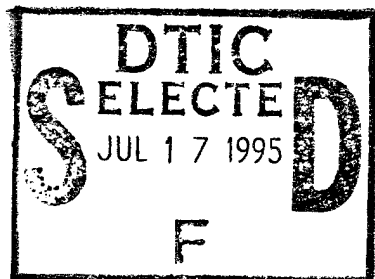


GAO

Report to the Chairman, Committee on  
Agriculture, Nutrition, and Forestry,  
U.S. Senate

December 1993

# PESTICIDES ON FARMS



## Limited Capability Exists to Monitor Occupational Illnesses and Injuries



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**Program Evaluation and  
Methodology Division**

B-254469

December 15, 1993

The Honorable Patrick J. Leahy  
Chairman, Committee on Agriculture,  
Nutrition, and Forestry  
United States Senate

Dear Mr. Chairman:

In response to concerns regarding potential adverse health effects from the occupational use of pesticides on farms, your committee requested that we conduct a study to determine the extent to which government programs and regulations protect farmers and farmworkers from unnecessary pesticide risks. In particular, you asked that we examine what mechanisms exist at the federal and state levels to determine the nature and extent of illnesses associated with occupational exposure to pesticides on farms.

Pesticides are designed to be toxic to some forms of life and often have the potential to cause adverse effects in a number of nontarget species, including humans. The Environmental Protection Agency (EPA) is responsible for ensuring that, when properly used, a pesticide does not pose an unreasonable risk to human health or the environment. To determine potential health effects and exposures, EPA conducts risk assessments of pesticide products, based largely on laboratory tests and field trials of pesticides. It is also important, however, to monitor for illnesses associated with the use of pesticides in order to identify potential problems, track trends over time, determine population groups at risk, evaluate the effectiveness of both risk assessment and risk reduction practices, and target interventions where necessary.

We organized our review of federal and state pesticide-related illness monitoring capabilities around the following general evaluation questions:

1. What monitoring systems and other data sources provide information on pesticide-related illnesses that occur in the farm sector?
2. What are the strengths and weaknesses of these monitoring systems and data sources, and how comprehensive is the information they provide in terms of kinds of health effects, population subgroups, pesticides, and geographic coverage?

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3. Does the information provided by these systems provide a basis for making reliable national estimates of pesticide-related illnesses that result from occupational exposure to pesticides on farms?

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## Background

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### Pesticides and Pesticide Exposure

Significant gains in agricultural productivity and output have resulted from the use of pesticides. However, these gains have not occurred without some increase in risks to the environment and to the health and safety of consumers and farmworkers. While potential consumer exposure to low levels of pesticide residues in drinking water and food has been the focus of concern in recent years, much less attention has been focused on the risks associated with occupational exposure to pesticides in the farm sector, despite the fact that farmworkers face potentially greater and more direct exposure from handling pesticides and working in fields where pesticides have been used.

The national estimates of farmers, farmworkers, and their families potentially exposed to pesticides range from 3.2 to 4 million people. Such exposure is either direct, through application activities (mixing, loading, flagging, and equipment maintenance operations), or indirect, from contact with residues on treated crop fields. EPA currently estimates that there are at least 20,000 illnesses associated with the occupational use of pesticides on farms each year in this country. Others have published estimates placing the number as high as 300,000.

The risks associated with pesticides and their uses vary because different pesticides have different levels of toxicity and different rates of breaking down, and some degrade into different substances that may be more or less toxic than the original substance. Certain agricultural practices also can place workers at different levels of exposure risk (for example, cultivating a field by tractor versus harvesting a crop by hand). In addition, the effects of pesticides are often influenced by environmental factors; some pesticides used in humid areas, for example, act differently when used in dry areas. Furthermore, pesticide exposure incidents can occur through accidents, misuse of pesticides, or lack of awareness of pesticide hazards. However, some representatives of farmworker organizations and health professionals have also expressed concern that even when certain

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pesticides are used properly (according to label instructions), farmworkers and applicators still face risks that can result in illnesses.

Pesticide exposure can lead to a diverse set of adverse health effects depending on the characteristics of the pesticide, the dose absorbed, and the physiological reaction of the individual affected. Health effects from pesticide exposure may follow from short- or long-term exposure and from low or high level exposure. Major routes of exposure include skin contact, inhalation, and ingestion. Some pesticides are highly toxic, with a few drops causing extremely harmful effects; other pesticides are less toxic, although too much exposure to them can also cause harmful effects. Effects can include acute symptoms that may appear within minutes or hours after exposure to pesticides and range from relatively mild headaches, fatigue, skin rashes, eye irritation, and general flu-like symptoms, to more serious first or second degree chemical burns, paralysis, and even death.

Chronic and delayed onset illnesses such as cancer, which may only appear years after repeated exposure to small doses of pesticides, can also occur. For example, there is a growing body of evidence, compiled mainly from retrospective epidemiological studies, suggesting that farmers experience an excess of several cancers, particularly non-Hodgkin's lymphoma. The strongest link to date from these studies is with certain pesticides: One study estimates that the incidence of non-Hodgkin's lymphoma among men exposed to a particular herbicide for more than 20 days per year may be as high as six times the incidence rate among those not thus exposed.<sup>1</sup> In addition, there is growing concern, but less knowledge, about possible reproductive, neurological, and immunotoxic effects of pesticide exposures.<sup>2</sup>

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## Federal Roles and Responsibilities

Under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended, EPA has responsibility for regulating the sale and use of pesticides. Included in its mandate, EPA has the responsibility for protecting agricultural workers and others from unreasonable adverse effects of pesticides. FIFRA defines pesticides, for the most part, as (1) any substance or mixture of substances intended for preventing, destroying,

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<sup>1</sup>Sheila K. Hoar, et al., "Agricultural Herbicide Use and Risk of Lymphoma and Soft Tissue Sarcoma," *Journal of the American Medical Association*, 256 (September 5, 1986).

<sup>2</sup>Scott R. Baker and Chris F. Wilkinson (eds.), *Advances in Modern Environmental Medicine*, Vol. XVIII, *The Effects of Pesticides on Human Health* (Princeton: Princeton Scientific Publishing Co., 1989).

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repelling, or mitigating any pest, and (2) any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.<sup>3</sup> FIFRA requires that EPA balance pesticide risks and benefits, including the economic, social, and environmental costs and benefits of pesticide uses. To accomplish this, EPA conducts a risk assessment to determine the hazards associated with a pesticide and its uses, as well as the risk reduction practices that may be necessary. FIFRA also requires the reregistration of existing pesticides originally registered years ago under standards and test data requirements far less stringent than today's. As of 1992, there were approximately 640 pesticide-active ingredients requiring reevaluation. According to EPA, the reregistration process may not be completed until the year 2006. Enforcement of pesticide regulations is generally carried out by state regulatory agencies through cooperative agreements with EPA.

EPA established a process in the early 1980's to evaluate the effects of selected pesticides that may present occupational exposure hazards. The process is built into EPA's larger risk assessment responsibilities pertaining to new registrations, reregistrations, and special reviews of pesticides. EPA's method for assessing occupational exposure involves, first, a review of a pesticide's toxicity based on animal test data submitted by the manufacturer. If certain acute toxicity and/or other health effects are identified, then EPA requires and reviews both crop residue and worker exposure data collected from field trials. These data are intended to provide a reasonable estimate of the amount of pesticide residue transferred to workers under harvesting or other work conditions. Based on such a review, EPA may establish risk management practices such as field reentry interval restrictions or protective clothing requirements for field workers.

In August 1992, EPA promulgated new worker protection standards to reduce the risks of illnesses and injuries from pesticide exposure. The standards provide generic risk reduction practices that cover all pesticide handlers and workers involved in the cultivation and harvesting of crops where pesticides are used. The standards' main features include: (1) restrictions on entry by workers into all pesticide-treated areas for 12 to 48 hours (72 hours for certain cases), depending on pesticide toxicity; (2) use of personal protective equipment for persons handling pesticides and for persons who must enter treated areas before expiration of reentry intervals; (3) training for agricultural employees regarding pesticide hazards; (4) provision of information to workers about pesticides being

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<sup>3</sup>FIFRA, sec. 2(u).

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applied; (5) availability of washing facilities for workers; (6) availability of emergency assistance to treat worker illness or injury; and (7) notification to workers concerning areas that are being treated or are under a reentry interval.

FIFRA also mandates that EPA establish procedures for monitoring the incidental exposure to pesticides of humans, animals, and the environment. The act further specifies that such monitoring should include, but not be limited to, the quantification of incidental human and environmental pesticide pollution and their trends over time, as well as the identification of the sources of contamination and their relationship to human and environmental effects. EPA is also required under FIFRA to formulate and periodically revise, in cooperation with other federal, state, and local agencies, a national plan for monitoring pesticides.

Pesticide-related illnesses resulting from the use of pesticides on farms can also be considered as occupational health and safety matters. However, the Occupational Safety and Health Act of 1970 (OSHA), which provides industrial workers with certain rights and protection, has limited application to agricultural farming operations.<sup>4</sup> Agricultural workers protected by OSHA regulations, such as the Hazard Communication Standard, which requires the provision of information and training on chemical hazards in the workplace, and the Field Sanitation Standard, which requires the provision of sanitary drinking and hand washing facilities in the workplace, are also afforded similar protection by EPA's new worker protection standards. Other OSHA regulations that require the reporting of incidents involving death or multiple hospitalizations that result from occupational accidents, including exposures to hazardous chemicals, are not covered by EPA standards.

The National Institute for Occupational Safety and Health (NIOSH) has developed and implemented surveillance projects pertaining to selected occupational health problems since 1970. As part of its efforts, NIOSH has sponsored the Sentinel Event Notification System for Occupational Risks (SENSOR) program since 1987 through a series of cooperative agreements with 10 states. A key objective of the SENSOR program is to encourage the development, implementation, and evaluation of state-level surveillance systems in order to identify targeted occupational-related illnesses and, through follow-up, to implement prevention measures. Four states—California, New York, Oregon, and Texas—have had SENSOR

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<sup>4</sup>An annual appropriations restriction limits the expenditure of OSHA funds so that the act applies to a farming operation only if it employs more than 10 workers and maintains a temporary labor camp.

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programs that included a major focus on the adverse health effects associated with pesticide exposure in the farm sector.

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## Objectives, Scope, and Methodology

Our study sought to identify and review all federal and state government monitoring systems, as well as other data sources that provide information on pesticide-related occupational illnesses that occur in the farm sector. We focused specifically on farm-related pesticide exposure cases that affect farmers, farmworkers (including, but not limited to, migrant and seasonal workers) and others who handle pesticides on farms. We excluded cases that occurred in other work areas, such as nurseries, greenhouses, forestry sites, and golf courses, or that resulted from residential exposure.

States delegate the responsibilities for pesticide regulation and related activities to different agencies (for example, departments of agriculture, of health, and of environmental protection). Therefore, our principal method was to survey each state's departments of agriculture and health (or their equivalents) for information on (1) systems that monitor the potential health risks associated with the occupational use of pesticides on farms; (2) rules, regulations, and statutes regarding monitoring systems; and (3) data these systems might have produced. The survey achieved a 100-percent response rate.

We asked the states how information was collected, compiled, and reported; how comprehensive available monitoring information was in terms of the coverage of different health effects, pesticides, farm subpopulation groups, and geographic areas; how incidents were reviewed to determine whether an illness was in fact related to a pesticide exposure; how information was reported and used for policy making purposes; what the quality was of available data and of estimates of the nature and extent of pesticide-related health problems; and whether there were any promising practices that might produce more accurate and reliable information. We also asked states to provide copies of relevant laws and regulations, as well as other written materials describing these reporting requirements and systems. In addition, we contacted several states with follow-up questions and requests for information.

Our second method was the in-depth case study. We supplemented our survey of states with case studies of California, a state with a large number of farmworkers and extensive experience in monitoring pesticide

illnesses, and New Jersey, a state that has tried to expand its monitoring efforts.

A third method involved conducting interviews. We spoke with federal and state agriculture, public health, and environmental officials, as well as farmers, farmworkers, and migrant-worker health care specialists.

Still a fourth method involved completing an information synthesis to identify what other data sources existed. Finally, we sought out promising practices in the monitoring of illnesses associated with occupational exposure to pesticides on farms. We conducted our review in accordance with generally accepted government auditing standards between January 1992 and March 1993.

## Summary of Results

We found that a number of national and state level reporting systems, surveys, and other data sources provided some information about acute pesticide-related illnesses that occur in the United States. However, except for special research studies, none addressed delayed onset or chronic health effects. Moreover, with the exception of the California state monitoring system, all were quite limited in coverage, comprehensiveness, and quality of information. As a result, there was no capability to accurately determine the national incidence or prevalence of pesticide illnesses that occur in the farm sector. Without a valid and reliable means of monitoring, there is no way to identify problems that may occur with the different uses of pesticides or determine whether risk assessment and management practices are effective in preventing hazardous exposure incidents.

At the national level, EPA has relied for many years on informal, voluntary reporting from state and local entities. This has resulted in sporadic and incomplete reporting of a limited number of exposure incidents. EPA has also used existing national surveys and other data sources—including the Consumer Product Safety Commission's National Electronic Injury Surveillance System, Colorado State University's Survey of Pesticide Poisonings, and the national database of the American Association of Poison Control Centers (AAPCC)—as means to collect information on the nature and extent of pesticide-related illnesses that occur in the nation.

These sources provide some useful indicators of egregious cases that involve hospitalization or emergency room treatment; however, such cases of pesticide poisonings among the general population are statistically rare

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events and, as a result, sample size and representativeness tend to be problems in these surveys. In addition, these surveys tend to underrepresent rural areas and lack detail about pesticides, work activities, and other information necessary for surveillance and monitoring purposes. Currently, EPA relies heavily on the pesticide illness data collected by the California monitoring system to gauge estimates and has tried to encourage selected states to develop monitoring systems modeled after the California system.

At the state level, we found that 25 states had mandatory requirements for the reporting of illnesses that might result from occupational exposure to pesticides on farms. The majority of these states (17 out of 25), however, considered pesticides in the context of broader reporting requirements that encompassed occupational, communicable, and/or environmentally related diseases. Reporting requirements, for the most part, have not been implemented in these states, and few, if any, illnesses involving pesticides have been reported.

A small number of states (8 out of the 25) had established mandatory requirements and procedures for the specific reporting of pesticide illnesses. These states relied on two levels of case recognition and reporting discretion. First, farmworkers and other groups must recognize illnesses that occur and seek out medical treatment by health care professionals. Second, health care professionals must diagnose the illnesses and subsequently report them to state officials.

California had by far the most effective and well-established monitoring system in place, providing detailed information on various pesticide illnesses that occur in the state. Information on cases is given by occupation, geographic location, pesticide type, and medical treatment, as well as by the strength of evidence linking the illness to pesticide use. Data are gathered through multiple sources, including interviews with patients and witnesses conducted through the offices of the county agricultural commissioners. In 1990, a total of 2,995 cases were reported in the monitoring system, of which about two thirds were classified as being possibly to definitely related to pesticide exposure. California has over 40 years of experience in monitoring pesticide illnesses, and has used its reporting information effectively for assessing pesticide risks and implementing risk reduction measures. The other states with a specific reporting requirement have considerably less experience in monitoring, and their less developed systems are not yet either widely used by health

care professionals or fully implemented in terms of data collection and analysis.

In general, state officials indicated to us that, to a large degree, underreporting is a serious problem with existing monitoring systems. These officials identified the following set of factors that cause underreporting: (1) the difficulties that farmworkers have in recognizing and identifying symptoms associated with pesticide-related illnesses, (2) the failure and/or inability of farmworkers to obtain health care, (3) the lack of adequate training of health care professionals in the awareness and diagnosis of pesticide-related illnesses, and (4) the unfamiliarity of health care professional with state reporting requirement and/or their unwillingness to report cases to state officials. Officials also indicated that, even when reports are made, it is frequently difficult to verify incidents and determine what caused them because of the delay in reporting and the lack of information about the circumstances of the illnesses.

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## Principal Findings

Our responses to evaluation questions 1, 2, and 3 are provided in the following sections, with the information organized both by level (that is, state or national) and by type of data or monitoring system.

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### National Level Monitoring Systems and Other Data Sources

We found several surveys and data sources that provide various types of information at the national level on agricultural health, occupational exposure, poisonings, and pesticide use. However, only a limited number provide any information on pesticide illnesses. These sources are discussed in the next three sections of our report.

### EPA Efforts and Programs

EPA has relied on voluntary reporting of pesticide exposure incidents since the early 1970's. In 1978, EPA implemented a formal Pesticide Incident Monitoring System (PIMS) to coordinate and collect information on the adverse effects of pesticide use. PIMS reports originated from various state and local agencies, poison control centers, health clinics, hospitals, and other sources, on a voluntary basis. From the early 1970's through 1981, when PIMS was ended due to funding cuts, approximately 65,000 incident reports were filed with EPA. About 60 percent of the reported cases involved human exposures; the remainder involved environmental and wildlife exposures.

The level of reporting that occurred under PIMS is unknown. EPA officials believe, however, that due to the voluntary nature of the system and the

fact that reports were totally lacking from some agricultural states, there was significant underreporting of incidents occurring across the nation. The quality of reports received by EPA also varied, ranging from mere allegations to well-confirmed cases. In addition, sufficient detail about the circumstances of individual exposure incidents was often lacking. Without information about the pesticides, crops, and application methods involved in exposure incidents, there was no basis for assessing whether new or revised regulatory measures were needed.

Although EPA has continued to receive voluntary reports of pesticide incidents since the elimination of PIMS, the level of reporting declined as less emphasis and funding were devoted to monitoring efforts. In 1991, EPA developed a formal management information system called the Incident Data System (IDS) in order to organize and track incoming pesticide incident reports originating from both voluntary sources and pesticide registrants, including manufacturers. (The latter are required under section 6(a)(2) of FIFRA to report known adverse effects involving registered products.) IDS was designed to organize and track data into a centralized computer system. Since IDS became operational in June 1992, EPA has received about 3,500 incident reports, including 1,600 involving human exposure.

In the mid-1980's, EPA acknowledged that a voluntary reporting system such as PIMS could not provide valid or reliable information on the magnitude and character of pesticide exposures nationwide. EPA explored a number of other strategies, with assistance from the Research Triangle Institute, to improve data collection on pesticide exposure incidents. These efforts included making greater use of state monitoring information supplementing existing national hospital surveys to increase coverage of pesticide incidents, providing technical assistance to poison control center officials to improve the uniformity and accuracy of data reporting, and determining the feasibility of having the Centers for Disease Control include pesticide poisonings as part of their ongoing surveillance of public health conditions.

EPA concluded that making use of existing surveys, particularly the Consumer Product Safety Commission's (CPSC) National Electronic Injury Surveillance System (NEISS) and the National Center for Health Statistics' National Hospital Discharge Survey (NHDS), and supplementing them with additional data collection specific to pesticides as well as increasing coverage of hospitals in rural areas, would be more cost effective than initiating a new data collection system. However, funding was never

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allocated by EPA to expand data collection and coverage of hospitals in rural areas, and the agency has not collected hospital emergency room data since 1987.

## National Hospital and Emergency Room Surveys

Three different national survey efforts have provided information on pesticide-related illnesses treated in hospitals: NHDS, NEISS, and the Colorado State University Surveys on Acute Pesticide Poisoning. EPA has relied on data from the latter two surveys.

NHDS is an ongoing national survey that provides statistics on the use of short-stay hospitals and the characteristics of patients who use these services. Conducted by the National Center for Health Statistics, NHDS has been used to collect data since 1964. The data set for 1990 included 266,000 medical cases for 474 hospitals, covering all 50 states and the District of Columbia. Cases are coded using the International Classification of Diseases. Those cases coded for pesticide-related illnesses were too few in number to project national estimates for incidents related to agricultural occupational use.

NEISS is an ongoing annual national survey of hospitals conducted by CPSC. The survey uses a probability sample of hospital emergency rooms to collect data on all types of consumer-product-related injuries treated in hospital emergency rooms. In 1978, EPA contracted with CPSC to have additional information about pesticide-related illnesses collected. However, this agreement was terminated in 1987 due to funding limitations. Based on the NEISS data, it was estimated that about 18,000 pesticide-related cases were seen in emergency rooms in 1992; 58 percent of these cases involved children under the age of five. Only four cases involving the occupational use of pesticides on farms were reported, which was too small a number to establish a national estimate. According to CPSC officials, as of January 1994, NEISS will no longer include data on pesticide-related illnesses in its overall data collection effort.

Pesticide illnesses that require hospital treatment are relatively rare events in the general population and are difficult to identify in a national survey such as NHDS, which covers all types of hospitalizations. EPA funded Colorado State University to conduct three retrospective national surveys specifically designed to identify hospital-admitted cases of pesticide-related illness. The surveys, covering the years 1971-73, 1974-76, and 1977-82, examined discharge records from a sample of general hospitals nationwide. The latest survey, covering the years 1977-82, identified an average of 2,850 hospitalized pesticide illness cases occurring

each year; of these, 814 involved occupational exposures by subpopulations, including farmers, farmworkers, commercial applicators, and others.

The NEISS and Colorado surveys have been able to provide some useful estimates of those pesticide illnesses treated in hospitals; however, both were limited in terms of identifying agriculturally-related cases and collecting sufficient detail about reported cases. NHDS, as currently designed, is even less effective in identifying pesticide cases of any kind. Cases are likely to be omitted where symptoms that are probably or possibly pesticide-related are not identified or coded as pesticide-related. This is a major problem with NHDS and to a lesser extent with the NEISS and Colorado surveys. (Previous reviews of NEISS data have revealed that from 15 to 50 percent of eligible cases were missed.) A further weakness of hospital-based surveys, of course, is that they cannot identify pesticide-related cases that are treated in other types of facilities, such as medical clinics or physicians' offices. These cases may also include serious pesticide illnesses.

#### National Poison Control Center Data

The American Association of Poison Control Centers (AAPCC) maintains a national data collection system containing information on the frequency and characteristics of poisoning incidents voluntarily reported to regional and local poison control centers. Centers are usually affiliated with community or university hospitals and provide poison information, consultation, and outreach to health professionals and the general public. In 1991, AAPCC compiled data from 73 participating poison control centers, representing coverage of about 80 percent of the nation's population. A total of 1.6 million accidental human exposures to poisons were reported in the database in 1991. Of this total, there were 75,335 accidental exposures to pesticides recorded; about 30 percent of these were listed as being treated in a health care facility.

The AAPCC database thus provides information on individuals who were possibly poisoned by pesticides or other substances. Some information is collected on the nature of the exposure (for example, poison involved, route of exposure, and symptoms); however, specific coding for agriculture is not reported in the database. In addition, not all poison control centers participate in the AAPCC database. States covered in the database vary by year, depending on whether the state has a poison control center, whether the center participates in the data collection effort, and whether the data submitted by the center meet the AAPCC data quality criteria. There is currently only partial or no reporting from 15

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states, many of which are largely agricultural in character. Thus, although the AAPCC data can provide useful indicators of general product safety and characteristics of poisonings, the data do not provide a reliable estimate of occupational, agricultural pesticide poisonings occurring in the United States.

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## State Level Monitoring Systems and Other Data Sources

### State Reporting Requirements

Based on our survey results, 25 of the 50 states have a statute or regulation that requires the reporting of pesticide illnesses that occur. In addition, respondents from seven other states (Idaho, Illinois, Louisiana, North Carolina, North Dakota, South Dakota, and Vermont) indicated that, although no formal requirements exist, their states had set up a process to encourage voluntary reporting.

Seventeen of the 25 states include pesticide illnesses as part of general reporting requirements for environmental, occupational, and/or communicable diseases. In these states, pesticide illnesses are usually defined as reportable events along with a variety of other illnesses or diseases that are deemed to be of public health importance. For example, in those states that require the reporting of illnesses that may result from exposure to toxic substances, pesticides are listed along with lead, asbestos, mercury, and several other organic chemicals and heavy metals. However, officials in these states indicated that very little, if any, reporting of pesticide illnesses had occurred.

The other 8 of the 25 states (Arizona, California, Florida, Iowa, New York, Oregon, Texas, and Washington) have established mandatory reporting regulations that are specific to pesticide illnesses. Some of these states in turn have implemented some pesticide monitoring capabilities, although California is currently the only state with a well-developed monitoring system. Most of the monitoring states only began to develop systems in the late 1980's and do not yet have the reporting structure or resources in place for the effective monitoring of pesticide illnesses.

California's system, which was begun more than 40 years ago and is now under the state's Environmental Protection Agency, is unique in several ways. First of all, California has two methods in place for receiving reports

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of pesticide illnesses. Through one method, reporting is linked to the state's workers' compensation system. Workers injured on the job are eligible to receive compensation benefits from the state when medical documentation of the injury is provided. Physicians who treat workers for injuries under the program are required to file a report with the state government in order to be reimbursed for services. This arrangement should encourage physicians to report cases. Under the second reporting method, physicians are required to report any health condition they believe is related to pesticide exposure.

California has an extensive process set up to collect, review, and investigate reports. Staff from offices of the county agricultural commissioners conduct follow-up work to document and evaluate the circumstances and possible causes of reported exposures. Information on the date and place of the incident, type of exposure, pesticide product involved, work activity, and a determination of the likelihood that the illness was due to pesticide exposure, are compiled from the physician's report and the follow-up investigation and fed into a central, computerized database. California officials have analyzed and reported these data in many formats over the years and have used the data to identify and track problems (for instance, with specific pesticides or agricultural work practices) and, in some cases, to develop new risk-reduction measures. For example, the reporting data have been used to revise worker field reentry intervals for pesticides such as methomyl. A designated tax based on pesticide purchases in the state helps fund the monitoring system.

Generally, the mechanisms for reporting pesticide illness cases are similar for the eight states that have a specific reporting requirement. The states typically require that health care professionals (that is, individual physicians, hospitals, clinics, and laboratories) identify and report cases of suspected pesticide illnesses. Reporting is to be done by phone or written form to the responsible state agency (that is, agriculture, health, or environment). Depending on the state and the level of severity of the case (for example, whether hospitalization occurs), reporting is required anywhere from immediately to 60 days after the illness is identified.

State agencies have required that reports should include basic information about the nature of the pesticide exposure and the illness that resulted. Officials from these states also told us that some follow-up actions, such as on-site inspections, interviews, and review of available documentation, are taken upon receiving reports of pesticide illnesses. Officials pointed out, however, that the extent to which cases can be investigated and

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verified is hampered by insufficient funding for staff and travel, as well as by reports that contain incomplete information and delays that occur in receiving reports from physicians and others.

Officials from the eight states with specific pesticide reporting requirements provided us with the most recent summary information available on the number of pesticide-related illnesses that occurred in their states. In California, a total of 2,995 illness and injury cases were identified in 1990 as potentially resulting from pesticide exposure. Of this total, 1,987 were classified as definitely, probably, or possibly related to pesticide exposure, 580 of which resulted from agricultural occupational use. The other states identified substantially fewer pesticide illness cases, ranging from a total of only 14 cases identified in Texas for 1991, to about 300 cases identified in Washington for that same year.

Although no state respondents were able to provide quantified estimates of the extent to which underreporting occurs, all eight of the states with specific pesticide reporting requirements believed it was a problem. Arizona, the only state to submit an audit report of its reporting system, found that its system was of limited value because very few cases of pesticide illness were reported. Although 48 cases of illness were recorded by the reporting system from early 1987 through mid-1989, investigators identified a large number of cases that were not reported to the state system. These included 35 cases treated by health care professionals in Mexico and 49 complaints of pesticide-related health effects reported to other agencies in the state.

There are many factors, largely pertaining to the discretionary nature of reporting by patients and physicians, that contribute to problems of underreporting, according to state agency officials. These officials reported that farmworkers often do not seek medical attention for a variety of reasons, including intimidation by employers, lack of available health care, unawareness of symptoms associated with pesticide illnesses, and a reluctance to incur financial losses by taking the time away from work required for reporting. State officials also noted problems among health care providers in the recognition, identification, and diagnosis of symptoms resulting from pesticide exposures. Furthermore, they pointed out that health care professionals are often unaware of state reporting requirements or simply do not take the time to file reports.

In short, based on these responses, it appears that both levels of discretion in these systems may work together to increase opportunities for

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underreporting. That is, the reliance on patients' reporting to health care professionals as a way to input the monitoring systems can fail because patients don't recognize their problem or don't report it. Health care professionals can also fail to report cases brought to their attention if they do not recognize or identify the problem as pesticide-related or simply neglect to file a report. Thus, for the system to produce more accurate totals, monitoring policy needs to target awareness and ease of reporting at both of these levels.

## SENSOR Projects

Three states—California, Oregon, and Texas—began SENSOR projects in 1987 that focused on the health effects of pesticide exposure. A fourth state, New York, initiated a similar program in 1990.

California. The goals of the California SENSOR project were to improve the accuracy and level of reporting under the existing monitoring system and, based on case follow-up with patients and investigations of worksites, to recommend measures for reducing occupational exposures to pesticides. A three-county area comprising Fresno, Madera, and Tulare counties was selected for the project. Participant health care providers were selected on the basis of (1) the likelihood that they would see significant numbers of cases, (2) geographical distribution throughout the county, and (3) patient population diversity. Participant providers included four occupational health care practices, three community hospital emergency departments, a rural health care center, a community health clinic, and the county health department.

A total of 230 cases were reported to the California SENSOR project between October 1988 and December 15, 1991; of these, 189 were occupational exposure cases. Forty-three percent of those cases deemed "definite," "probable," or "possible" involved agricultural occupations. Based on this reporting, it appears that the existing state system for reporting acute pesticide illness was reasonably sensitive in identifying most cases of acute pesticide illness that reached a physician for medical care. However, the project also identified workers with pesticide illnesses who reported coworkers with symptoms of pesticide illnesses who did not seek medical care, thereby suggesting that, once again, not all cases were being reported to the state monitoring system.

Oregon. The Oregon SENSOR project was undertaken to develop an active reporting, investigation, and follow-up system in the state. Oregon had no mandatory reporting system prior to 1987 when the SENSOR effort began, although state agencies did receive voluntary reporting of pesticide

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illnesses from various sources. Under SENSOR, state officials conducted education and outreach to inform health care providers of the state reporting requirements and improve their awareness of pesticide-related illness symptoms, as well as to provide pesticide safety information to farmers and farmworkers in the state. In addition, a case management information system was set up for data entry and analysis purposes.

Efforts of the Oregon SENSOR project resulted in reports of 109 agricultural occupational-exposure pesticide poisonings between July 1987 and December 1991. Reports originated from physicians directly, Oregon's poison center, local and state health departments, or the Pesticide Analytical and Response Center (PARC). The Oregon SENSOR project increased awareness and reporting of pesticide illness cases among physicians in the state. However, its ability to identify and confirm cases, particularly among migrant workers, was limited. SENSOR project staff estimated that fewer than one half of all acute pesticide-related illnesses in the state were being reported.

Texas. In 1986, the Texas Department of Health received only two reported cases of an occupational-exposure pesticide illness. The SENSOR project was begun to encourage reporting by health care providers. Information about the state reporting requirements and pesticide-related illness symptoms was sent to health care providers in selected agricultural areas of the state. This contributed to an increase in reported cases. A total of 132 pesticide illness cases were reported during the period 1987-91; however, one third of these cases involved a cluster of 44 individuals identified from a newspaper article.

As part of its SENSOR project, the Texas Department of Health initiated a special study to investigate the extent of apparent underreporting of cases and to attempt to identify barriers to reporting. A nine county area in the major agricultural region of the Texas panhandle was selected for study. The study used three data gathering methods to ascertain cases for 1989 and 1990: a review of surveillance data from the Texas Department of Health, a review of hospital emergency room and discharge data, and a mail survey of physicians. The study concluded that the number of occupational pesticide poisonings identified for the nine-county area were underreported by at least a five-fold ratio for 1989 and 1990. The study also identified some barriers to reporting, including the reluctance of health care providers to address occupational health problems, the difficulty of tracking migrant workers who often seek medical care in Mexico, and the

perception in the agricultural community that government programs such as SENSOR are intrusive.

New York. In New York, SENSOR funding did not directly support efforts to develop and implement pesticide illness reporting and follow-up until 1992. However, the SENSOR surveillance model was used by state officials in establishing New York's pesticide registry, which requires reporting by physicians, hospitals, health clinics, and laboratory facilities.

### State Level Hospital Surveys

Officials in three states—South Carolina, Nebraska, and New Jersey—reported to us that they used hospital surveys to assess the extent of pesticide illnesses. The Medical University of South Carolina conducted three surveys during the period 1971-87 to identify patients admitted to hospitals in the state for pesticide poisoning. The Nebraska and New Jersey Departments of Health each conducted one state hospital survey; Nebraska's covered the years 1985-89, and New Jersey's the years 1985-92. In all three survey efforts, which were conducted retrospectively, hospital discharge records were reviewed to identify pesticide poisoning cases using the International Classification of Diseases codes. Information on the patient and the circumstances of the pesticide illness (for example, age, occupation, pesticide involved, symptoms, how the exposure occurred, and so on) were collected, if available. However, medical records usually do not contain key data about how and why such incidents occur.

In South Carolina, 312 cases of pesticide poisoning were identified during the period 1983-87. Of this total, 50 (16 percent) involved occupational-exposure cases that were agriculturally related. In Nebraska, hospitals treated a total of 106 cases of exposure to agricultural chemicals between 1984 and 1989. The study did not report how many cases involved pesticides (as distinct from other agrichemicals) or identify those that resulted from occupational exposure. The chemical associated with the largest percentage of cases (33 percent) in the Nebraska study was anhydrous ammonia, the type of commercial fertilizer used most frequently in the state; organophosphate and carbamate insecticides were involved in about 40 percent of the cases identified. The New Jersey hospital survey revealed a total of 390 cases of pesticide poisoning during the period 1985-88. This number included only three cases resulting from the agricultural use of pesticides.

## Making National Estimates Based on National and State Monitoring Systems and Other Data Sources

We found that there currently are no means of establishing valid and reliable national estimates of the nature and extent of pesticide-related illnesses (occurring as a result of occupational exposure to pesticides on farms) based on existing national or state level data sources and monitoring systems. The information provided by current monitoring and data systems is severely limited in terms of the types of illnesses reported, as well as the population subgroups and geographic areas covered.

National level surveys such as NEISS and the Colorado State University pesticide poisoning surveys, as well as information compiled by AAPCC, can provide useful indicators of egregious cases. However, greater coverage and better targeting of pesticide-specific illnesses are needed to improve estimates.

Current state monitoring systems, which are structured around two discretionary levels, require the completion of a four-step process for pesticide illnesses to be reported: (1) farmworkers must recognize an illness as pesticide-related; (2) they must then decide to seek medical treatment from a health care worker (that is, report it); (3) the physician must recognize the illness as pesticide-related (independent of the farmworker's recognition); and (4) the physician must report the illness to the state monitoring system.

However, barriers that exist at each step of the reporting process have limited the effectiveness of state monitoring systems. Farmworkers, for example, are frequently unaware of symptoms that can result from pesticide exposures. Even in situations where they can identify such symptoms, they may not be able to get medical treatment because it is unavailable or because, by doing so, they risk losing work. In addition, physicians and other health care workers often do not correctly identify symptoms as being pesticide-related because they lack awareness and training or because the symptoms themselves are too general and indistinguishable from other causes of illnesses.

Furthermore, health care providers are not always aware of state reporting requirements for pesticide cases or willing to file reports with state agencies. As a result of SENSOR projects and other state efforts, education and outreach programs have begun to increase physicians' awareness and reporting. However, much less education and outreach have been targeted to raising awareness and increasing education among farmworkers.

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Monitoring approaches that rely on the reporting discretion of patients and physicians can work well to identify certain types of pesticide-related illnesses. This is especially true for the more serious exposure cases where the linkage to pesticide exposure is reasonably clear. However, no system as currently designed, including the California system, is able to overcome existing reporting barriers and track the full range of pesticide events that occur. Different approaches and methods of monitoring are needed to address the different types of illnesses, population groups affected, and pesticide use environments.

We urge specific caution in extrapolating national estimates from single state data. No state had solutions for patient and physician underreporting problems (including California, which has extensive worker's compensation support for patient and physician reporting). Despite the overall success of the data management once the incidents are reported to the system, California still reports problems in getting patients and physicians to report.

California is unusual in many ways, providing the most comprehensive event monitoring and surveillance system, as well as the most comprehensive pesticide use management practices, of any state. California has relatively stringent pesticide registration requirements and risk reduction practices that are generally more protective of workers than existing federal requirements. In addition, California has climatic conditions, crops, and farming practices that are unique. Taken together, these factors mean that California data cannot be generalized to other states. However, data from the California monitoring system are important for regulatory purposes at the national level and in fact are used by EPA in conducting pesticide reregistrations and special reviews.

EPA based its estimates of at least 20,000 incidents a year largely on the California data, which is a problematic basis given the just-discussed differences between California and the rest of the nation. Further, although the methods used in generating these national estimates were reasonable, the estimates are highly dependent on data assumptions. EPA considered several ways to extrapolate from the California data to get an estimate of the likely number of physician-diagnosed cases occurring nationwide. These included, for example, extrapolations based on ratios of the percent of the agricultural workforce employed, the level of agricultural pesticide expenditures, the amount of insecticide used on agricultural crops, and the number of hospitalized occupational pesticide poisoning cases occurring in California versus the nation. EPA chose the

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ratio of the number of hospitalized cases in California and the nation (which was derived from the Colorado State University hospital surveys) as the most plausible basis to estimate the number of physician-diagnosed cases for the nation. EPA acknowledged, however, that there are “no hard data” to support the assumption that the ratio of hospitalized cases to physician-diagnosed cases in California is the same for the nation. Further, the agency also acknowledged that its estimates do not include the number of incidents for which medical treatment is not sought or for which medical diagnosis is not made, and that the number of such incidents is very likely to be large.

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## Conclusions

FIFRA charges EPA with (1) the determination of potential risks associated with the use of pesticides and the development of practices to mitigate these effects, and (2) the establishment of systems to monitor adverse health effects that may result from the actual use of pesticides. Together, these two tasks should provide a means of anticipating and preventing adverse effects, as well as a system of checking the effectiveness of the methods of prediction and intervention.

Successful risk assessment and risk reduction practices should result in fewer exposures; however, poor incident monitoring would also lead to the same apparent result insofar as a large proportion of incidents remained unidentified. It is therefore extremely important to check on both the compliance with risk management and the quality of monitoring to understand whether estimates reflect successful prevention or underreporting of pesticide events. In view of the foregoing, we believe that the number of reported incidents cannot be used to indicate either the nature or the extent of events actually occurring, nor can they form the basis for national estimates.

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## Matters for Congressional Consideration

Having some means to monitor pesticide-related illnesses that occur is necessary to be able to identify potential problems, look at trends over time, determine population groups at risk, and evaluate whether risk assessment and risk reduction practices are effective. This is especially important given the slow progress to date with efforts to reregister many of the older pesticides currently in use. We found that very little capability exists at the national or state level to address these needs. This is primarily due to the levels of discretion that exist in most reporting systems, the problems of underreporting they generate, and the general tendency of

monitoring systems to rely only on reporting by health care professionals while neglecting farmworkers and others who are potential reporters.

Although the numbers generated from the California data cannot be used as a basis for determining national estimates due to the uniqueness of the state, we believe the system could serve as a technical model for EPA and selected states for monitoring illnesses associated with the agricultural use of pesticides. In addition, we believe that the NIOSH SENSOR models provided some useful strategies to consider in developing state monitoring efforts. However, other approaches to monitoring are also needed to track the full range of pesticide exposure incidents that can occur. A combination of monitoring strategies that use different data sources may provide the best means to achieve improvement. Monitoring strategies of potential utility include hospital-based surveys, illness and injury reporting systems (by health care providers and others), population-based surveys (such as one-time or repeated field studies involving questionnaires and examinations of population subgroups) and exposure surveillance (such as evaluating the extent of farmworker exposure to pesticides).

Given these concerns, the Congress may wish to encourage EPA to increase its efforts to develop better pesticide monitoring capabilities by determining (1) where greater monitoring efforts are needed, given the diversity that exists across the nation in the types of health effects and circumstances of exposures; (2) what methods are most effective and appropriate for monitoring pesticide illnesses; (3) what resources would be required to design, implement, and maintain monitoring strategies; and (4) what types of technical and other assistance should be provided to selected states and other organizations to implement improved monitoring systems.

EPA and the Department of Agriculture provided oral comments on a draft of our report. Both agencies agreed in general with our findings and conclusions. They also provided technical comments, which we have incorporated in our report.

As we agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of this letter. We will then send copies to the Administrator of EPA and to others who are interested.

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If you have any questions or would like additional information, please call me at (202) 512-2900 or Kwai-Cheung Chan, Director of Program Evaluation in Physical Systems Areas, at (202) 512-3092.

Sincerely yours,

A handwritten signature in cursive script that reads "Eleanor Chelimsky".

Eleanor Chelimsky  
Assistant Comptroller General

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**Abbreviations**

AAPCC	American Association of Poison Control Centers
ADHS	Arizona Department of Health Services
CDFA	California Department of Food and Agriculture
CPSC	Consumer Product Safety Commission
DFRWI	Doctor's first report of work injury
EPA	Environmental Protection Agency
FDACS	Florida Department of Agricultural and Consumer Services
FDHRS	Florida Department of Health and Rehabilitative Services
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
IDS	Incident Data System
ISS	Investigation and Surveillance Section (Arizona)
NEISS	National Electronic Injury Surveillance System
NHDS	National Hospital Discharge Survey
NIOSH	National Institute for Occupational Safety and Health
NYPPR	New York Pesticide Poisoning Registry
ORAI	Office of Risk Assessment and Investigation (Arizona)
OSHA	Occupational Safety and Health Act of 1970
PARC	Pesticide Analytical and Response Center (Oregon)
PIMS	Pesticide Incident Monitoring System
PIRT	Pesticide Incident Reporting and Tracking System (Washington)
PISP	Pesticide Incident Surveillance Program (California)
SENSOR	Sentinel Event Notification System for Occupational Risks

# Summary of State Survey Results for States With General Laws for the Reporting of Pesticide-Related Illnesses and Injuries

## Introduction

As part of our review, we surveyed all 50 state departments of agriculture and health (or their respective equivalents). Our survey achieved a 100-percent response rate.

We asked respondents to our survey whether their states had any laws, either general or specific, or voluntary systems in place with regard to the monitoring and surveillance of pesticide-related illnesses. We also asked the respondents to describe (1) the laws and systems they had in place, (2) the initial-event reporting process, and (3) agency follow-up and response. We also asked our respondents to provide any data summaries generated by their systems on these events. We further asked respondents to provide documentation for the policies and procedures in place, as well as any studies describing the effects of the collected data on pesticide management strategies.

Twenty-five of the 50 states reported having laws or regulations requiring the reporting of pesticide-related illnesses. The remaining 25 states reported having no such laws or regulations in place.

Pesticide-related illnesses were reportable events, under general reporting categories, in 17 of the 25 states. These categories included occupational hazards or occupationally related illnesses; communicable diseases; toxic exposure, chemical; and heavy metal poisoning substances or environmental hazards.

Pesticide-related illnesses were reportable events in 8 of the 25 states under reporting categories specific to pesticide use, including either specific pesticide-related health events or specific pesticide-user violations. None of the 25 states had either reporting requirements or reporting efforts specific to illnesses associated with the occupational exposure to pesticides on farms.

We discuss states with general reporting requirements in this appendix and states with specific reporting requirements in appendix II. However, we have included data for all mandatory reporting states in the tables in this appendix. Seven states—Idaho, Illinois, Louisiana, North Carolina, North Dakota, South Dakota, and Vermont—had voluntary reporting efforts. These efforts are not discussed in our report. (We discuss legal citations as reported by the states; we did not verify their accuracy.)

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## Tabular Summary of Survey Results

We summarize our survey results in five tables. These tables include basic descriptions of the laws and efforts in place, recipient agency, timeliness requirements, and states using specific criteria in determining the degrees of certainty to which illnesses are related to pesticide use. We also asked respondents about the information they required, data gathering efforts, and report processing and follow-up procedures.

Respondents indicated they sought information on the pesticides involved, including the EPA registration numbers; symptoms of the illness; type of crop, work, and equipment involved in an incident; cause or suspected cause of illness; date; place; and patient demographics. However, respondents did not indicate what levels of completion their reports typically achieved.

Follow-up procedures reported by respondents included on-site inspection, interviews, and the obtaining of documentation verifying both exposure and medical effects. However, once again, respondents provided no information on the extent to which these procedures were followed and how effective these procedures were in obtaining further information. The following states reported having no follow-up procedures: Connecticut, Michigan, New Hampshire, Ohio (public health), and Utah.

Table I.1 presents an overview of pesticide laws and efforts in place. This includes the year in which state laws or regulations were established and the type of reporting requirement in place.

**Appendix I  
Summary of State Survey Results for States  
With General Laws for the Reporting of  
Pesticide-Related Illnesses and Injuries**

**Table I.1: Overview of Pesticide Regulation, by State**

State	Year law or regulation established	General			Specific pesticide illness	Certified applicators and handlers only
		Occupational safety/health	Communicable disease	Poisoning or toxic substance exposure		
Arizona	1988				X	
Arkansas	1960		X			
California	1970				X	
Connecticut	1991 <sup>a</sup>	X				
Florida (Ag) <sup>b</sup>	1978				X	
Florida (PH) <sup>b</sup>	1982		X			
Hawaii	1990			X		
Iowa	1989				X	
Maine	1986	X				
Massachusetts	1980					X
Michigan	1976	X				
Mississippi	>1980			X		
Missouri	1980	X				
New Hampshire	1986	X				
New Jersey	1985			X		
New Mexico	1981	X				
New York	1990				X	
Ohio (Ag) <sup>b</sup>	1990					X
Ohio (PH) <sup>b</sup>	1976	X				
Oregon	1987				X	
Pennsylvania	1977					X
South Carolina	1992		X			
Texas	1985	X			X	
Utah	1990			X		
Virginia	1980	X		X		
Washington	1989				X	
Wisconsin	1984		X			

Note: An "x" indicates "pertains to this state."

<sup>a</sup>Occupational injuries have been reportable to the Connecticut Department of Labor since 1948. In 1990, the Occupational Health Clinics Bill was passed to set up general occupational health and safety monitoring in the state. The surveillance system went into effect in 1991.

<sup>b</sup>Florida and Ohio have pesticide regulations for both their departments of agriculture (Ag) and their departments of public health (PH); thus, they are each listed twice.

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Table I.2 summarizes survey responses indicating who is required to report in the various states.

**Table I.2 Who Must Report**

State	Reporting entity								Other
	Physician	Hospital room	Emergency Clinic	Laboratory	Poison control center	Farmer-owner operator	Certified/licensed applicator	Health care professional	
Arizona	X				X			X	
Arkansas	X	X	X	X	X	X			Agricultural extension agents
California	X								
Connecticut	X								
Florida (Ag) <sup>a</sup>	X	X	X	X			X	X	County health departments
Florida (PH) <sup>a</sup>	X								
Hawaii	X			X					
Iowa	X			X	X				Occupational health nurses
Maine	X	X							
Massachusetts								X	
Michigan	X	X		X			X		
Mississippi	X	X	X	X					
Missouri				X					
New Hampshire	X								
New Jersey		X							
New Mexico							X		
New York	X	X	X	X	X				
Ohio (Ag) <sup>a</sup>								X	
Ohio (PH) <sup>a</sup>	X								
Oregon	X	X	X	X	X	X			
Pennsylvania							X		
South Carolina	X	X	X	X					
Texas	X			X	X				
Utah		X							
Virginia	X	X							
Washington	X								
Wisconsin	X	X							

<sup>a</sup>Florida and Ohio have pesticide regulations for both their departments of agriculture (Ag) and their departments of public health (PH); thus, they are each listed twice.

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Table I.3 includes information on agencies receiving the report. Public health departments, or their equivalents, are typically the recipient agencies. However, reporting procedures in those states with specific laws or regulations in place may include multiple agencies in the reporting process. These procedures are discussed in appendix II.

**Table I.3: Recipient Agency**

State	Recipient		
	Department of agriculture	Department of public health	Other/additional
Arizona		X	Pesticide Poisoning and Surveillance Program
Arkansas		X	Health informs agriculture
California			Pesticide Illness Surveillance Program
Connecticut		X	Joint reporting to labor department
Florida (Ag) <sup>a</sup>	X		
Florida (PH) <sup>a</sup>		X	Health must report to agriculture
Hawaii		X	
Iowa		X	
Maine		X	Health informs labor
Massachusetts	X		
Michigan		X	
Mississippi			Poison Control Center
Missouri		X	
New Hampshire		X	
New Jersey		X	
New Mexico		X	
New York		X	Pesticide Poisoning Registry
Ohio (Ag) <sup>a</sup>	X		
Ohio (PH) <sup>a</sup>		X	
Oregon	X	X	Pesticide Analytical and Response Center
Pennsylvania	X		
South Carolina		X	
Texas		X	
Utah		X	
Virginia		X	
Washington		X	Pesticide Illness Report Tracking
Wisconsin		X	

<sup>a</sup>Florida and Ohio have pesticide regulations for both their departments of agriculture (Ag) and their departments of public health (PH); thus, they are each listed twice.

**Appendix I  
Summary of State Survey Results for States  
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In table I.4, we describe the required reporting times established by the states. Some states have different requirements for reporting egregious and non-egregious events. An "egregious" event typically involves death, hospitalization, cluster cases, or cluster hospitalizations. Both New Jersey and Wisconsin review hospital discharge data (HDD) as part of their surveillance. New Jersey requires that hospital discharge data (HDD) be reported within 30 days after discharge; Wisconsin requires physicians to report within 72 hours and hospitals to report their patient discharge data within 60 days after the quarter. Utah requires reporting within 60 days of recognition or diagnosis, except for egregious cases that may constitute an immediate threat to the public's health. These must be reported immediately.

**Table I.4: State Timeliness Requirements**

State	WD	Hours			Days					No definite time requirement
		24	48	72	5	7 (week)	10	30	>30	
Arizona		E			NE					
Arkansas		X								
California		a				b				
Connecticut			X							
Florida (Ag) <sup>c</sup>										X
Florida (PH) <sup>c</sup>			X							
Hawaii	X									
Iowa										X
Maine								X		
Massachusetts			X							
Michigan			E				NE			
Mississippi						X				
Missouri		E				NE				
New Hampshire			X							
New Jersey								HDD		
New Mexico			E							
New York			X							
Ohio (Ag) <sup>c</sup>			X							
Ohio (PH) <sup>c</sup>			X							
Oregon	X									
Pennsylvania										X
South Carolina <sup>d</sup>										P
Texas										X

(continued)

**Appendix I  
Summary of State Survey Results for States  
With General Laws for the Reporting of  
Pesticide-Related Illnesses and Injuries**

State	Hours					Days				No definite time requirements
	WD	24	48	72	5	7 (week)	10	30	>30	
Utah									X	
Virginia						X				
Washington			X							
Wisconsin			X						HDD	

Legend

E = Egregious cases  
HDD = Hospital discharge data  
NE = Non-egregious cases  
P = Promptly  
WD = One working day  
X = All cases

<sup>a</sup>Telephone report

<sup>b</sup>Written report

<sup>c</sup>Florida and Ohio have pesticide regulations for both their departments of agriculture (Ag) and their departments of public health (PH); thus, they are each listed twice.

<sup>d</sup>For South Carolina, "promptly" is unofficially considered to be from 7 days to weeks.

We also asked states whether they evaluated the likelihood of a reported event having been pesticide-related, based on the data they collected. For example, the responsible agency in California, the Department of Pesticide Regulation of the California Environmental Protection Agency, classifies the relation between pesticide exposure and illness based on the evidence provided in the reports from physicians and follow-up investigations as follows:

- **Definite:** The signs and symptoms exhibited by the affected person are such as would be expected to result from the exposure described. Both medical evidence (such as blood cholinesterase levels or allergy tests) and physical evidence (such as workplace samples or contaminated clothing) are available at least by report and support the conclusion that the illness was the result of the pesticide exposure.
- **Probable:** There is a close correspondence between the pattern of exposure and the illness experienced. Medical and/or physical evidence may not be available.
- **Possible:** There is some correspondence between the pesticide exposure described and the illness experienced. The information available may be ambiguous.

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**Appendix I**  
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- Unlikely: The exposure may be uncertain; the signs and symptoms reported are not typical of the exposure suspected, but the possibility that the victim is suffering the effects of pesticide exposure cannot be discounted.
- Unrelated: Evidence is available to demonstrate that the illness was caused by factors other than exposure to pesticides.
- Asymptomatic: The subject was exposed to one or more pesticides but suffered no illness in consequence. This category includes asymptomatic cholinesterase depression.
- Indirect: The illness complained of appears to have been caused not by pesticide exposure, but by measures prescribed for avoiding pesticide exposure.<sup>1</sup>

Since some degree of exposure to pesticides can be assumed for cases classified "possible," "probable," and "definite," these cases are collectively designated as pesticide-associated cases in much of California's reporting and analysis. Survey responses to the practice of using degrees of certainty in determining the extent to which illnesses are pesticide-related are shown in table I.5.

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<sup>1</sup>State of California, California Environmental Protection Agency, Department of Pesticide Regulation, Worker Safety and Health Branch, Sacramento, California.

**Appendix I  
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**Table I.5: States Using Degrees of Certainty in Determining Pesticide-Related Illnesses and Injuries**

State	Degree of certainty					
	Almost always	To a very great extent	To a moderate extent	To some extent	To little or no extent	Other
Arizona	X					
Arkansas	X					
California	X					
Connecticut						"Yes"
Hawaii	X					
Iowa				X		
Maine				X		
Massachusetts			X			
Michigan					X	
Mississippi		X				
Missouri	X					
New Hampshire					X	
New Jersey	X					
New Mexico					X	
New York	X					
Ohio (Ag)	X				X	
Ohio (PH)				X		
Oregon	X					
Pennsylvania				X		
South Carolina	X					
Utah		X				
Virginia					X	
Washington	X					
Wisconsin					X	

<sup>a</sup>Ohio has pesticide regulations for both its department of agriculture (Ag) and its department of public health (PH); thus, it is listed twice.

Only 11 states with reporting requirements submitted event counts from summary reports as part of their survey response. Only one voluntary reporting state, North Dakota, submitted an event count. (See table I.6.) Most states with reporting requirements had not established effective programs or procedures to implement their requirements. As a result, most of these states reported few incidents a year, and typically only those that involved emergency room treatment or hospitalization.

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**Table I.6: Number of Pesticide-Related Illnesses and Injuries Reported to States**

State	Year	Reported event
Arizona	1991	A total of 87 suspected pesticide-related cases; 52 of these cases were investigated; as a result of investigations, 29 cases confirmed or suspected; 12 of the confirmed and suspected cases involved agricultural exposure
California	1990	A total of 2,995 illnesses reported as suspected of being associated with exposure to pesticides; 1,987 cases categorized as definite, probable, or possible; 1,919 occupational; 580 definite, probable, or possible for agricultural occupations <sup>a</sup>
Florida	1992	A total of 138 cases were reported to the agriculture department through PIMS; 10 cases were reported to the public health department for a 4-year period
Hawaii	1990	A total of 600 illness and injury reports from environmental exposures, including pesticides, heavy metal poisonings, natural toxins, hydrocarbons, indoor air, outdoor air, hazardous waste, medical waste, ionizing radiation, non-ionizing radiation, drinking water, and other; 77 pesticide-related illnesses, mostly nonoccupational; agricultural cases not identified
Iowa	1992	A total of 1,782 work-related injuries reported for the state, 46 involved chemical exposures, including 9 cases of inhalation and ingestion; agricultural/occupational cases not specified
New Jersey	1985-92	A total of 399 cases from hospital discharge records for pesticide poisonings; only three agricultural/occupational cases identified
New York	1991	A total of 99 incidents reported to the pesticide registry; 68 confirmed or suspected cases; 14 identified as occupational
North Dakota	1991	A total of 59 exposures to agricultural chemicals reported, 46 to pesticides
Oregon	1992	Nine events of agricultural, occupational pesticide exposure reported to PARC; four of these events confirmed as cases, one determined to be a suspected case, and four events determined not to be cases, including those events lacking in sufficient information to establish a causal relation between a pesticide exposure and symptoms
Texas	1991	Fourteen cases of confirmed/suspected pesticide poisonings reported
Virginia	1990	Of all cases of communicable diseases, there were no reported toxic-substance-related illnesses
Washington	1991	A total of 694 complaints, 453 completed (21 involving agriculture)

<sup>a</sup>Agricultural occupations determined by using standard industrial codes, excluding nursery occupations.

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# Summary of State Survey Results for States With Specific Laws for Reporting Pesticide-Related Illnesses

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In this appendix, we discuss seven of the eight states that reported laws specifically requiring the reporting of pesticide-related illnesses. These states are Arizona, Florida, Iowa, New York, Oregon, Texas, and Washington. We discuss the California effort separately in appendix III.

In general, as for states with general reporting requirements, survey respondents for states with specific reporting requirements also indicated a wide range of information solicited in the reporting process and in the process of making determinations on suspected cases. This information included data on the pesticides involved; exposure symptoms; type of crop, work, and equipment involved in the incident; documentation of the suspected cause of the illness; and patient demographics. However, although respondents indicated a wide range of information sought in initial reports and follow-up procedures, they did not indicate what levels of completion their reports typically achieved.

Follow-up procedures reported by respondents included on-site inspection and interviews, as well as the obtaining of documentation verifying exposure and medical effects. However, once again, respondents provided no information on the extent to which these procedures were followed and how effective these procedures were in attaining further information. (We discuss legal citations as reported by the states; we did not verify their accuracy.)

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## Arizona

The Arizona departments of health and agriculture both have regulations requiring that illnesses associated with pesticide use be reported.

Among its worker safety practices, the Department of Agriculture requires that employers make prior arrangements for emergency medical care and that the name, address, and telephone number of the physician, clinic, or hospital emergency room providing such care be posted in a prominent place. The department also requires that baseline cholinesterase be established for handlers under certain conditions and that arrangements be made for monitoring employees working alone with acutely toxic or restricted-use pesticides.

Under Arizona revised statutes, the Department of Health Services has two primary responsibilities with regard to the reporting of pesticide-related illnesses:

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1. Health care professionals and poison control centers are required to file incident reports with the health department for an illness that is believed to be caused by or related to documented exposure to pesticide.

2. A.R.S. 36-606 also requires the director of Health Services to notify the Department of Agriculture of all illnesses from agricultural pesticide exposure and to notify the Structural Pest Control Commission of all illnesses from structural pesticide exposure.

In 1989, the director of the Department of Health Services, in cooperation with rural health clinics, county health departments, state and local medical associations, poison control centers, and other appropriate health care professionals, was mandated to develop and implement a system for reporting and preventing pesticide-provoked illnesses. This included a mandate to establish medical education programs to alert health care professionals to the symptoms, diagnosis, treatment, and reporting of pesticide-provoked illnesses.

The Office of Risk Assessment and Investigation (ORAI), Investigation and Surveillance Section (ISS), Arizona Department of Health Services (ADHS), administers the Pesticide Poisoning Surveillance and Prevention Program to identify factors associated with pesticide-related illnesses. Reports of cases and suspected cases of pesticide illness must be made within 5 days of treatment. However, any case or suspected case that results in hospitalization or death must be reported immediately by telephone no later than 24 hours from the time of hospital admission or death. Cluster illnesses must be reported immediately, by telephone, no later than 24 hours from the time the second case or suspected case is identified.

Reports of cases are required to provide evidence of disturbance of function, damage to structure, or illness in humans resulting from the inhalation, absorption, or ingestion of any pesticide. Physician diagnoses are required as evidence for these confirmations, and the health care professional or poison control centers must indicate in the incident report the reason for believing that the illness was caused by documented exposure or is related to the documented exposure.

ORAI/ISS evaluates each report of an illness filed by a health care professional and each complaint of illness made by regulators or the public. Reports by health care professionals and complaints from other persons that include a written report are investigated to confirm the illness and determine the circumstances that may have caused the illness. The

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event is then classed as a confirmed or a suspected case of illness, based on physician determination. The findings of an evaluation are provided to local health departments, as well as to state pesticide regulatory agencies. Medical information obtained in the course of an investigation remains confidential, however, and is not released to the public or included in a public file.

In a 1989 assessment of the reporting system, the ORAI/ISS subsections of the Arizona Department Health concluded that "the reporting by physicians continues to be abysmal."<sup>1</sup> A subsequent 1990 performance audit conducted by the Office of the Auditor General for the state of Arizona further concluded that the ADHS pesticide registry was of limited value and that: "In relation to the number of people potentially exposed to agricultural pesticides, the number of cases reported is very small."<sup>2</sup>

According to the audit committee, many cases of illness caused by agricultural pesticides were not reported to the registry. The committee found that cases as severe as those of a child hospitalized after playing in an area containing illegally dumped, granulated pesticides and a man who lost the use of his hands after exposure to herbicides, were not reported.

Although the committee found no method for accurately identifying the number of unreported cases of pesticide-related illnesses, the committee did identify two key reasons for the underreporting of pesticide-related illnesses in their state: (1) People may not seek medical care, and (2) those that do may not be diagnosed as having an illness related to pesticides.

Identifying farmworkers as "a high-risk group," the committee noted that farmworkers were even less likely than the general public to seek medical care. The committee interviewed physicians, clinic and hospital staff, social and legal service providers, and health officials and were told that, "unless symptoms interfere with their ability to work, farmworkers seldom seek medical care."<sup>3</sup>

The audit committee cited three reasons for patient underreporting: (1) Most farmworkers have no health insurance and time away from work means loss of income; (2) farmworkers fear that reporting a work-related

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<sup>1</sup>"Reports of Cases and Suspect Cases of Pesticide-Related Illnesses, 1989."

<sup>2</sup>State of Arizona, Office of the Auditor General, A Performance Audit of Pesticide Regulation: Department of Health Services, November 30, 1990, p. 4.

<sup>3</sup> A Performance Audit of Pesticide Regulation: Department of Health Services, p. 6.

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illness may make trouble for their employer and result in loss of work; and (3) when farmworkers do seek medical care, some visit doctors in Mexico because costs are lower and language and cultural barriers are removed.

The audit committee partially attributed physician underreporting to ADHS ineffectiveness in educating the medical community to recognize and report pesticide poisonings. The committee found that, although ADHS is statutorily mandated to alert health care professionals to the symptoms of pesticide poisoning, the department's efforts to train the medical community in the recognition and reporting of pesticide-related illnesses have been limited and largely ineffective.

Physician training in the recognition of pesticide poisoning is especially important given the difficulties inherent in the nature of pesticide poisoning. Except in severe cases, symptoms of pesticide-related illnesses are similar to those of a number of common complaints such as flu, gastroenteritis, and allergies. Dermatitis, the most common symptom, has many causes. Moreover, tests to confirm diagnoses are expensive and uncertain, and for some types of pesticides, no lab test exists.

The Arizona audit further observed that

"Diagnosis may be even more difficult for health care professionals who don't often encounter these cases. Doctors who work regularly with fieldworkers said milder cases of pesticide-related illness may be misdiagnosed as a health care professional is not alert to the possibility, and does not ask enough questions to obtain a thorough occupational history from the patient."<sup>3</sup>

However, the committee also observed that, even when a diagnosis is made, physicians may still be reluctant to report.

Physicians and health care professionals responding to the audit committee reported that cases may not be reported because health care professionals fear becoming involved in lawsuits or occupational injury claims in which they might have to defend uncertain diagnoses in court. A review of the literature by the auditing agency corroborated this suggestion, with the agency noting that "Arizona's present statute on reporting pesticide poisoning may actually discourage some reporting."<sup>4</sup>

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<sup>3</sup>State of Arizona, Office of the Auditor General, A Performance Audit of Pesticide Regulation: Department of Health Services, November 30, 1990, p. 7.

<sup>4</sup>A Performance Audit of Pesticide Regulation: Department of Health Services, p. 9.

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Arizona's statute requires health care professionals to file "...incident reports of pesticide poisonings which they diagnose or reasonably believe, based on their professional judgment, to be pesticide poisoning."<sup>5</sup> However, as previously noted, diagnosis can be uncertain in all but extreme cases. Health care providers may feel their professional reputation is at risk if they report cases that are not definitely related to pesticides.

In response to these findings, the audit committee suggested that

"Changing statutory language to include cases in which the physician is uncertain of the diagnosis, but has reason to believe pesticides may be involved, could result in a higher rate of reporting. It would also remove the burden of classification from health care professionals, who may rarely encounter pesticide-related illnesses. The ADHS staff, who study pesticide poisonings daily, would then have the responsibility of categorization, perhaps using California's categories of "possible," "unlikely," and "unrelated" to replace Arizona's "no case" where a physician did not diagnose the case as definite or probable."<sup>6</sup>

Arizona officials indicated they almost always use a system establishing the degree of certainty to which illnesses are pesticide-related and that data were collected in a centralized, computerized database.

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## Florida

Both the Florida Department of Health and Rehabilitative Services (FDHRS) and the Florida Department of Agriculture and Consumer Services (FDACS) have statutes in place requiring the reporting of illnesses associated with the occupational use of pesticides. However, we found confusion between these state agencies with regard to the nature and extent of their responsibilities in the implementation of these reporting requirements.

Documents from FDHRS referred to a Pesticide Incident Monitoring System (PIMS) administered by FDACS. However, FDACS officials could not confirm a stand-alone PIMS as described by FDHRS. According to the director of FDACS and the director's assistant, "PIMS" refers to the overall collection and database management effort used within the department for tracking information on suspected pesticide illnesses from when a report is made to the point where the agency can determine whether there has been a compliance violation.

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<sup>5</sup>A Performance Audit of Pesticide Regulation: Department of Health Services, p. 9.

<sup>6</sup>A Performance Audit of Pesticide Regulation: Department of Health Services, p. 10.

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The Florida state code requires physicians to report cases of pesticide-related illnesses to FDACS. However, according to FDACS officials, the intent of the law is to use medical sources as indicators of possible compliance violations pertaining to the uses of pesticides and not for the purpose of medical monitoring. Separately, however, FDHRS has an administrative requirement defining pesticide poisonings among communicable diseases. All health care professionals are thereby required to report these events to FDHRS immediately.

FDACS also requires health care professionals to report cases to the county health departments. However, these reports terminate with the state department of agriculture—that is, FDACS. Florida statute does not require FDACS (agriculture) to inform FDHRS (health), although the agency may do so at its own discretion. In addition, there are some links—both formal and informal—between the agencies in the administration of the requirements.

FDACS is currently implementing a new internal policy of sending a copy of the work request to initiate an investigation to FDHRS for every human exposure report made to FDACS. FDHRS would then be responsible for disseminating this information to local health departments and other pertinent agencies. Officials of both agencies have entered into an informal agreement for FDHRS to be informed should FDACS attain medical confirmation of a reported event in the course of their investigation.

The FDACS regulation stipulates no time requirement for reporting, and although the agency prefers to begin investigations within 24 hours of a report, this is an agency policy rather than a state regulation. FDHRS uses its own administrative requirement as a basis for stipulating a 48-hour reporting requirement on health care professionals.

FDHRS evaluated the pesticide-related illness tracking system in 1990 and found that the system had a “disappointing participation with less than a handful of cases reported in any given year [and that] therefore it has not been an effective monitoring and prevention tool.”<sup>7</sup>

The evaluation identified three weak points in the system: (1) a lack of awareness on the part of physicians regarding the reporting requirement, (2) an unfamiliarity regarding the diagnosis and management of pesticide

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<sup>7</sup>Florida Department of Health and Rehabilitative Services, Inter-Office Memorandum to District Administrators from the Deputy Secretary for Health and State Health Officer, August 22, 1990.

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poisonings, and (3) an inability of the tracking forms to properly represent the physician's evaluation of the case.

According to FDHRS officials, FDHRS uses a system establishing the degree of certainty to which illnesses are pesticide-related to little or no extent. Officials also indicated that data are collected in a centralized, noncomputerized filing system. FDACS maintains its data in a noncentralized, computerized database.

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**Iowa**

As of 1989, pesticide poisonings are specifically included among reportable environmental illnesses in the state of Iowa. Physicians, poison control centers, and occupational nurses are required to report cases of pesticide poisoning; hospitals, emergency rooms and clinics are encouraged to report them. Reports are submitted to the Iowa Department of Public Health. There is no stipulated time requirement for making reports. Iowa officials indicated that they use to some extent a system establishing the degree of certainty to which illnesses are pesticide-related and that data are collected in a centralized, computerized database.

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**New York**

The New York Pesticide Poisoning Registry (NYPPR) was established in 1990 as a surveillance system to assess the frequency of poisoning incidents and to minimize and prevent future incidents. The Registry's intent was to (1) investigate and intervene in any situations of ongoing risk of pesticide poisoning, (2) develop and implement interventions to reduce the risks of pesticide poisonings, (3) monitor both the acute and chronic effects of pesticide exposures, and (4) increase the medical community's awareness concerning the adverse health effects of pesticide exposure.

NYPPR staff also respond to inquiries about toxicological and clinical aspects of pesticide poisonings. Physicians are referred to poison control centers for case management advice. At the centers, staff discuss health and safety measures with physicians in order to minimize or prevent continued pesticide exposure.

Medical personnel and clinical laboratories are required to report suspected pesticide poisonings to NYPPR by phone within 48 hours. Clinical laboratories are also required to report cases of depressed cholinesterase levels. However, the six New York State regional poison control centers, the local health departments, and the various other affected government agencies are not required to report.

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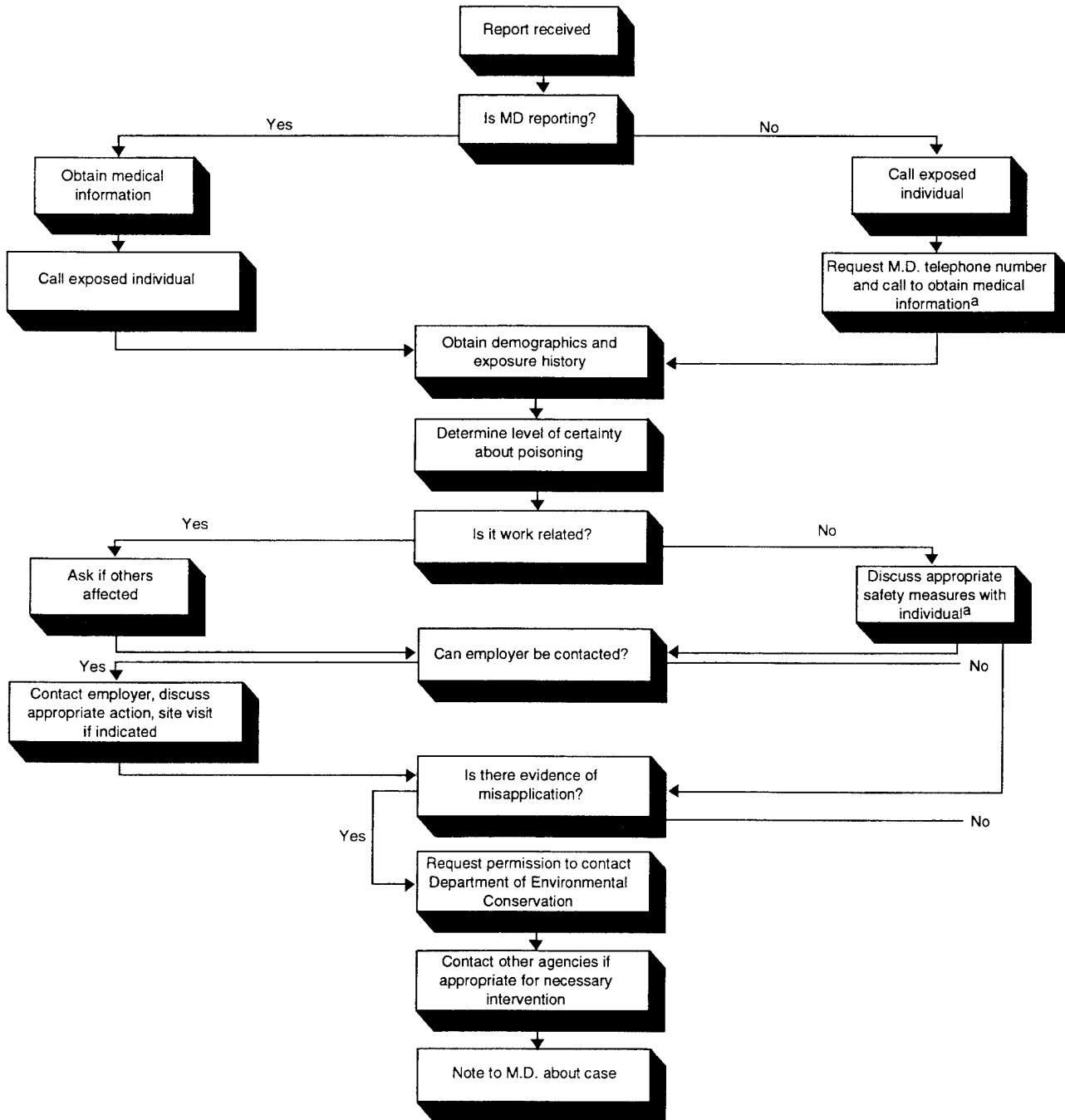
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New York state provided us a schematic showing how that state system integrates the various stages in the event monitoring procedure. (See figure II.1.)

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**Figure II.1: New York Pesticide Incident Reporting Procedure**



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<sup>a</sup>Educational materials sent to reporting M.D. and to affected individuals.

Source: NYPPR

New York officials reported that they almost always use a system establishing the degree of certainty to which illnesses were pesticide-related and that data are collected in a centralized, computerized database.

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## Oregon

In response to concerns about underreporting, misdiagnosis, and reports being received too late for prompt investigation and follow-up, pesticide poisoning was made a reportable event in Oregon upon the completion of the Oregon Health Division's revision of its "Control of Diseases" rules in June 1987. For reporting purposes, "pesticide poisoning" includes acute poisoning as well as subacute illnesses or conditions (dermatologic, ophthalmologic, or systemic) caused by, or suspected of being caused by, pesticide exposure.

Oregon officials were also concerned about the range of claims regarding the adverse health effects of pesticide use. These claims ranged from concerns about substantial underreporting of cases to assertions that there are no health problems associated with the use of pesticides.

In 1988, Oregon established the Pesticide Analytical Response Center (PARC) to more accurately and objectively assess the extent of the problems, to provide factual information to the public, to assist health care providers by alerting them to problem products or misuses, and to develop strategies for the prevention of pesticide-related illness.

PARC is an interagency organization intended to assist in the evaluation of adverse health effects and environmental impacts allegedly caused by pesticides. Agency membership currently comprises representatives from the Oregon departments of Agriculture; Forestry, Fish, and Wildlife; Environmental Quality; Oregon Occupational Safety and Health Administration; State Fire Marshal; Health; and the Oregon Poison Center. Agency capabilities include centralized and standardized data on pesticide-related health effects, as well as the ability to mobilize expertise for the investigation of incidents.

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Oregon health care providers are required to report cases of pesticide-related illnesses diagnosed or suspected on the basis of clinical judgment, as well as those cases confirmed by laboratory tests. Oregon rules further stipulate that only in cases of known occupational exposures should symptoms such as minor dermatitis, conjunctivitis, or low grade mucosal irritation be included.

Reports should be made to local health departments by telephone within 1 working day. Local health departments record immediately available information and relay the information to the state health division immediately. In turn, the state health division should immediately initiate an investigation.

Oregon has documented situations in which growers have brought pressure to bear on community health care providers not to report cases. Oregon periodically examines claims statistics from its Workers' Compensation Department, as well as evaluates selected hospital emergency department logs when resources are available. However, state officials told us that these efforts would not capture farmworker events since farmworkers tend not to report at all. Officials further suspected "drastic" underreporting of pesticide-related illnesses by the state department of labor. These officials reported that they almost always used a system establishing the degree of certainty to which illnesses were pesticide-related and that data are collected in a centralized, computerized database.

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## Texas

As of 1985, the state of Texas requires all physicians to report occupational pesticide poisonings to the Epidemiology Division of the Texas Department of Health. Texas officials reported that their follow-up procedures can include on-site inspection, interviews with witnesses and patients, acquisition of documents verifying exposure, and medical documentation of effects. These officials also informed us that they almost always use a system establishing the degree of certainty to which illnesses were pesticide-related. However, no reporting time requirement is stipulated (although "prompt" reporting is encouraged). Finally, officials reported that data are collected in a centralized, noncomputerized filing system.

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## Washington

In response to growing concerns over health and environmental impacts from the use and misuse of pesticides, the Washington state legislature

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created a multiagency based Pesticide Incident Reporting and Tracking system (PIRT). The legislature cited a need for increased reporting, comprehensive unbiased investigative capability, and enhanced community education as requirements in order to continue to meet the state's responsibilities to provide for public health and safety. Toward that end, the legislature provided for the various agencies responsible for pesticide regulation to coordinate their activities to ensure adequate monitoring of pesticide use, as well as protection of workers and the public from the effects of pesticide misuse.

PIRT's responsibilities include establishing guidelines for centralizing the receipt of information related to actual or alleged pesticide incidents; reviewing and making recommendations for procedures for investigating pesticide incidents; monitoring the time periods required for agencies to respond to reports of pesticide incidents; reviewing pesticide incidents of unusual complexity and those that cannot be resolved; identifying inadequacies in state or local law that result in inadequate protection of public health, with special attention to reentry intervals; and reviewing and approving an annual report prepared by the state Department of Health detailing the year's activities and summarizing agency investigations of pesticide incidents.

PIRT is chaired and coordinated by representatives from the Department of Health and includes representatives from all state agencies that deal with pesticides, the Washington Poison Network, the University of Washington School of Public Health, Washington State University Extension Service, a practicing toxicologist, and a member of the general public.

Of the five individual state agencies, only the Departments of Agriculture, Labor and Industry, and Health have responsibilities pertaining to farmworkers as they are defined in this report. Agriculture investigates complaints of pesticide misuse or misapplication. Labor and Industry investigates employee complaints. The responsibilities of the Department of Health include conducting medical investigations of suspected human pesticide poisonings and those animal poisonings that may relate to human illness; providing technical assistance regarding health effects and risks of pesticides to health care providers, other agencies, and individuals; providing community information regarding health effects of pesticide exposure; and securing and providing for analysis of environmental samples or human and animal tissues to determine the nature and cause of any suspected case of pesticide poisoning.

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PIRT is structured primarily to coordinate investigations by the five state agencies and to share information. PIRT reviews the coordination of investigations and provides a forum for agencies to discuss roles and to make recommendations for improvements. The Washington Poison Network is a result of this dialogue. Calls to the Poison Network resulting in referrals to health care providers or involving patient treatment are reported to the Department of Health for follow-up. In addition, these calls provide the department an opportunity to inform physicians about pesticide-event reporting responsibilities.

Washington requires all primary care providers to report egregious events immediately and nonegregious events within 48 hours to the Department of Health. Poison control centers in Washington typically report events to the Department of Health, although this is not a requirement. Washington officials reported that they almost always use a system that establishes the degree of certainty to which illnesses are pesticide-related.

# The California Pesticide Incident Surveillance Program

Our analysis of the California system is based on documents provided by the state of California and on our case study of the system, including interviews with California officials, members of the farmworker community, farmworker advocacy groups, and university research groups.

The California Pesticide Incident Surveillance Program (PISP) investigations fulfill a vital feedback function in the California pesticide regulatory system. Along with data from numerous other sources, results of these investigations provide critical information for policy decision making. These decisions can involve the development of more protective laws and regulations, cancellation of pesticide uses that pose unacceptable risks, or the development of strategies to reduce potential hazards while maintaining essential pest control tools.<sup>1</sup>

The California system thus provides the most comprehensive of all state monitoring and data collection efforts. The state also differs from federal and other state systems in the registration, use, and monitoring of pesticides. A basic knowledge of the California system is therefore important to an understanding of why the actual data from that system cannot be used as a basis for national estimates. Moreover, state officials expressed concerns over suspected underreporting similar to those expressed by officials of other states.

In this appendix, we describe the California system in terms of its legislative history, product registration, and organization and reporting procedures. We discuss legal citations as reported by the representatives of the state; however, we did not verify their accuracy.

## Legislative History

The state Economic Poison Act of 1921 and its amendments of 1929 provided the state Director of Agriculture the clear authority to cancel a registration or refuse to register any pesticide that the state determined to be ineffective, that damaged nontarget organisms, or that was detrimental to public health and safety when properly used. Such authority did not occur at the federal level until 1964.

Legislation in 1972 (California Chapter 794) made the development of pesticide worker safety regulations the joint and mutual responsibility of the California Department of Agriculture and the Department of Health Services. The state adopted regulations requiring protective clothing and

<sup>1</sup>California Environmental Protection Agency, Department of Pesticide Regulation, California's Pesticide Regulatory Program (Sacramento, Calif.: 1991), p. 37.

equipment, as well as mandating longer intervals before workers could reenter fields treated with some pesticides. California also became the first state requiring users of certain high toxicity pesticides to employ closed systems for mixing and loading operations. Enforcement was delegated to The California Department of Food and Agriculture (CDFA) and county agricultural commissioners.

California passed the Birth Defects Prevention Act in 1984. This act required all registered economic poisons to have complete and adequate chronic health effects studies. The act increased the size and responsibilities of CDFA's Registration Branch and led to the creation of a separate Medical Toxicology Branch for the evaluation of toxicological data.

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## Product Registration in California

Since 1972, the state has required CDFA to thoroughly evaluate and register all pesticides before they are sold or used in the state. Applicants must conduct tests and studies necessary for these registrations, and the director of CDFA may refuse to register, or may cancel, any pesticide that (1) causes serious, uncontrollable, adverse effects on the environment; (2) provides less public value or greater detriment to the environment than benefit received from its use; or (3) involves a use that is detrimental to vegetation, domestic animals, or public health and safety, or that is of little or no value for the intended purpose.

Applicants submit data on product chemistry, environmental fate, efficacy fish and wildlife effects, hazard to nontarget organisms, worker exposure, and toxicology. If these studies indicate the potential for adverse health effects, CDFA's Medical Toxicology Branch then conducts its own hazard identification studies, and the Worker Health and Safety Branch conducts its own exposure assessment.

CDFA's Medical Toxicology Branch has two major functions: the review of toxicology studies and the preparation of risk assessments. In the case of new active ingredient, data are reviewed for chronic and acute health effects.<sup>2</sup> Data are also reviewed for new products containing already registered active ingredients, for label amendments on currently registered products that include major new uses, and for the reevaluation of currently registered active ingredients. The results of these reviews, together with exposure information from other branches, are used in the

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<sup>2</sup>Chronic toxicity refers to adverse effects from many repeated exposures. Acute toxicity refers to adverse effects from a one-time or very few exposures.

determination of health risk characterizations. These are then peer-reviewed by the California Department of Health Services.

CDFA's Worker Health and Safety Branch evaluates potential workplace hazards of pesticides. This branch is responsible for evaluating exposure studies on active and inert ingredients in pesticide products and on application methodologies, for conducting studies evaluating potential risks from exposure to pesticides, and for evaluating and recommending measures to improve occupational environments for workers handling or potentially exposed to pesticides. The Medical Toxicology Branch reviews the toxicology studies to determine their adequacy and the potential for adverse health effects that may range from acute toxicity to chronic effects such as cancer or birth defects.

The state of California then bases its judgment on whether to allow the use of the substance, and under what conditions, on these evaluations. The state has so far required a data collection above and beyond that required by the federal EPA on toxicity data from animal tests for 300 pesticides, residue data from field tests for 200 pesticides, and occupational exposure data from work sites for 100 pesticides.

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### The California Environmental Protection Agency Registration Program

According to California officials, although similar in process, California's pesticide registration program differs from EPA's in a number of ways. California may require studies in addition to, or different from, those required by EPA, including worker exposure data, poisoning treatment, foliar residue, indoor exposure potential, hazards to bees, and dust hazard of powdered products to workers. California has rejected studies previously accepted by EPA because of their noncompliance with state guidelines. The state has denied registration to products registered by EPA because of lack of appropriate or adequate studies, label instructions that do not provide sufficient reduction of product hazard, and an insufficient margin of safety in product use. In the past, California has also imposed use restrictions and additional worker protection requirements on pesticides approved by EPA that are then registered in California.

Finally, FIFRA requires EPA to balance risk considerations with economic benefits. In making its decision on registration or cancellation of a product, EPA must take into account both the adverse effects on the environment and the economic, social, and environmental cost and benefits of the use of the product. California law does not require

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**Appendix III  
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consideration of economic benefits and does not allow registration of products with significant adverse effects.

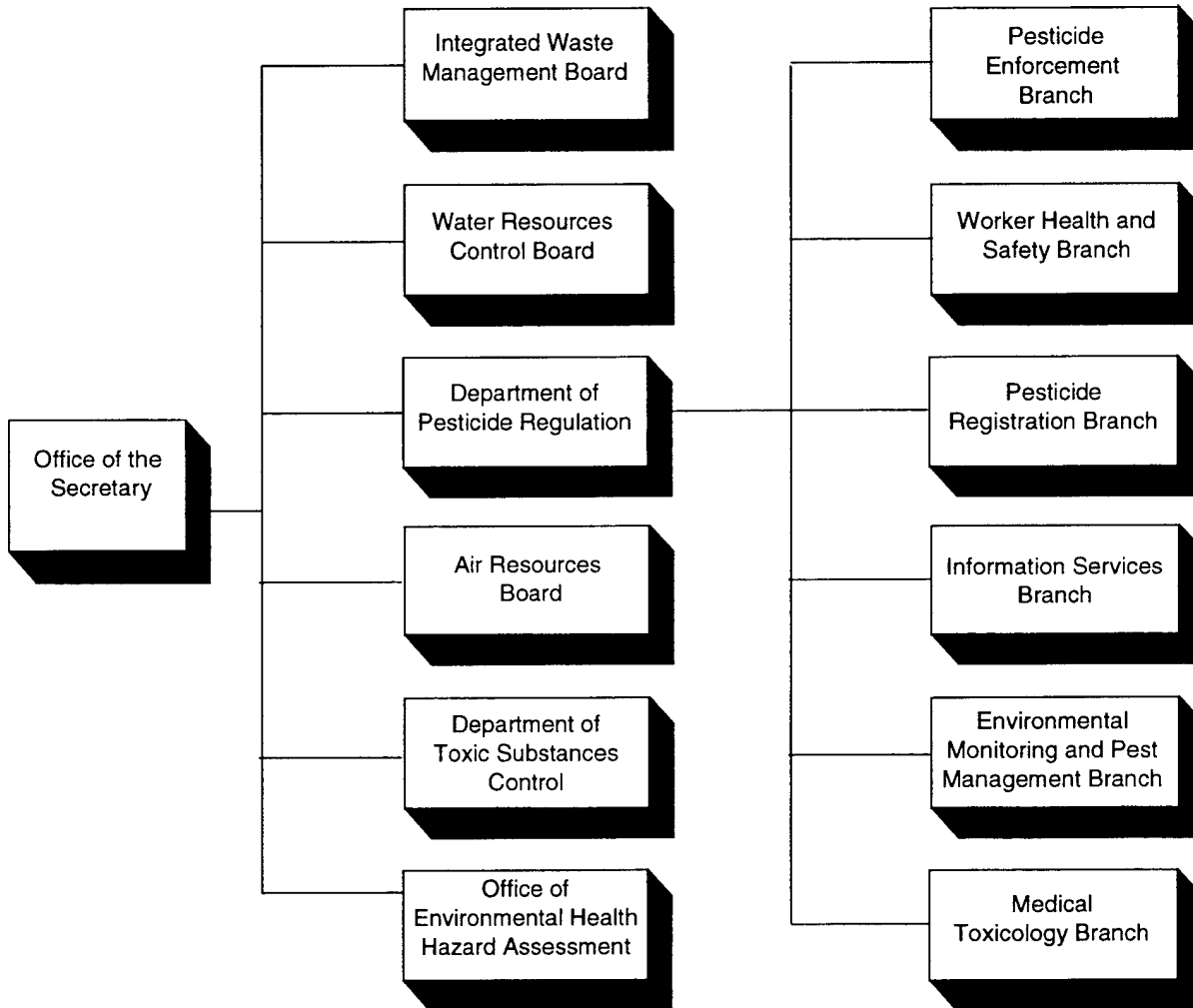
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**California Reporting  
Procedures**

California placed its major environmental programs under the California Environmental Protection Agency in 1991. This reorganization also placed pesticide-related programs under the newly formed California Department of Pesticide Regulation. (See figure III.1.)

Appendix III  
The California Pesticide Incident  
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Figure III.1: California Environmental Protection Agency



Source: California Department of Pesticide Regulation, Pesticide Enforcement Branch, Pesticide Regulation Newsletter, Vol. 1, No. 1 (Oct. 1991).

Reports of pesticide-related illnesses (or those suspected of being related) reach the Department of Pesticide Regulation by one of two routes: first, through physician reporting to the local county health officials; and second, by way of the Department of Industrial Relations, Bureau of Labor

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**Appendix III  
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Statistics. California requires physicians to report pesticide-related illnesses or injuries to the local health officers by telephone within 24 hours. Upon receipt of a telephone report from the physician, local health officials notify the Department of Pesticide Regulation, Worker Health and Safety Branch and the county agricultural commissioner, who conducts a case investigation.<sup>3</sup>

In addition to reporting cases to the local health officer by telephone, physicians are required to submit a written report to the Department of Industrial Relations within 7 days. Physicians may also file reports with insurers for workers' compensation. These reports must be filed within 5 days of the initial examination. Reports from insurers or from employers must be submitted to the Department of Industrial Relations within 5 days of receipt. The Department may thus receive duplicate reports from physicians as well as insurers and employers. The Worker Health and Safety Branch routinely checks with the Department of Industrial Relations every 2 weeks for reported cases, and submits the cases they find to the county agricultural commissioners for investigation and follow-up.

A joint program of the California Environmental Protection Agency and county agricultural health commissioners went into effect in 1974 to investigate pesticide exposure incidents and to identify events that led to their occurrence. County agricultural commissioners have primary investigatory responsibility for the state of California for initial report submissions.

All incidents that come to the attention of the California Environmental Protection Agency or a county agricultural commissioner involving alleged misuse of pesticides; pesticide damage or injury to crops, property, or the environment; or adverse human or animal health effects must be investigated. The information gathered during these investigations is used for enforcement purposes in imposing sanctions for pesticide misuse, as well as for the evaluation of pesticide use patterns and the effectiveness of the regulatory system. Incident investigation may also lead to the banning of products or product uses.

County agricultural commission investigators collect data through intensive, standardized interviews. While many states provide standardized forms for initial report submissions and subsequent

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<sup>3</sup>The local health officer also informs the Office of Environmental Health Hazard Assessment in the California Environmental Protection Agency. However, this reporting process is not germane to our analysis.

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**Appendix III  
The California Pesticide Incident  
Surveillance Program**

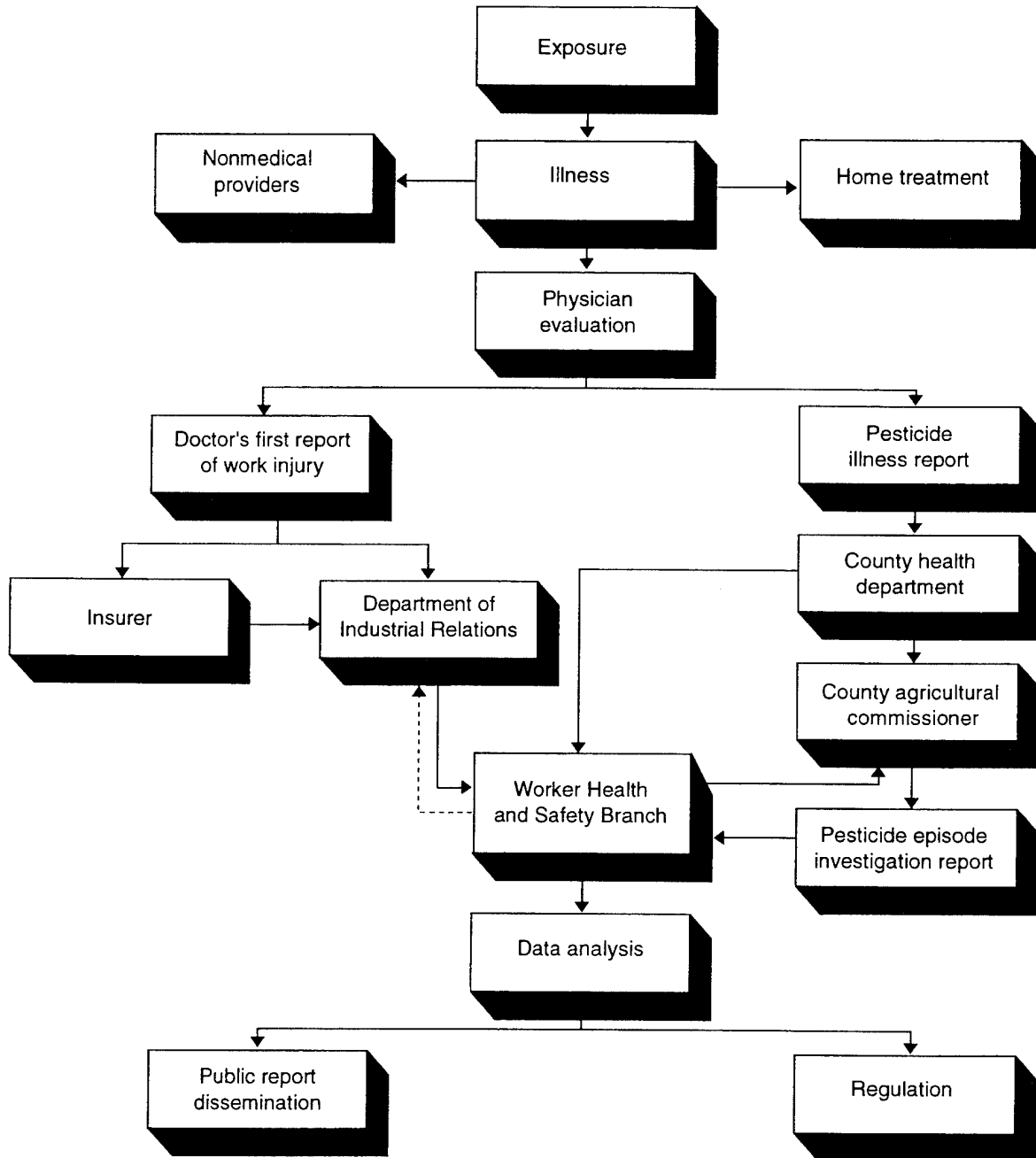
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information gathering, California provides 11 forms for county agricultural commission follow-up investigations alone, 2 for matters regarding public exposure and 9 for those regarding employee exposures.

Copies of all final illness investigative reports are sent to the Worker Health and Safety Branch. There, analysts evaluate the information in order to describe it in terms of its adequacy, the evidence for pesticide exposure, and the probability that the illness reported was caused by the pesticide exposure described. The investigation also gathers information on the nature of the complaint, the activity of the victim at the time of exposure, and the availability of protective gear. The California pesticide exposure reporting process is depicted in figure III.2.

Appendix III  
 The California Pesticide Incident  
 Surveillance Program

Figure III.2: California's Pesticide Illness Surveillance Program



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**Appendix III  
The California Pesticide Incident  
Surveillance Program**

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Sources: Michael O'Malley, M.D., "Systemic Illnesses Associated with Exposure to Mevinphos in California, 1982-89," California Department of Pesticide Regulation, Worker Health and Safety Branch, Sacramento: Jan. 4, 1992; diagrams submitted by the California Environmental Protection Agency, Department of Pesticide Regulation, Sacramento; interviews with officials of the Worker Health and Safety Branch of the California Department of Pesticide Regulation.

Certain incidents may trigger special handling as priority investigations. These include human effects involving death or serious illness; illness to five or more persons; and significant environmental contamination, property loss, or fish and wildlife kills. Counties receiving such reports are required to report them immediately, by telephone, to the California Environmental Protection Agency. The Agency then immediately reports such incidents to EPA, the Department of Health Services, California Department of Fish and Game, or other affected government agencies.

The Worker Health and Safety Branch and the Enforcement Branch also provide training for county agricultural commission staff on investigative techniques, and Worker Health and Safety Branch staff members may also become involved in field investigations. Finally, branch physicians and other staff are available for consultations with local health care authorities and health care providers.

Enforcement Branch staff review completed reports for possible regulatory purposes. Workers Health and Safety Branch staff also review reports and maintain these data in a centralized, computerized database by standard industrial code, the Pesticide Illness Surveillance Program (PISP). The branch prepares annual pesticide illness reports using this database and may also initiate special investigations based on event anomalies identified through the analysis of the database. The Worker Health and Safety Branch has also initiated limited projects using active biological monitoring for pesticide exposures among farmworkers.

In addition, the branch also uses PISP data in conducting cooperative studies with other agencies, including EPA and the National Institutes of Occupational Safety and Health. Finally, the Worker Health and Safety Branch is considering matching PISP data with the registry of birth defects maintained by the California Birth Defects Monitoring Program.

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# Major Contributors to This Report

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