-13 of *Healthy People 2010* is to reduce by 50% from the year 2000 the number of human pesticide exposures that result in a visit to a health care facility. Due to differences in PIMS data from those used for *Healthy People 2010*, a comparison is not possible.

## Intervention Strategies

Washington State uses regulatory, surveillance, and educational strategies to reduce pesticide-related

illness. The primary means of reducing these illnesses include:

- Developing and enforcing regulations for the provision of personal protective equipment and use of appropriate application practices to minimize the risk of exposure
- Educating users, applicators, and others at higher risk of exposure due to frequent use (such as farm workers) about the safe use of products and use of personal protective equipment
- Identifying products and practices that cause pesticide-related illness and making efforts to reformulate or discontinue their use
- Developing alternative products and pest management methods to reduce the use of pesticides known to cause illness.
- Providing outreach and education to the public on pesticide use and alternatives: <http://www.doh.wa.gov/ehp/Pest/default.htm>.

#### **Data Sources**

Washington State Department of Health, Pesticide Illness Monitoring System Data Base (PIMS).

Washington State Department of Agriculture, Pesticide Management Division and Farmworker Education Program

Washington State Department of Health, [Behavioral Risk Factor Surveillance System](#), 2000

Office of Financial Management, Washington State Racial and Hispanic Population 2005

#### **For More Information**

Washington State Department of Health, Office of Environmental Health and Safety, Pesticide and Surveillance Section: (360) 236-3360

#### **Technical Notes**

“Drift exposure” is the unintended airborne exposure of an individual through movement of the pesticide from its intended target during or following application or the entry of people into a target site during an application. “Residue exposure” is contact with a surface upon which a pesticide has been deposited.

#### **Endnotes**

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<sup>1</sup> Donaldson, D., Kiely, T., & Grube, A. (2002). *Pesticides industry sales and usage: 1998 and 1999 market estimates*. Report No. EPA-733-R-02-001. Washington, DC: U.S. Environmental Protection Agency.

<sup>2</sup> Fenske, R., Lu, C., Kalman, D., Simcox, N., Allen, E., & Kiefer, M. (2000). Biologically Based Pesticide Dose Estimates for Children of Agricultural Families. *Environmental Health Perspectives*, 108, 515-520.

<sup>3</sup> Washington State Department of Health, Division of Environmental Health, Office of Environmental Health Assessments. (2004). *Improving data quality in pesticide illness surveillance: Final report to the National Institute of Occupational Safety and Health*. Grant Number 5U01 OH0 7296. Olympia, WA: Washington State Department of Health.