

**SUMMARY OF RESULTS FROM THE
CALIFORNIA PESTICIDE ILLNESS
SURVEILLANCE PROGRAM
- 2010 -**

HS-1889

California Environmental Protection Agency

Department of Pesticide Regulation

Worker Health and Safety Branch

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Format Change Note

This report provides a summary of illnesses identified by the Pesticide Illness Surveillance Program (PISP) of the California Department of Pesticide Regulation (DPR) in 2010. Historically, this report has served as the primary source of PISP data for a calendar year. In an effort to shorten the gap in the publication of the annual report and provide current illness data, this report will consist of a shorter summary accompanied by the complete body of data tables traditionally published with the report.

The decision to change the report format also reflects PISP adaptation to technological advances. With the publication of the California Pesticide Illness Query program (CalPIQ) in 2009, the public can retrieve reports of pesticide illness and generate reports according to their own specifications. CalPIQ is available at <http://apps.cdpr.ca.gov/calpiq> and can retrieve cases evaluated as definitely, probably, or possibly related to pesticides from 1992 through the most recent year published.

Executive Summary

DPR identified 1,114 cases as potential health effects of pesticide exposure. This represents a 16% decrease from the 1,329 cases investigated in 2009, but remains within the range typical of recent years. The California Poison Control System (CPCS) remained a major source of case identification. Of the 1,114 cases identified in 2010, CPCS transmitted reports of 575 (52%), an increase from the 509 reported in 2009.

DPR scientists concluded that pesticide exposure had been at least a possible contributing factor to 811 (73%) of the 1,114 cases. Agricultural use of pesticides was the source of exposure in 231 (28%) of the 811 cases.

Background, Sources, and Purpose of Illness Surveillance

DPR administers the California pesticide safety program, widely regarded as the most stringent in the nation. Mandatory reporting of pesticide¹ illnesses has been part of this comprehensive program since 1971. Illness reports are collected, evaluated, and analyzed by program staff. PISP is the oldest and largest program of its kind in the nation; its scientists provide data to regulators, advocates, industry, and individual citizens.

¹ "Pesticide" is used to describe many substances that control pests. Pests may be insects, fungi, weeds, rodents, nematodes, algae, viruses, or bacteria -- almost any living organisms that cause damage or economic loss, or transmit or produce disease. Therefore, pesticides include herbicides, fungicides, insecticides, rodenticides, and disinfectants, as well as insect growth regulators. In California, adjuvants are also subject to the regulations that control pesticides. Adjuvants are substances added to enhance the efficacy of a pesticide, and include emulsifiers, spreaders, and wetting and dispersing agents.

Under Health and Safety Code section 105200, California physicians are required to report any suspected case of pesticide-related illness or injury by telephone to the local health officer within 24 hours of examining the patient. The law requires health officers to inform the county agricultural commissioner (CAC) and to complete a pesticide illness report (PIR), which is sent to the Office of Environmental Health Hazard Assessment (OEHHA), the Department of Industrial Relations (DIR), and DPR. This reporting pathway identifies only a minority of the cases investigated. DPR strives to ensure that PISP captures the majority of significant illness incidents. To identify unreported pesticide cases, DPR has a memorandum of understanding with DIR and the Occupational Health Branch of the California Department of Public Health (CDPH-OHB), under which PISP scientists review copies of the Doctor's First Report of Occupational Illness and Injury (DFROII), documents that workers' compensation claims payers are required to forward to DIR and are subsequently shared with CDPH. PISP Scientists select for investigation any DFROII that mentions a pesticide as a possible cause of injury, or mentions unspecified chemicals if the occupation or setting is one in which pesticide use is likely. Another significant source of pesticide illness cases is the California Poison Control System, which began assisting in pesticide illness reporting in 1999. When medical professionals contact CPCS and suspect that a pesticide caused an illness, CPCS submits a pesticide incident report to DPR which satisfies the physician's reporting requirement. Through our contract with CPCS, we continue to identify hundreds of symptomatic exposures that otherwise would have escaped detection.

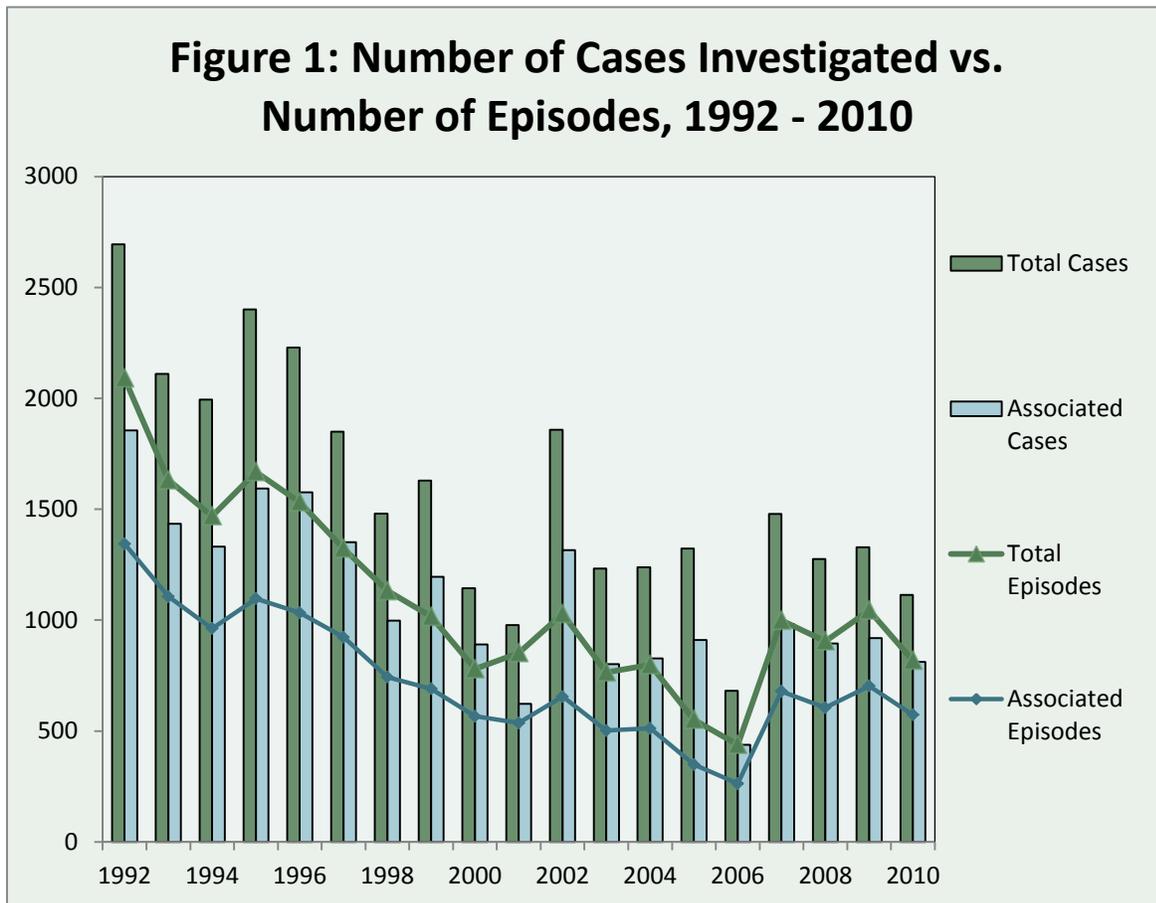
Agricultural commissioners investigate identified pesticide illnesses that occur in their jurisdictions, whether or not they involve agriculture. DPR provides instructions, training and technical support for investigators. The instructions include directions for when and how to collect samples to document unintended exposure or contamination of persons and/or the environment. As part of the technical support, DPR contracts with the California Department of Food and Agriculture Center of Analytical Chemistry to analyze the samples. When investigations are complete, CACs send reports to DPR describing their findings. These reports describe the circumstances that may have led to pesticide exposure and the consequences to the exposed individuals. DPR scientists evaluate medical reports and all information the CACs gather in the investigative process. They abstract and encode basic descriptors of the event, then undertake a complex synthesis of all available evidence to assess the likelihood that pesticide exposure caused the illness. Standards for the determination are described in the PISP program brochure, "Preventing Pesticide Illness," which can be viewed or downloaded from DPR's web site at <http://www.cdpr.ca.gov/docs/whs/pisp/brochure.pdf>.

DPR maintains its surveillance of human health effects of pesticide exposure in order to evaluate the circumstances of pesticide exposures that result in illness. DPR scientists regularly consult the PISP database to evaluate the effectiveness of DPR's pesticide safety regulatory programs and assess need for changes. If illness reports indicate excessive risk, DPR may implement additional restrictions on pesticide use by providing CACs with California-specific

recommendations for pesticide application permit conditions or by changing regulations. If an illness incident results from illegal practices, state and county enforcement staff take appropriate action to deter future incidents.

2010 Numeric Results – Totals

In 2010, 1,114 cases were identified as potential health effects of pesticide exposure (see Figure 1). This represents a 16% decrease from the 1,329 cases investigated in 2009, but remains within the range typical of recent years.



A case is the Pesticide Illness Surveillance Program representation of a person whose health problems may relate to pesticide exposure.

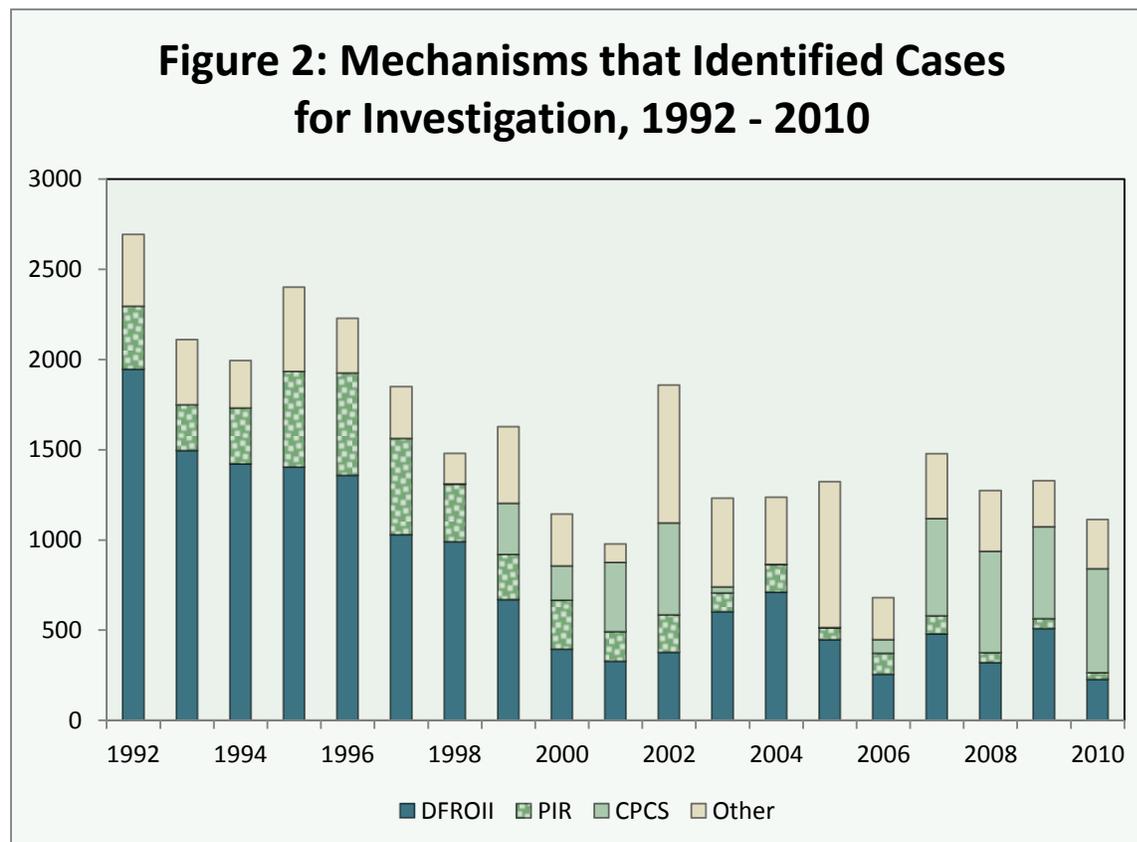
An episode is an event in which a single source appears to have exposed one or more people (cases) to pesticides.

Associated cases are those evaluated as definitely, probably, or possibly related to pesticide exposure. A definite relationship indicates a high degree of correlation between the pattern of exposure and resulting symptomatology. The relationship requires both physical evidence of exposure and medical evidence of consequent ill health to support the conclusions. A probable relationship indicates a relatively high degree of correlation between the pattern of exposure and resulting symptomatology. Either medical or physical evidence is inconclusive

or unavailable. A possible relationship indicates that health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

Associated episodes are those in which at least one case was evaluated as associated.

Figure 2 demonstrates the variation in numbers of cases identified by the different sources, as well as an overall downward trend.



DFROII – Doctor’s First Report of Occupational Illnesses and Injury (Workers’ Compensation document).

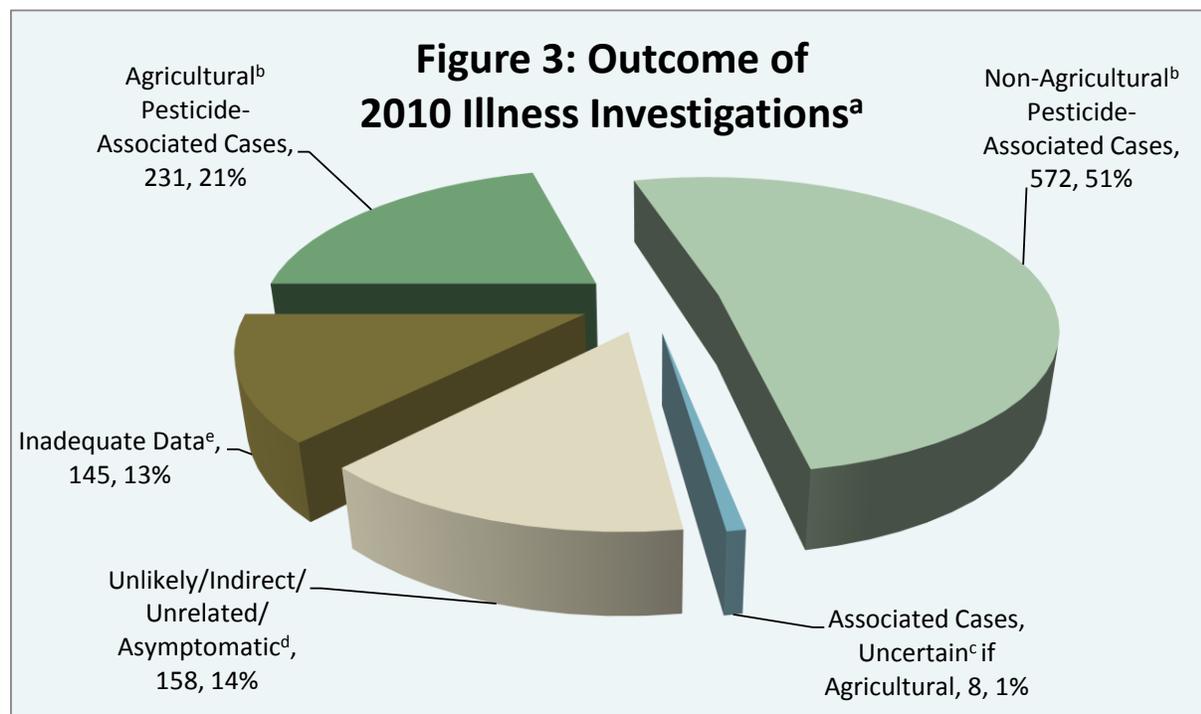
PIR – Pesticide Illness Report (physician reporting in compliance with Health and Safety Code Section 105200).

CPCS – California Poison Control System (facilitated physician reporting).

Other – All other methods of case identification, including citizen complaints, contacts by emergency responders, and news reports.

DPR scientists found pesticide exposure to be at least a possible contributing factor to 811 (73%) of the 1,114 cases identified. PISP defines the term “pesticide-associated” as cases evaluated as definitely, probably, or possibly related to pesticide exposure. “Agricultural” is defined as involving pesticides intended to contribute to production of an agricultural commodity, including livestock. This corresponds to the regulatory definition of “production agriculture”. Use in non-production agriculture are designated “non-agricultural” along with structural, sanitation, or home garden use, as well as pesticide manufacture, transport, storage, and disposal.

Of the 811 pesticide-associated cases, 231 (21% of the 1,114 total cases) were attributed to pesticides used for agricultural purposes. Another 572 associated cases (51%) occurred under circumstances considered non-agricultural. Eight of the 811 pesticide-associated cases could not be characterized as agricultural or non-agricultural due to unclear circumstances presented in investigations. Evidence indicated that pesticide exposure did not cause or contribute to ill health in 158 (14%) of the 1,114 cases assigned for investigation. Insufficient information prevented evaluation of 145 cases (13%) (Figure 3).



^a Total cases investigated = 1,114

^b *Agricultural* and *Nonagricultural* refer to the intended use of the pesticides definitely, probably, or possibly related to human health effects.

^c *Associated Cases, Uncertain if Agricultural* refers to cases in which investigators provided little or no information, such as when victims could not be located or refused interviews.

^d *Unlikely/Indirect/Unrelated/Asymptomatic* refers to cases in which the weight of the evidence was against pesticide causation. This occurs when exposed people did not develop symptoms, or if symptoms were not caused or were unlikely to have been caused by pesticide exposure.

^e *Inadequate* means that there was not enough data available or reported to determine if pesticides contributed to ill health.

Table 1 shows the numbers of cases evaluated at each level of relationship. Among the 811 pesticide-associated cases, evidence established a definite relationship to pesticide exposure for 111 (14%), a probable relationship for 469 (58%), and a possible relationship for 231 (28%). See Table 1.

Table 1: Relationship Evaluation of 2010 Illness Investigations				
Relationship	Relation to Agriculture			Total
	Agricultural ^a	Non-Agricultural ^b	Unknown or Not Applicable ^c	
Definite ^d	21	90	0	111
Probable ^e	153	313	3	469
Possible ^f	57	169	5	231
Pesticide-Associated Subtotal	231	572	8	811
Unlikely ^g	7	19	0	26
Indirect ^h	0	10	0	10
Asymptomatic ⁱ	22	20	0	42
Unrelated ^j	0	0	80	80
Not Applicable (inadequate data) ^k	6	108	31	145
Overall Total	266	729	119	1,114

^a Agricultural cases are those that implicate exposure to pesticides intended to contribute to the production of agricultural commodities.

^b Non-agricultural cases include all those in which the pesticide was not intended to contribute to production of agricultural commodities.

^c Agricultural designation is not applicable to cases unrelated to pesticide exposure.

^d A definite relationship indicates a high degree of correlation between the pattern of exposure and resulting symptomatology. The relationship requires both physical evidence of exposure and medical evidence of consequent ill health to support the conclusions.

^e A probable relationship indicates a relatively high degree of correlation between the pattern of exposure and resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

^f A possible relationship indicates that health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

^g An unlikely relationship indicates that a correlation cannot be ruled out absolutely. Medical and/or physical evidence suggest a cause other than pesticide exposure.

^h An indirect relationship indicates that pesticide exposure is not responsible for symptomatology, but pesticide regulations or product label contributed in some way, (e.g., heat stress while wearing chemical resistant clothing).

ⁱ An asymptomatic relationship indicates that exposure occurred, but did not result in illness/injury.

^j An unrelated relationship indicates definite evidence of causes other than pesticide exposure, including exposure to chemicals other than pesticides.

^k A relationship of “not applicable” indicates that relationship cannot be established because the necessary information is not available to the evaluator.

Occupational exposures (those that occurred while the affected people were at work) accounted for 448 (55%) of the 811 pesticide-associated cases from 2010. Non-occupational exposures accounted for 345 pesticide-associated cases (43% of the total). Eighteen pesticide-associated

cases could not be characterized as occupational or non-occupational; six of these 18 also could not be characterized as agricultural or non-agricultural.

Enforcement actions often are still under consideration when DPR receives the illness investigative reports, thus linking cases to Enforcement Branch violations is approximate. Based on the information available at the time of evaluation, WHS scientists concluded that of the 811 pesticide-associated cases, 417 (51%) provided evidence that violation of safety requirements had contributed to exposure, and harm might have been avoided if all the people involved had adhered strictly to safety procedures already required by regulations and/or pesticide labels. Non-compliance with regulations (e.g. paperwork violations) that did not contribute to the pesticide exposure was identified in 67 (8%) cases. Scientists remained uncertain whether violations contributed to 107 cases (13%), and 220 cases (27%) had health effects attributed to pesticide exposure in spite of apparent compliance with all applicable label instructions and safety regulations. Of these 220 cases, 45 (20%) were attributed to pesticides used for agricultural purposes. Further evaluation of these cases is needed to determine if additional safety requirements are appropriate.

Legislative update – AB1963

The passage of Assembly Bill 1963 (Nava, Chapter 369, Statutes of 2010), which added Section 105206 to the Health and Safety Code (HSC), requires clinical laboratories to provide DPR the results of all cholinesterase blood tests performed for agricultural pesticide-related exposures related to certain activities. AB 1963 was established to evaluate the Medical Supervision Program (California Food and Agriculture Code, Section 12981) which requires agricultural employers to contract with physicians to monitor employees who regularly handle toxicity category I or II pesticides that inhibit cholinesterase. Physicians order baseline and periodic blood testing to measure the level of activity of cholinesterase enzyme. HSC Section 105206 requires clinical laboratories to provide numeric results along with the reason medical providers ordered the cholinesterase tests (pursuant to Section 6728 of Title 3 CCR). Information on the patient, physician, employer and laboratory should also be provided. PISP scientists are looking into the possibility of integrating the data into a database in a way that links cholinesterase test results to the individuals tested, and identify changes over time. In 2015, DPR and OEHHA, in consultation with DPH, will produce a report on the effectiveness of the medical supervision program, and the usefulness of laboratory-based reporting of cholinesterase testing for pesticide illness and surveillance.

PISP Cases in Cold-Storage Facilities

In early 2010, two cases of pesticide illness reported to PISP prompted a large-scale monitoring and industrial hygiene effort intended to mitigate pesticide exposure within California's fruit

cold storage facilities. Two fruit quality inspectors separately sought care for similar symptoms after approximately one month of assessing Chilean grape imports. The US Department of Agriculture (USDA) requires treatment of these grapes with the fumigant methyl bromide (MeBr) upon arrival to the United States.

The inspectors visited their personal physicians for neurological symptoms such as dizziness, memory troubles and difficulty walking. One of the men was initially suspected of having a stroke, but laboratory tests contradicted this. After discussing their health problems in March 2010, they discovered their similar symptoms. Medical evaluations confirmed they had MeBr poisoning when, in conjunction with their neurological symptoms, their blood bromide levels were substantially elevated. Both men endured months of disability, but by September 2010 they had fully recovered.

Scientists from DPR's Human Health Mitigation Program inspected fumigation practices and monitored MeBr levels from the fumigation and aeration at shipping docks, during transit and while in storage within cold-storage facilities (CSF). Results indicated excessive off-gassing of methyl bromide for about 36 hours after the post-fumigation aeration process. An air monitoring study of Chilean fruit, conducted in 2010 and 2011, confirmed that off-gassing of MeBr was a problem in the seven CSFs monitored: six in the Los Angeles basin and one in Central Valley. DPR established best management practices for Chilean fruit in cold storage facilities to reduce the risk of excessive MeBr exposure. In response to the study's findings and recommendations, California cold storage facilities have installed or deployed methyl bromide monitoring systems including colorimetric and/or continuous monitoring devices, implemented various exposure control protocols such as ventilation, work hour restrictions, and pre-purging of trailers before off-loading, and have made their workers aware of the situation through training and posting. DPR continues oversight of mitigation activities with on-site visits to verify compliance and spot-checks of a facility's monitoring results.

Large Episode Agricultural Drift Cases

In 2010, pesticide drift was associated with 115 (83%) of 139 fieldworker illnesses in twelve separate episodes. Two episodes of pesticide drift in Monterey County are highlighted because they involved a large number of people.

The first involved insecticide drift onto fieldworkers. Five hours after an application began, 32 fieldworkers arrived at a field to harvest strawberries about 1200 feet away from an ongoing insecticide treatment to a nearby field. Thirty-one of the workers reported that an odor from the neighboring application bothered them. The crew was moved away from the odor and finished the harvest from the previous day. As the fieldworkers continued to work, two workers symptoms persisted. The farm manager, who was aware of the application and odor, told the

workers they could seek care if their symptoms persisted. In all, 22 fieldworkers reported symptoms and only the two who reported persistent symptoms were taken for care. The growers were cited for failure to take their employees for medical management when there were reasonable grounds to believe that an exposure to a pesticide had occurred. The handler training records did not include the use of the pesticide involved, fenpyroximate. On interviews of the applicator, mixer/loader and supervisors, they said the insecticide applied was new to them. Weather station data showed wind was blowing between 3-7.7 mph southwest, towards the direction of the harvest crew.

Also in Monterey County, a broccoli harvesting crew of 26 fieldworkers unknowingly violated an active inner buffer zone when they arrived to work in a field adjacent to another field that had been fumigated with methyl bromide (57%) and chloropicrin (43%) the previous day. When the workers arrived, the restricted entry interval was still in effect for approximately 12 more hours. The workers parked their cars within 10 feet of the fumigated field, which did not leave much room for the harvesting machine to pass. As a result, the harvesting machine operator accidentally drove over the tarpaulin and tore open a 120-ft section. Twenty-one of the 26 workers reported symptoms, such as shortness of breath, coughing, throat, nose and eye irritation, headaches, nausea and dizziness. Some were taken for care and others went to another work site. An investigation into the incident revealed the broccoli grower had agreed to allow the buffer zone to extend onto his property, since the harvest was not scheduled to start until restricted entry interval (REI) ended. Due to an oversight by the farm manager, he allowed the harvesters to start a day earlier.

After the harvesters left, the applicator, the operator of the fumigated field, and the broccoli grower sent three workers to repair the damaged tarpaulin. They recognized the buffer zone was incompletely posted and improvised signs to complete posting. The agricultural commissioner cited the operator of the fumigated field for inadequate posting and the broccoli grower for neglecting to warn the harvesters about the fumigation and allowing them to enter the field. The commissioner also cited the labor contractor for not leaving promptly when workers first reported symptoms or taking the whole crew for care.

Non-agricultural drift

Non-agricultural drift episodes resulted in 146 illnesses in 2010. While most incidents affected only one person, ten of 105 total episodes affected at least two individuals, and one involved 18 people.

In Los Angeles County, a property owner allegedly applied an insecticide he purchased online to several unoccupied units to control roaches. The landlord said he was mandated by the Los Angeles County Department of Public Health to treat the cockroach infested units within the two

apartment buildings. An investigation was initiated when a tenant from one of the treated units called the local CAC office complaining of symptoms he experienced after the application. Another resident soon called the county office to complain. When county staff questioned others, at least 18 residents reported symptoms, such as headache, nausea, vomiting and respiratory symptoms following the application. Only one resident sought medical attention. Samples taken from the treated units confirmed the use of cypermethrin, but the CAC could not find any evidence of a use in conflict with the label. The solvent in the product is known to cause a strong odor, which could have been a source for the symptoms. The landlord hired a pest control company to do additional spraying for cockroaches and was advised to use a licensed company to handle his pest control needs in the future.

Pesticide Illness in Schools

Forty-four illnesses evaluated as definitely, probably, or possibly associated with pesticide exposure occurred in schools. PISP defines schools as establishments that provide academic or technical instruction, including day care centers.

The majority of school pesticide illnesses were incurred in the course of employment (59%) and in non-agricultural circumstances (61%).

Twelve (27%) of the 44 cases involved children, but 11 of these stemmed from an episode that occurred in 2009 but were added to the PISP database in 2010. The remaining school-related child illness involved a 21 month old who inhaled bleach fumes from an empty pitcher that had contained diluted bleach used to disinfect toys at a daycare center. According to the teacher, the child vomited once, was coughing and gasping for air. She was taken for care and recovered without incident.

Of the remaining illness cases at schools, fourteen episodes involved one person apiece, two episodes affected two people, one involved at least six people, and one was implicated in eight adult illnesses.

In Santa Barbara County, at least six people at an elementary school developed symptoms while an agricultural field 1/3 mile east of the school was being fumigated with chloropicrin. The principal and five cafeteria workers all suffered symptoms at the school. Four students also complained of burning eyes, but they were not assigned case numbers because identifying information was not available. When a county investigator also developed symptoms near the application site, he drove to the injection point to stop the application but it was already completed. The investigation revealed the pesticide control business failed to comply with permit conditions which required application of a second water seal to a treated area and to monitor the field a day after application.

Morbidity and Mortality

Of the 811 cases evaluated as associated with pesticide exposure, 22 people were hospitalized and 98 people reported time lost from work or normal activity (e.g. going to school) (Table 2). Fourteen of the 22 people hospitalized (64%), ingested a pesticide. Two of the ingestion cases were ultimately fatal. Thirteen of the 22 (59%) of the hospitalized patients acknowledged suicide attempts.

Table 2: Summary of Pesticide-Associated^a Hospitalization and Disability, 2010			
Relationship	Total Cases	Number Hospitalized^d	Lost Work Time^e
Definite/Probable ^b	580	20	81
Possible ^c	231	2	17
Total Cases	811	22	98

^a Pesticide-associated cases are those in which pesticide exposure was evaluated as definite, probable, or possible contributor to ill health.

^b A definite relationship indicates a high degree of correlation between the pattern of exposure and resulting symptomology. The relationship requires both physical evidence of exposure and medical evidence of consequent ill health to support the conclusions. A probable relationship indicates a relatively high degree of correlation between the pattern of exposure and resulting symptomology. Either medical or physical evidence is inconclusive or unavailable.

^c A possible relationship indicates health effects correspond generally to the reported exposure, but evidence is not available to support a relationship.

^d Number of associated cases who were admitted and spent at least one full day (24-hour period) hospitalized.

^e Number of associated cases who missed at least one day of work or normal activity such as school.

There were a total of five fatalities reported, two of whom died while hospitalized. Three of the five incidents were due to suicide. Two of the three suicides involved ingestion of pesticides (an herbicide and suspected insecticide), while the third suicide involved mixing pesticides with household cleaners to produce a lethal gas. This method, referred to as detergent suicide, has sparked much discussion in emergency response and occupational health literature in recent years. Of the remaining two non-suicide related fatalities, one man died after he drank juice unknowingly spiked with paraquat by a friend playing a prank. He vomited blood, had difficulty breathing, and was visibly jaundiced. He developed pulmonary fibrosis and died after an undetermined amount of time in the hospital. The other involved a man with Alzheimer's Disease, who was found dead after entering a tarped home that was being fumigated with sulfuranyl fluoride. A structural pest control operator noticed a section of a sealed tarp had been

tampered with. When he investigated, he found the man dead on the sofa. He was last seen near the treatment site and apparently ignored warnings to leave the area.

Tabular summaries presenting different aspects of the data are available online at <http://www.cdpr.ca.gov/docs/whs/pisp.htm> or by contacting the WHS Branch at (916) 445-4222.

Appendix I: Acronyms

CAC	County Agricultural Commissioner
CDPH	California Department of Public Health
CPCS	California Poison Control System
DFROII	Doctor's First Reports of Occupational Illness and Injury
DIR	Department of Industrial Relations
DPR	California Department of Pesticide Regulation
HIPAA	Health Insurance Portability and Accountability Act
NIOSH	National Institute for Occupational Safety and Health
OEHHA	Office of Environmental Health Hazard Assessment
PIR	Pesticide Illness Report
PISP	Pesticide Illness Surveillance Program
REI	Restricted Entry Interval
SENSOR	Sentinel Event Notification System for Occupational Risk
U.S. EPA	United States Environmental Protection Agency
WHS	Worker Health and Safety Branch