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Development of a Surveillance Program for Occupational Pesticide Poisoning: Lessons Learned and Future Directions

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S Y N O P S I S

The authors describe the growth from 1987 through 1996 of the Occupational Pesticide Poisoning Surveillance Program at the Texas Department of Health. The program was initially based on a Sentinel Event Notification System for Occupational Risks (SENSOR) model, using sentinel providers to report cases, supplementing the passive reporting by physicians that was required by law. The model was evaluated after five years, and significant changes were implemented to improve case ascertainment. Current active surveillance methods emphasize collaboration with a number of agencies and organizations for identification of cases and follow-up. The number of confirmed occupational cases increased from 9 workers in 1987 to 99 workers in 1996. The evolution from a passive system to an active surveillance program expanded the number of reported cases and strengthened inter-agency collaborations.

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Although thought to be significant, the extent of work-related pesticide poisonings in this country remains largely undocumented.¹ Historically, this has been due primarily to a lack of reporting mechanisms for pesticide-related health effects. State-mandated reporting has become more common in recent years, and more than 25 states currently have reporting requirements. Many of these states, however, are not able to compile useful information on the incidence or prevalence of acute work-related pesticide illness. Establishing a surveillance system takes time, and in some states, the reporting requirement is relatively new. In other states, the reporting requirement is an unfunded legislative mandate, and limited public health resources are channeled to other priority areas. Finally, even in states with established, funded surveillance programs, severe underreporting of pesticide-related illness has been documented.¹

There are many reasons why work-related pesticide illness is underreported. Most reporting laws require reporting by health care providers to the state public health agency. However, workers with acute pesticide illnesses that are not life-threatening may not be seen by physicians or other health care providers because they do not have access to care, cannot afford medical care, do not think they are sick enough to seek care, or are afraid their employers will find out and fire them. In addition, symptoms of pesticide illness may be nonspecific and mimic those of other common illnesses, so when an ill worker does seek care, an accurate diagnosis may not be made. Finally, providers may accurately diagnose and treat an acute work-related pesticide illness but fail to report it to the health department.

Workers in agriculture are at high risk for pesticide illness. Other workers at significant risk are those employed by pesticide manufacturers, formulators, and shippers and pesticide applicators in other industries—for example, the structural application (building pest control) and lawn and garden industries. Workers in other settings where pesticides are applied—for example, office and restaurant workers—are also at risk, but it is difficult to quantify risk in these settings.

Because Texas is a large state and agriculture is a major industry in the state, the potential exists for significant work-related pesticide illness. In 1992, Texas had 180,644 farms, encompassing 130,886,608 acres² or 77% of the total landmass of the state. The US Department of Agriculture estimated the farm and ranch work force in Texas in 1997 to be 225,000 workers.³ This estimate included 169,000 self-employed workers, 19,000 unpaid workers

such as family members, and 37,000 hired workers; it could not be determined how many of the state's migrant farm workers were included among the hired employees. A 1993 survey estimated that Texas's migrant work force consisted of more than 370,000 workers (including dependents such as children and non-employed spouses).⁴

In an effort to improve documentation, and ultimately prevention, of occupational pesticide poisoning in Texas, acute pesticide poisoning was added to the list of reportable occupational conditions in 1986.⁵ This regulation requires physicians and laboratory directors to report cases of acute occupational pesticide poisoning to the Texas Department of Health (TDH) and allowed TDH to establish a surveillance program. In what follows, we describe the evolution of the occupational pesticide poisoning surveillance program in Texas from its beginnings in the late 1980s through 1996.

HISTORY OF SURVEILLANCE FOR OCCUPATIONAL PESTICIDE POISONING IN TEXAS

The occupational pesticide surveillance program was initially conceived as a passive system that would collect reports submitted as required by law. However, when only two reports were received in 1986, the first year that reporting was required, TDH realized the need for a more active surveillance effort. In 1987, TDH received financial support for this effort from the National Institute for Occupational Safety and Health (NIOSH) under the Sentinel Event Notification System for Occupational Risk (SENSOR) cooperative agreement program.⁶

During the first five years of SENSOR funding, 1987 through 1991, TDH initiated active surveillance using a sentinel provider system. Due to Texas's large size and the program's limited funding, this surveillance effort was concentrated in three highly agricultural areas of the state: the Rio Grande Valley, the Wintergarden area, and the Southern High Plains. Surveillance program staff contacted physicians, clinics, and hospitals and asked them to serve as sentinel providers. Providers that agreed to participate were contacted by phone or fax on a regular basis (originally monthly, then quarterly) and queried as to whether they had treated any workers with acute pesticide poisoning. During this five-year period, the passive reporting required by law continued statewide, and TDH also initiated a quarterly review of death certificates.

Case definition. Over the years, surveillance program staff have worked with NIOSH, other states, and Federal

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agencies to develop a case definition for occupational pesticide poisoning. A case classification algorithm has evolved (and is now used in at least eight other states), which takes into consideration documentation of exposure and the temporal relationship between exposure and illness as well as evidence of a causal relationship between the pesticide and the reported illness based on the known toxicology of the pesticide. Cases are classified as occupational if the exposure occurred while the individual was at work (this includes working for compensation, working on a family farm or in another home-based business, or working as a volunteer emergency medical technician, firefighter, or law enforcement officer). Once identified as an occupational exposure, a case is then classified as "confirmed" or not, based on the case classification algorithm.

A reported occupational exposure might not be classified as a confirmed occupational pesticide poisoning for several reasons. A worker might be exposed but not acutely ill, the illness may not be related to the exposure, or there may be insufficient information about either the pesticide or the illness to adequately classify the case.

Program evaluation. In 1991, TDH conducted an evaluation of its pesticide poisoning surveillance system for 1989 and 1990 in a nine-county area of the Southern High Plains region. The evaluation involved review of hospital records and emergency department logs at 16 hospitals and 7 migrant clinics to determine the number of pesticide poisoning cases seen during the two-year period. The cases identified during the record review were then compared with the cases that had been

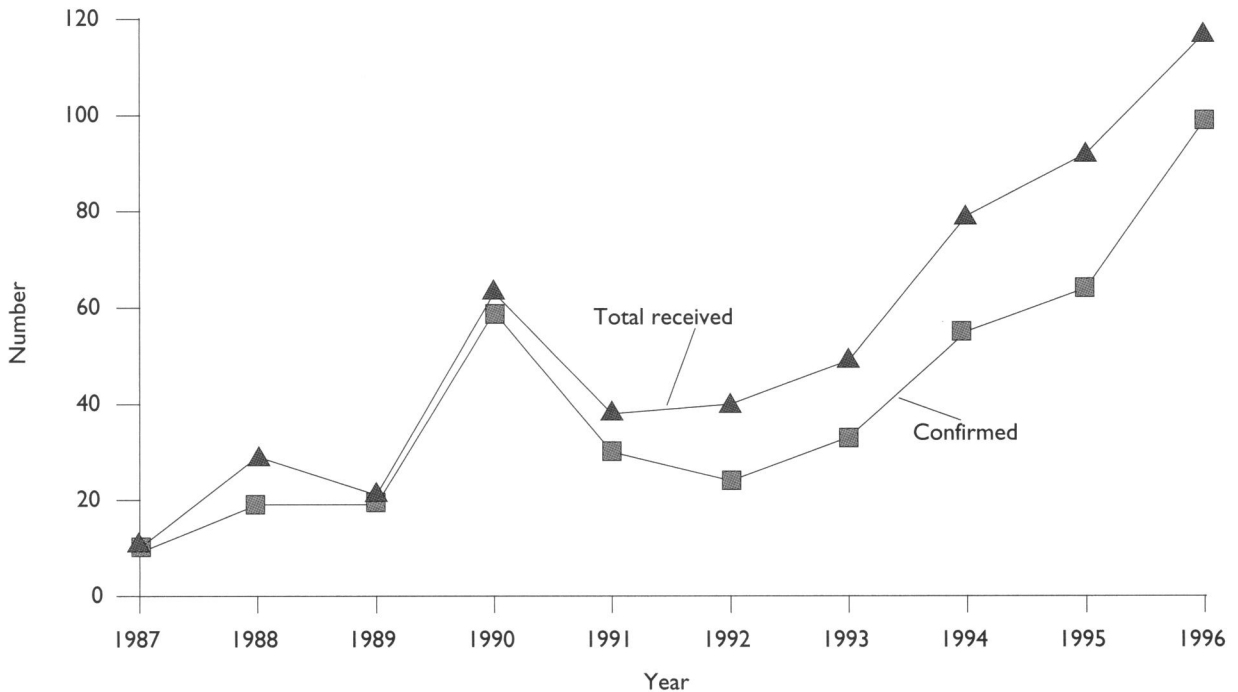
reported to the surveillance program from the same region in 1989 and 1990. The evaluation documented underreporting by the medical facilities. Two cases had been reported to the surveillance system; one of these was identified during the record review, and 10 additional cases that had not been previously reported were also identified.

IMPROVING THE PROGRAM

Based on the results of this evaluation and the first five years of experience, several improvements were made to the surveillance program with the goal of increasing physician reporting and expanding case ascertainment statewide. From 1992 through 1996, the program continued to enroll new sentinel providers, particularly in agricultural areas in which there had been none. In addition, program staff began conducting periodic reviews of hospital medical records in an effort to identify unreported cases. Finally, attempts were made to broaden the scope of case ascertainment by establishing relationships with other state agencies or organizations that might have knowledge of workers exposed to pesticides, such as the Texas Department of Agriculture (TDA), the Texas Workers Compensation Commission, the Structural Pest Control Board, and the Texas Poison Center Network.

Benefits of collaboration. These attempts to initiate collaborations with other agencies were highly successful. In November 1993, the Texas Commissioners of Health and Agriculture jointly signed a Memorandum of Understanding that formalized a relationship between the two agencies to work together to reduce occupational illnesses

Figure 1. Number of acute occupational pesticide poisoning reports received and number confirmed, by year, Texas, 1987–1996



and assure safe and healthful workplaces. TDA then adopted a policy requiring inspectors to report to TDH all incidents involving human exposures to pesticides. Beginning in March 1994, TDA inspectors began calling the surveillance program staff to report human exposures; this resulted in a dramatic increase in reported cases.

Another increase occurred in the fall of 1995, when the Texas Poison Center Network was established. This network consists of six independent poison control centers based at academic institutions throughout the state; all have agreed to report illnesses related to pesticide exposure to TDH. Many hospital emergency departments call the Poison Center Network for guidance in treating people with pesticide-related illnesses. The poison centers report these cases to TDH, thereby diminishing the need for TDH to conduct active surveillance through the primary care system.

Also in 1995, the Structural Pest Control Board, the Texas agency responsible for investigating misuse of pesticides in and around buildings, signed a Memorandum of Understanding with TDH to create a mechanism for the flow of information between the two agencies. Now the Structural Pest Control Board reports all incidents

involving human pesticide exposure to TDH.

Number of reports received. From 1987 through 1996, 534 reports of acute occupational pesticide poisoning were received by the TDH surveillance program; 411 (77%) of these were confirmed based on the case classification system. Reports received from multiple sources on the same case are counted only once; the source of the first report received by the program is recorded as the reporting source.

Figure 1 shows the total number of reports of occupational exposures received and the number confirmed by year for 1987 through 1996 and highlights the dramatic increase from nine confirmed cases in 1987 to 99 confirmed cases in 1996. The peak in 1990 was likely due to 14 individuals becoming ill after a single exposure incident in a municipal office building. This incident also contributed to the large percentage of workers reported from the public administration sector (Figure 2). As expected, the majority of confirmed cases involved agriculture workers.

The numbers of cases reported each year during the 10-year period by the four major reporting sources can be seen in Figure 3. This figure illustrates the shift from

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physicians to TDA and the Texas Poison Center Network as the primary reporting sources.

Reporting by the TDA, the Texas Poison Center Network, and the Structural Pest Control Board has not only increased the number of reports received, but the reporting lag time (the time between a pesticide exposure incident and a report being filed) was shorter for these cases than for cases reported from other sources. In 1996, the average reporting lag time for TDA was 7 days, compared with 24 days for health care providers. Reporting by TDA and the Structural Pest Control

Board has also improved case ascertainment by providing reports of pesticide illness in workers who do not seek medical care; a surveillance program that relies solely on health care providers would miss these cases. Although these exposures may be less severe, they often have important implications for prevention, and we believe it is useful to document them.

Additional benefits of programmatic changes. The surveillance program has grown in other important ways since 1992. With the primary focus having shifted from physician reports to reports from other state agencies and organizations, since the mid-1990s we have tried to interview each reported individual to obtain first-hand information about the exposure incident—information important for case classification. This individual contact allows us to offer information about prevention of future exposure incidents as well as to answer questions about potential health effects or encourage a physician visit if appropriate. Follow-up efforts also include review of medical records and incorporating findings from the TDA or the Structural Pest Control Board inspection when applicable.

Expanding the program. In 1995 the surveillance program received additional funding from NIOSH to begin conducting field investigations of pesticide expo-

Figure 2. Confirmed cases of acute occupational pesticide poisoning, by industry sector, 1987–1996

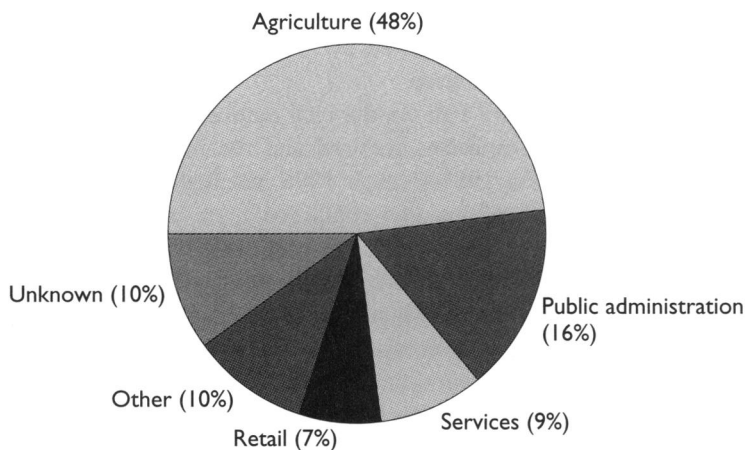
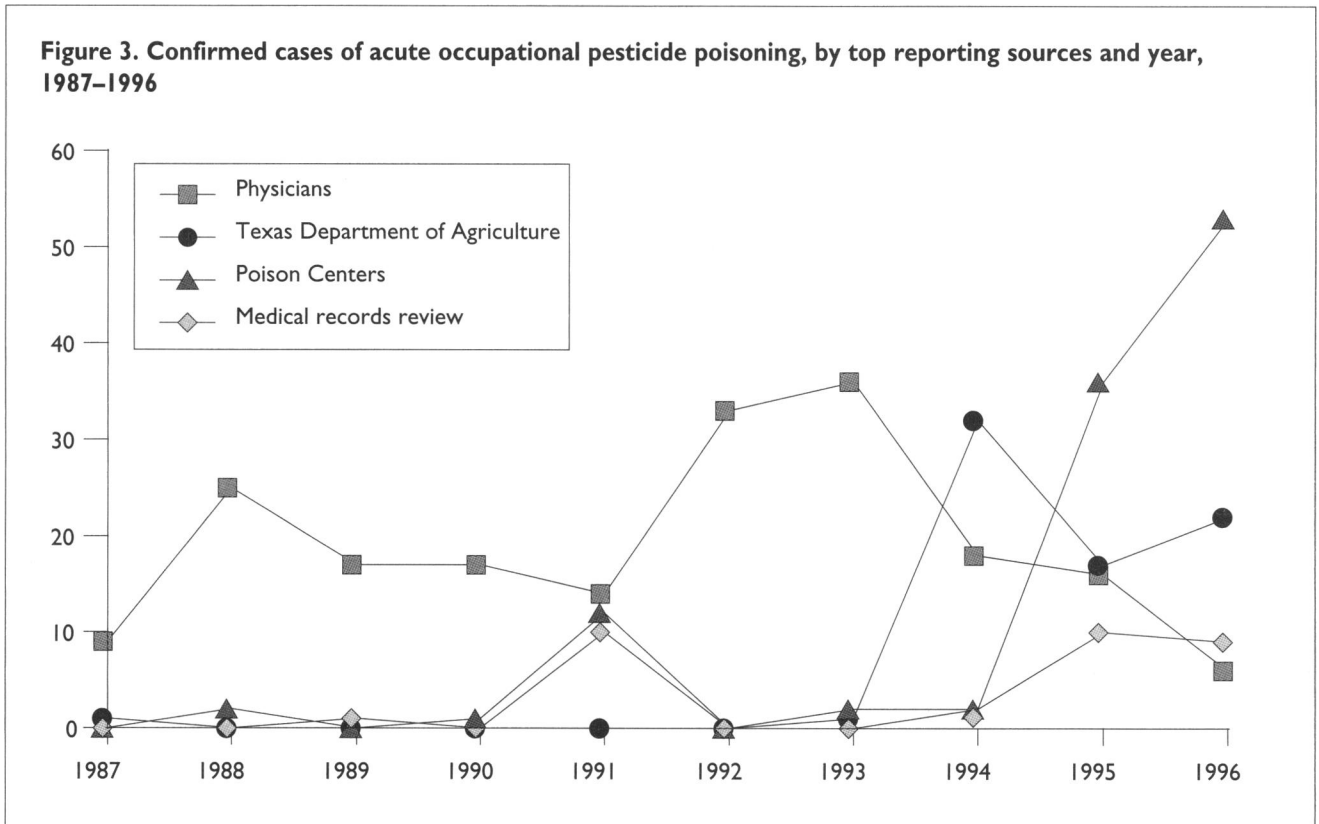


Figure 3. Confirmed cases of acute occupational pesticide poisoning, by top reporting sources and year, 1987–1996



sure incidents. The purpose of this initiative was to determine whether rapid field follow-up of cases ascertained through SENSOR pesticide surveillance could yield information useful for prevention. This initiative has been highly successful in Texas, with the shorter reporting lag times for cases reported by state agencies and organizations playing a significant role in this success. The field investigations have been important not only in providing information for prevention but in strengthening our relationship with TDA; agriculture-related investigations are conducted jointly with TDA, and final investigation reports are shared. During one investigation, we were able to document workers becoming ill after exposure to a fumigant, even though all protective equipment required on the label was worn during the application; this investigation may lead to changes in instructions for product use.⁷

Refining the program. It is important to point out that in addition to adding reporting mechanisms over the years, the program has tried several methods of case ascertainment that were unsuccessful, usually due to low yield of cases for the effort involved. In

fact, in 1996 the program stopped enrolling and contacting sentinel providers because it was so time- and labor-intensive and only a small number of new cases were identified. Over the years we attempted several medical record reviews in agricultural areas of the state, but this effort was also abandoned in 1996 due to low yield of cases and high personnel time and cost. Other methods of case ascertainment have been investigated for possible use but were found not to be feasible. For example, some states have successfully used hospital discharge data for surveillance of occupational (and other) conditions.^{8,9} Unfortunately, hospital discharge data are not yet available for this purpose in Texas. However, a collaboration with the Texas Trauma Registry, in which the Registry would provide reports of exposed workers admitted as trauma patients to participating hospitals, is currently being discussed. Worker compensation data are also often used as an adjunct to surveillance of work-related conditions.^{8,10,11} Although TDH has signed a Memorandum of Understanding with the Texas Workers Compensation Commission, a reporting mechanism has not yet been established.

LESSONS LEARNED

In the 10 years from 1987 through 1996, surveillance of acute occupational pesticide poisoning in Texas evolved from a passive system that received reports from physicians as required by law to an active surveillance program that receives reports from multiple sources and follows up all reports received. Although active surveillance was initiated using the SENSOR model, which relies heavily on reporting by physicians, we found that this model alone resulted in severe underreporting of pesticide illness. In an effort to improve case ascertainment, we cultivated relationships with other state agencies and the newly formed Texas Poison Center Network. This effort was highly successful and resulted in tremendous growth of the program.

The relationships between TDH and the reporting agencies are truly collaborative ones. In exchange for reports of pesticide-related illness, the surveillance program conducts follow-up of exposed individuals and is available to provide information on the potential health effects of pesticides.

It is important to note that although case ascertainment has increased substantially since 1987, given the number of agricultural workers, it is likely that occupational pesticide poisoning is still severely underreported in Texas. There are several reasons for this. With the current system, workers still have to seek health care or contact a state agency for a report to be made. Incidents involving workers who cannot afford health care, do not have access to health care, are reluctant to seek medical care or assistance from a collaborating state agency, or

are unaware that assistance is available to them will not be reported to the surveillance program. Furthermore, some workers, especially those who live or work near the Mexico or New Mexico borders, may receive care outside of Texas and their cases would not be reported to TDH.

FUTURE DIRECTIONS

Looking toward the future, we hope to build on past successes of the surveillance program. We will continue to improve case ascertainment methods, increase the number of field investigations, and actively work with the Texas Workers Compensation Commission to establish a reporting mechanism. In an effort to reach a group of workers at particularly high risk for pesticide illness, we are establishing ties with migrant clinics and developing educational materials and intervention programs to reduce migrants' risk of pesticide exposure.

The ultimate goal of surveillance for work-related pesticide illness in Texas is prevention. In the first 10 years of surveillance, we have progressed from merely collecting data to using data to develop intervention strategies. These prevention activities, in their infancy today, will be our primary focus over the next five years.

Support for the surveillance program was provided through a SENSOR Cooperative Agreement (#U60\CCU602983) between the National Institute for Occupational Safety and Health and the Texas Department of Health. The authors thank the staff members who have contributed significantly over the years, in particular Teresa Willis and Rachel Rosales, MSPH.

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