

# Pesticide-Related Illness

Resource ID # 5960

## Pesticide-Related Illness

### Summary

Washington is one of eight states which actively track and investigate pesticide-related illnesses. Approximately 40% of all identified cases occurred among workers in agricultural settings, and about 80% of these were men. The total number of cases and number in occupational / agricultural settings has remained relatively constant over the past five years.

### Introduction

The use of pesticides has expanded greatly since World War II. There are now more than 20,000 registered pesticide products derived from more than 600 active ingredients. According to the United States Environmental Protection Agency (EPA), agricultural usage of pesticides peaked around 1980 and now accounts for approximately 80% of total pesticide use. In addition, an estimated three-fourths of all US households use some form of pesticides.<sup>1</sup> In Washington, 50% of households report having used pesticides outside their homes and 16% report indoor use during the past year.

Public concern over the risks from pesticides has increased during the past three decades. These concerns have created a growing demand for data on the public health impacts of pesticide exposure. Although about half the states have rules requiring some form of reporting of pesticide exposure and illness, Washington is one of only eight states that routinely conduct comprehensive case investigations and surveillance activities.

The most recent statistics on pesticide poisonings nationwide (1992) indicate there were 10,000 to 20,000 physician-treated pesticide illnesses and injuries among agricultural workers.<sup>2</sup> However, the actual extent of this problem is difficult to estimate as

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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 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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pesticide illnesses and injuries are very complex and difficult to track. Some farmworkers are reluctant to report incidents and seek treatment, or might not recognize an illness as being pesticide-related. Pesticide products can be composed of single pesticides or mixtures of pesticides and other ingredients. Depending upon the extent of exposure and toxicity of the pesticide, people can manifest a wide variety of health problems, ranging from non-specific signs and symptoms that mimic the flu to serious systemic effects that, under certain circumstances, can result in death. The severity of illness can be influenced by individual susceptibilities. Children and the elderly are among those at higher risk of serious effects. There is particular concern about farmworkers and their children, many of whom face chronic exposure to a variety of products<sup>3</sup>.

The EPA requires that pesticide products go through extensive testing prior to marketing, yet this testing does not address all environmental conditions, mixtures of chemicals, and chronic exposure patterns that can occur in actual use. Illness surveillance can provide important early warning of potential problems that might not be detected by manufacturer testing.

Since 1990, the Washington State Department of Health (DOH) has maintained the Pesticide Illness Monitoring System (PIMS) to track pesticide related illnesses and injuries. Data collected through PIMS have identified high-risk pesticides and use practices for regulatory change, intervention activities, and education.

### Description of Potential Indicators

Pesticide-related illness is one of the few environmental health problems for which health data are available.

**Hazard Indicators.** Pesticides are widely used in Washington. However, information on the amount and types of pesticides used are not available because there are no regulations requiring reporting of pesticide use.

**Exposure Indicators.** Exposure to some pesticides can be measured by biomarkers in blood or urine. One of the

most common biomarkers for exposure to organophosphate pesticides is cholinesterase activity in the blood. The Department of Labor and Industries recommends occupational cholinesterase monitoring, and is currently developing rules to require cholinesterase monitoring for agricultural mixers and loaders of class I organophosphate and carbamate insecticides.

**Protective Indicators.** The number of farmworkers using or trained in the use of Personal Protective Equipment (PPE) is a protective indicator. Indicators of other educational interventions could also be used.

**Health Outcome Indicators.** Pesticide illness is a notifiable condition in Washington. The PIMS system collects information on reported cases of pesticide-related illnesses. Each case is investigated and classified based on the severity of the illness and the 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 indicators are used in the following sections: non-occupational/non-agricultural, non-occupational/agricultural, occupational/non-agricultural, and occupational/agricultural.

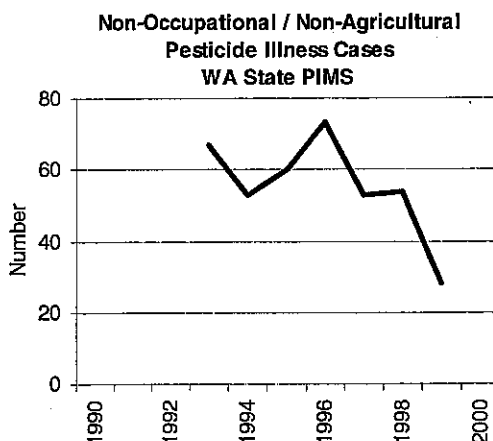
## Non-Occupational/Non-Agricultural Cases

These are illnesses that occurred among individuals not working at the time of their exposure and in circumstances where the application was not intended for production of an agricultural commodity. This category includes illnesses resulting from homeowner application of pesticides and non-occupational exposure from commercial applications such as for ants or termites.

Between 1997 and 1999, there were an average of 45 cases of non-agricultural/non-occupational pesticide related illness per year. Seventeen percent resulted in moderate to severe illness.

### Time Trends

Consistent information is available on pesticide-related illnesses from 1993 to 1999. There has been a decrease in the annual number of non-occupational / non-agricultural cases.



### Geographic Variation

The greatest number of illnesses occurred in the largest population centers, King and Pierce counties.

### Type of Activity

Forty-two percent of illnesses were related to application and mixing operations, and in most of these cases, the work was being done by hand. Exposure to drift from a pesticide application (18%) was the second most frequent cause of illness (see Technical Notes).

### Population Characteristics

Of the 135 cases identified between 1997 and 1999, 28% of illnesses occurred in adults age 25-44, 21% occurred in children younger than 15, and 18% occurred in adults older than 64. More women (57%) experienced illnesses than men.

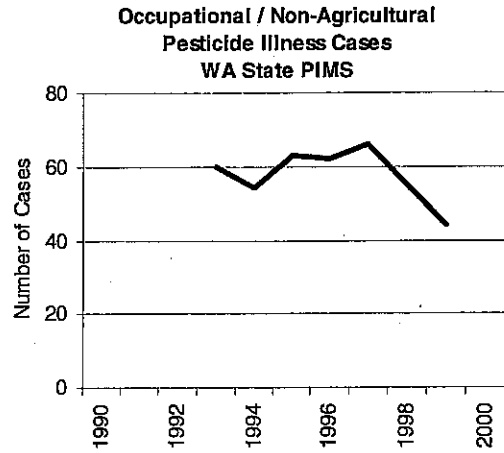
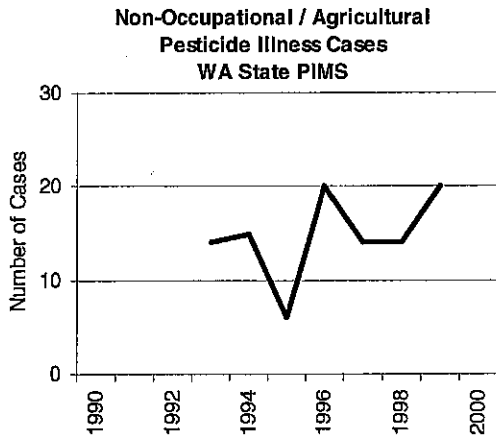
## Non-Occupational/Agricultural Cases

These are illnesses that occurred among individuals not working when the exposure occurred and where the application was intended for an agricultural commodity. These cases include individuals who were exposed to pesticides drifting from an agricultural application.

The fewest number of illnesses occurred in this setting. From 1997 to 1999 there were an average of 16 cases per year. Ninety-two percent of illnesses were mild, and there were no severe illnesses.

### Time Trends

There was a slight increase in the number of non-occupational / agricultural cases between 1993 and 1999.



**Geographic Variation**

Half of these illnesses occurred in Yakima and Grant counties, regions associated with intense agricultural production.

**Type of Activity**

Seventy-two percent of these illnesses were related to pesticide drift exposure, and 13% were related to pesticide residues (see Technical Notes).

**Population Characteristics**

Given the small number of cases, it is difficult to draw conclusions regarding differences by age or gender. Of the 48 cases identified between 1997 and 1999, 28% occurred in people age 35-44 and 19% in people age 5-14. Two thirds of the illnesses occurred in males.

**Occupational/Non-Agricultural Cases**

These are illnesses occurring in people who were working at the time of their exposure and where the application was not intended for production of an agricultural commodity. These incidents occurred in a wide variety of occupational settings. Many of these cases were individuals who were inadvertently exposed while they were at work but whose job was not associated with pesticide application.

From 1997 – 1999 there were an average of 55 cases per year. Over 60% of the illnesses were classified as definite or probable. Eighty-nine percent of illnesses were mild and there were no severe cases.

**Time Trends**

There was a slight decrease in the number of cases from 1993 to 1999.

**Geographic Variation**

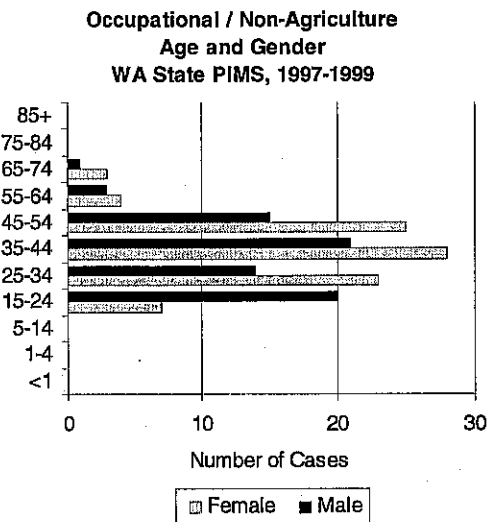
Twenty-seven percent of illnesses occurred in King County, followed by Yakima (11%), Snohomish (10%), Spokane (7%), and Benton (7%) counties.

**Type of Activity**

One-third of illnesses were from exposure to pesticide residues, and most were the result of residues on structures or surfaces. Twenty-nine percent of illnesses were related to applications or mixing of pesticides, primarily hand or ground application, 18% occurred as a result of dropping or breaking a pesticide container, and 13% were associated with exposure from drift.

**Population Characteristics**

Of the 165 cases identified between 1997 and 1999, 77% occurred in people age 25-54, and 24% occurred in people age 45-54. Fifty-five percent of illnesses occurred among women.



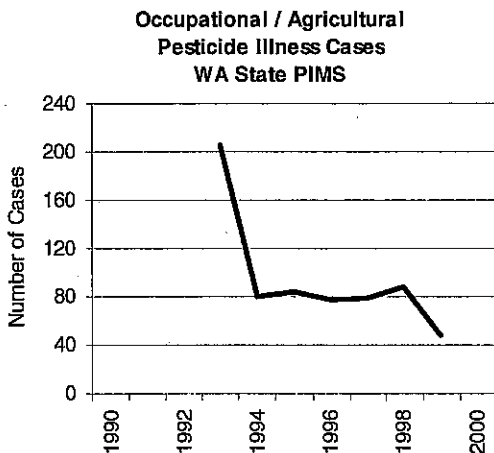
## Occupational / Agriculture Cases

These are illnesses that occurred while the individual was working, and the application was intended for an agricultural commodity. Most of these illnesses were among agricultural workers, including people employed in greenhouse, nursery, bulb farm, shellfish, and forest operations.

In the three-year period 1997 to 1999, more than 200 illnesses occurred in an occupational agricultural setting. Fifty-two percent of these illnesses were classified as definite or probable, and 26% of the injuries were moderate to severe. 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, numbness). Skin irritation or rash was also a frequent complaint.

### Time Trends

In 1993 there were several incidents involving large numbers of people. Aside from these occurrences the number of incidents and cases remained relatively stable from 1994 through 1998.



### Geographic Variation

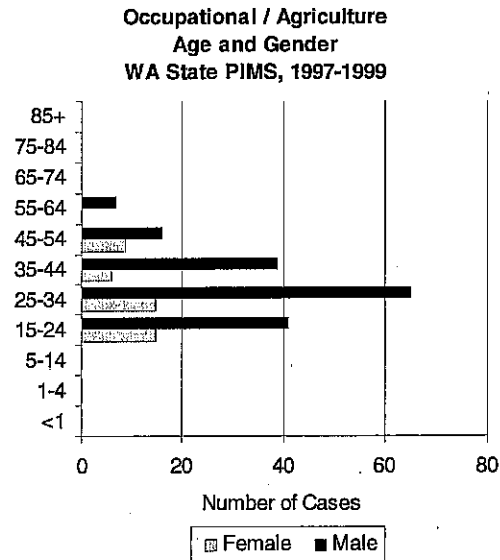
Yakima, Grant, and Okanogan counties had the largest number of reported illnesses. These are regions with intense agricultural production.

### Type of Activity

Forty-eight percent of the illnesses were related to mixing, loading and application of pesticides, 24% resulted from exposure to drift, and 22% from exposure to residues.

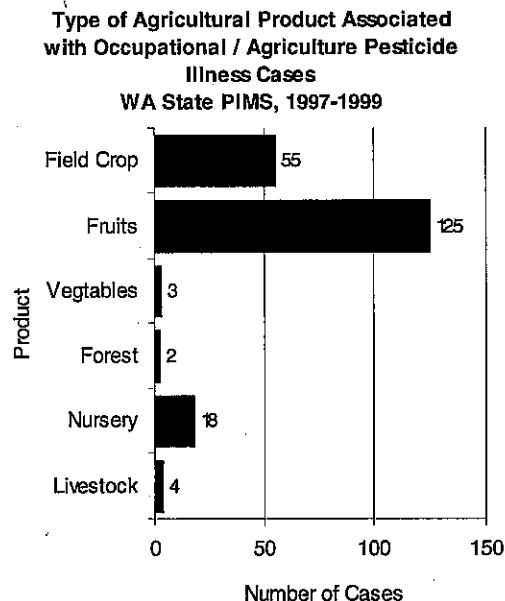
## Population Characteristics

Of the 215 cases identified between 1997 and 1999, 85% occurred in people age 18-44, 38% in people age 25-34, and 26% people age 18-24. Seventy-nine percent of illnesses occurred in men.



### Type of Agricultural Product

Fifty-eight percent of illnesses occurred in the fruit tree industry, 26% in field crops, and 8% in nursery/greenhouse operations.



## **Healthy People 2010**

Objective 8-13 of *Health People 2010* is to reduce the number of pesticide exposures that result in a visit to a health care facility by 50%.

## **Intervention Strategies**

Washington has many regulatory, surveillance and educational efforts focusing on the reduction of pesticide-related illness. The major means of reducing these illnesses include:

- Development and enforcement of regulations which ensure the provision of personal protective equipment and the use of appropriate application practices to minimize the risk of exposure.
- Education of users, applicators, and others who face higher risks of exposure (such as farmworkers) on the safe use of products and use of personal protective equipment.
- Identification of products and practices which result in pesticide-related illness, and efforts to reformulate or discontinue use of such products.
- Development of alternative products and pest management methods to reduce the use of pesticides known to cause illness.

Development of effective intervention strategies hinges largely on prompt reporting and accurate documentation of adverse outcomes associated with pesticide related events. Pesticide-related illnesses are a notifiable condition and the Pesticide Program is actively engaged in projects to better identify the cause of exposure and reduce the degree of under reporting of such incidents.

## **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 (BRFSS). 2000.

## **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> United States Environmental Protection Agency, Office of Pesticide Programs, Pesticide Industry Sales and Usage: 1996 and 1997 Market Estimates.

<sup>2</sup> Keifer, Matthew C., Effectiveness of Interventions in Reducing Pesticide Overexposure and Poisonings. *Am J Prev Med* 2000;18(4S):80-9.

<sup>3</sup> Fenske, R., Lu C., Kalman, D., Simcox, N., Allen E., Kiefer, M. Biologically Based Pesticide Dose Estimates for Children of Agricultural Families. *Environ Health Perspect.* 2000,108:515-520.