

Summary of Reported Pesticide Exposures in Louisiana: October 2001 - September 2002



Louisiana Department of Health and Hospitals
Office of Public Health
Section of Environmental Epidemiology and Toxicology

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I. INTRODUCTION

Pesticides are chemicals developed to repel, control, or kill pests, such as insects, weeds, rodents, or fungi. The Louisiana Department of Agriculture & Forestry (LDAF) registers over 11,000 pesticides for use statewide (LDAF, 2002). Some of these products are registered for restricted use, requiring application by certified applicators or people under their supervision, while others are registered for general, household use. Although the majority of pesticides are used on crops, pesticides are also widely used in and around the home, in workplaces, and public places such as schools and parks. The widespread use of pesticides in society and urban sprawl has increased the risk of inadvertent pesticide exposure for all segments of the population.

Circumstances resulting in inadvertent exposure to pesticides include drift or overspray, occupational exposure, and household exposure. Drift or overspray occurs when pesticide spray from an airplane, tractor or a home sprayer drifts or blows onto people living, working or going to school near agricultural fields or other application sites. Occupational exposure occurs when a worker, farmworker, applicator, or mixer, touches or inhales a pesticide. Workers may also unknowingly expose their families by carrying pesticides into the home on their bodies and clothes. Household exposure can occur through the improper handling, storage, and application of household pesticides and exposure to residue of pesticide applications made in and around the home.

Health effects associated with pesticide exposure vary according to many factors: pesticide toxicity, dose, duration and frequency of exposure, route of exposure, exposure to other chemicals, and age and health of affected individuals. Acute, or short-term, exposure to pyrethroid insecticides can cause upper respiratory irritation, shortness of breath, and skin irritation. Acute exposure to herbicides can cause eye and skin irritation, coughing, burning of the throat and lungs, dizziness and nausea. Research also suggests adverse health effects may result from chronic, or long-term, exposure to some pesticides.

In 1991, the Louisiana Department of Agriculture and Forestry (LDAF) and the Louisiana Department of Health and Hospitals (LDHH) established the Health-Related Pesticide Incident Report (HRPIR) Program. The purpose of this statewide program is to investigate and evaluate adverse health effects associated with acute pesticide exposure occurring in Louisiana. The HPRIR Program is complaint-based: only pesticide exposure incidents reported to LDAF and LDHH are investigated. In August 2002, LDHH added an additional reporting source: Louisiana Poison Control Center. The Louisiana Poison Control Center forwards all pesticide-related calls to LDHH. Investigation of these calls depends on the circumstance of exposure and severity of health effects.

This report contains a descriptive summary of pesticide surveillance data from October 2001 through September 2002.

II. INVESTIGATIVE PROCESS

A Health-Related Pesticide Incident Report (HRPIR) is initiated when the Louisiana Department of Agriculture and Forestry/ Office of Agricultural and Environmental Sciences/ Pesticide and Environmental Programs (LDAF) receives a complaint of health effects possibly associated with pesticide exposure. A LDAF Inspector visits the site of the incident, takes a written statement from the complainant(s) regarding the circumstances of exposure and reported health effects, and collects environmental evidence (e.g., applicator's records, environmental samples). LDAF evaluates the collected information to determine if a pesticide has been misused. LDAF regulates pesticide use through the Federal Insecticide, Fungicide, and Rodenticide Act and the Louisiana Pesticide Law.

Information collected by LDAF is immediately forwarded to the Louisiana Department of Health and Hospitals Office of Public Health/ Section of Environmental Epidemiology and Toxicology (LDHH). LDHH interviews complainants about the incident, eliciting additional information about the circumstance of exposure and reported health effects. When appropriate, medical records are obtained. Toxicological information from pesticide labels, Material Safety Data Sheets (MSDS), and health studies are also reviewed. LDHH evaluates the collected information to determine the likelihood that the pesticide(s) caused the reported health effects and evaluates the possibility of long-term health effects associated with the pesticide exposure. LDAF and LDHH each provide the complainant with a final report.

In August 2002, LDHH began receiving real-time reports from the Louisiana Poison Control Center (PCC) of all cases involving a pesticide exposure. PCC case reports are included in the surveillance system if a reported pesticide exposure resulted in one or more health effects related to pesticide exposure, as determined by the PCC specialist. All occupationally related incidents are referred to LDAF for further investigation. Other cases may also be referred to LDAF depending on the circumstance of exposure and severity of health effects. Most PCC case reports, however, are not referred to LDAF as they typically involve residential exposures resulting in minimal health effects.

III. RESULTS

Results represent data from the pesticide surveillance program from October 2001 through September 2002.

Throughout this report, an *incident* is defined as a reported health-related pesticide event affecting at least one person. Each individual affected by a single incident is considered a *case*. Therefore, many cases may be included in one incident. The health effects associated with a reported pesticide exposure are evaluated individually by case.

Case Classification

Cases are classified using the National Institute for Occupational Safety and Health's (NIOSH) case definition for acute pesticide-related illness and injury. Classification categories consider the level of certainty of exposure, documentation of health effects, and the plausibility of reported health effects based on the known toxicology of the pesticide(s) (NIOSH, 2000). The strongest evidence of pesticide exposure is confirmation of exposure by environmental or biological samples, and of health effects by medical records.

Case Classification Categories for Acute Pesticide-Related Illness and Injury (NIOSH, 2000):

Confirmed Case

Definition: Health effects confirmed as being associated with pesticide exposure.

Criteria:

1. Laboratory, clinical, or environmental evidence corroborate exposure;
2. New post-exposure abnormal signs* and/or test/laboratory findings reported by a licensed health care provider; and
3. Consistent evidence of a causal relationship between the identified pesticide and the health effects based on the known toxicology of the pesticide.

Likely Case

Definition: Health effects likely associated with pesticide exposure.

Criteria:

1. Laboratory, clinical or environmental evidence corroborate exposure;
2. New post-exposure abnormal symptoms† were reported; and
3. Consistent evidence of a causal relationship between the identified pesticide and the health effects based on the known toxicology of the pesticide.

OR

1. Evidence of exposure based solely upon written or verbal report;
2. New post-exposure abnormal signs* and/or test/laboratory findings reported by a licensed health care provider; and,

3. Consistent evidence of a causal relationship between the identified pesticide and the health effects based on the known toxicology of the pesticide.

Possible Case

Definition: Health effects possibly associated with pesticide exposure.

Criteria:

1. Evidence of exposure based solely upon written or verbal report;
2. New post-exposure abnormal symptoms† were reported; and
3. Consistent evidence of a causal relationship between the identified pesticide and the health effects based on the known toxicology of the pesticide.

Unlikely Case

Definition: Health effects unlikely associated with pesticide exposure.

Criteria:

1. Laboratory, clinical or environmental evidence corroborate exposure, or evidence of exposure based solely upon written or verbal report;
2. New post-exposure abnormal signs*, symptoms†, and/or test/laboratory findings were reported; and
3. Evidence of health effects based on pesticide exposure is not present (e.g., exposure dose was insufficient to produce observed health effects, temporal relationship does not exist).

Insufficient Information

Definition: There is insufficient health and/or exposure data.

Criteria:

1. Insufficient health and/or exposure data to evaluate case's health effects.

No Symptoms Reported/ Not Pesticide-Related

Definition: Health effects were not experienced by the case.

Criteria:

1. No health effects were experienced or reported by the case; or
2. Definite evidence of a cause other than pesticide exposure.

* Signs are objective findings that can be observed and described by a licensed healthcare professional.

† Symptoms are any subjective evidence of a disease or condition as perceived and reported by the affected individual.

Figure 1 depicts the total number of reported incidents and cases by the case classification. There were 65 incidents and 110 cases during the one-year period.

**Figure 1: Classification of Health-Related Pesticide Cases and Incidents:
October 2001- September 2002**

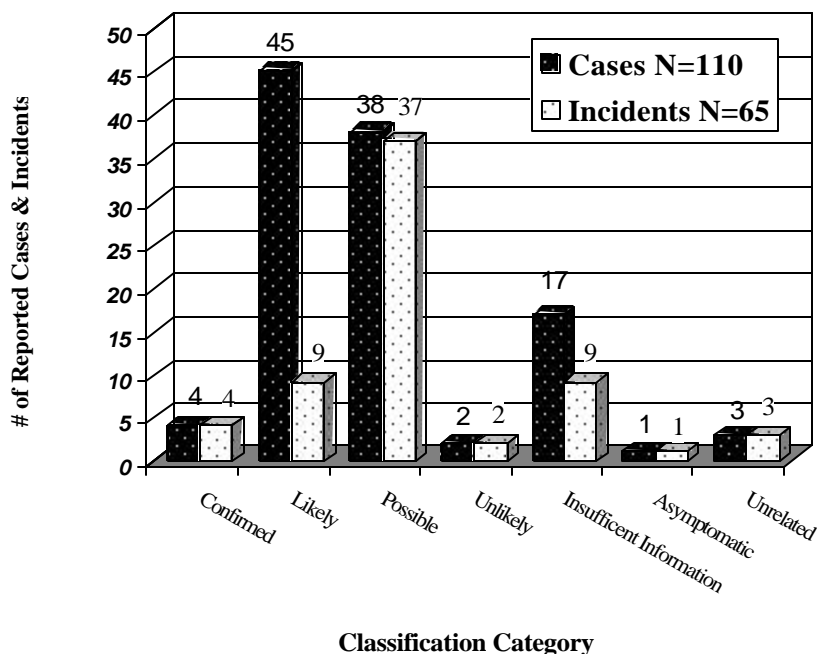


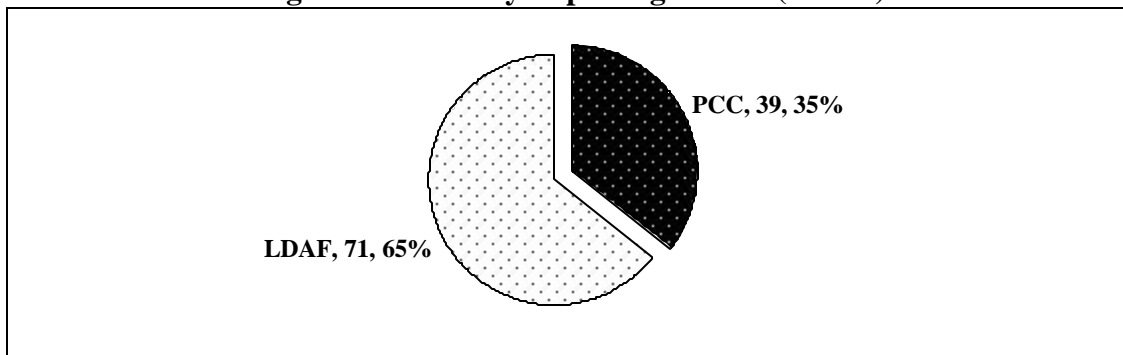
Figure 1 categorizes cases and incidents by reported health effects. Incidents with more than one case were classified according to the classification category of the strongest case (i.e., confirmed was the strongest, followed by likely). Of the 110 cases reported from October 2001 to September 2002, 79% (87 cases) experienced symptoms associated with pesticide exposure as determined by NIOSH's case classification system. Cases with health effects associated with pesticide exposure include 4 confirmed cases (4%), 45 likely cases (41%), and 38 possible cases (35%).

The remaining cases were classified as follows: 17 insufficient information (16%), 3 unrelated (3%), 2 with health effects unlikely related to pesticide exposure (2%), and 1 asymptomatic (1%). Cases classified as insufficient information were usually lacking in the number of reported health effects. If a case reported only 1 health effect, the NIOSH classification system deems it as insufficient information to determine if the health effect was pesticide-related. A minimum of 2 reported symptoms are needed to make this classification.

Reporting Source

Reports of pesticide exposure were obtained from 2 sources: Louisiana Department of Agriculture and Forestry (LDAF), and the Louisiana Poison Control Center (PCC). Figure 2 shows the number of cases from each source.

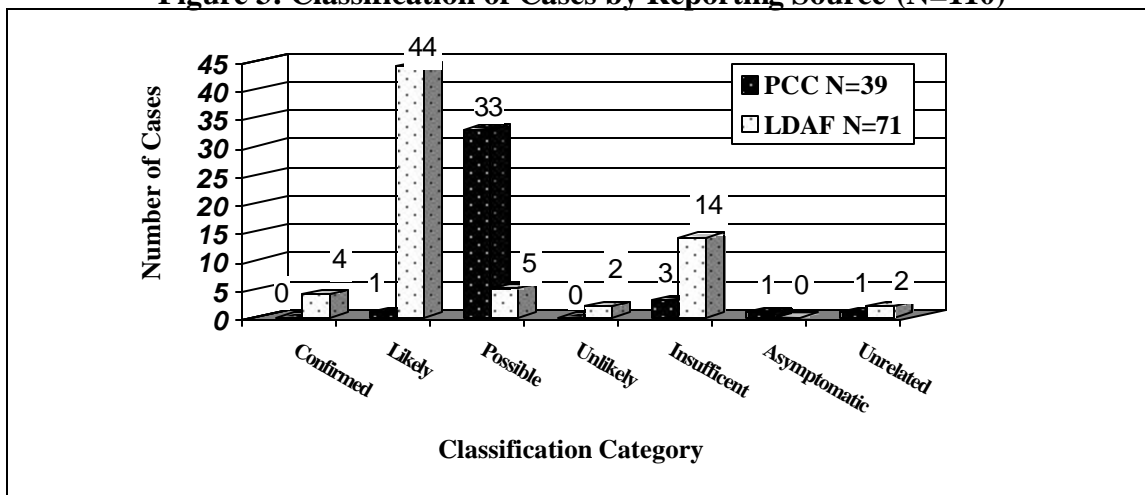
Figure 2: Cases by Reporting Source (N=110)



As indicated in Figure 2, LDAF accounts for the majority of pesticide exposure cases, 71 cases, or 65% of all reported cases. During this reporting period, there were only 2 months of PCC reports: August – September.

Figure 3 shows the number of cases per source by classification category.

Figure 3: Classification of Cases by Reporting Source (N=110)

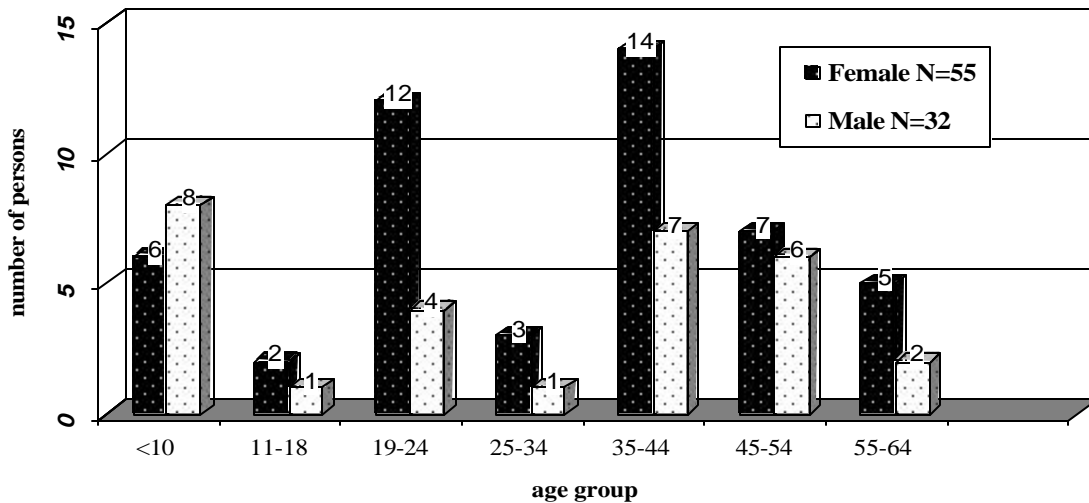


LDAF was the reporting source for all of the 4 confirmed cases, and 98% of the likely cases. Eighty-nine percent of the possible cases (33 cases) were reported by PCC. The remaining 23 cases – unlikely, insufficient, asymptomatic, and unrelated - did not have health effects that were classified as associated with pesticide exposure. Of these 23 cases, 78% or 18 cases were reported by LDAF.

Demographics of Cases: Age and Sex

Figure 4 shows the age and sex of the 87 confirmed, likely, and possible cases.

Figure 4: Age & Sex Distribution of Cases with Health Effects Associated with Pesticide Exposure



There were a total of 87 cases classified with health effects reported to pesticide exposure. Of these 87 cases, 55 or 63% were females, and 32 or 37% were males. The median age for children was 4.2 years (range .5 – 18.2), and the median age for adults was 40.0 (range 20.2-85.2).

Occupational Pesticide Exposures

Twenty-nine percent of the cases (25 cases) with health effects associated with pesticide exposure were occupationally related. Incidents are considered occupationally related if the reported pesticide exposure occurred while the exposed individual was at work. Work-related incidents include reported exposures occurring on employer premises, work for a family business, travel on business, and work for pay or compensation at home.

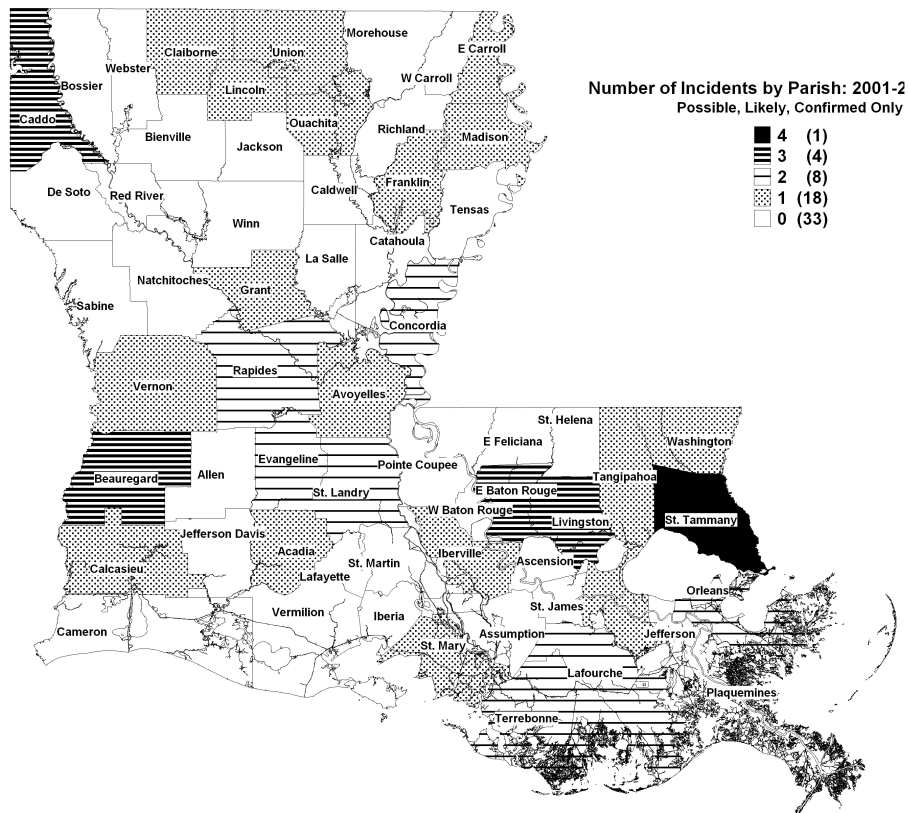
Twenty-one occupational cases were involved in a single incident involving a pesticide misapplication at a public elementary school. The incident involved an application of an organophosphate insecticide, chlorpyrifos, to the doorways and foundations of temporary buildings, in order to control swarming termites and ants. Immediately following the application, 21 people working in and around the temporary buildings noticed an odor and began to experience symptoms. All 21 individuals were

sent off site for the remainder of the day. At the time of the application, there were no children present. Upon returning to school the following day, several persons complained that their symptoms had returned and they were again sent away from school for the remainder of the day. The most commonly reported complaints were headache, sore throat, and allergy-like symptoms. Five days after the incident, symptoms had resolved and everyone returned to work.

Other occupational exposures include a pesticide loader exposed to organophosphates while preparing pesticides for application and a boll weevil trapper sprayed by an aerial applicator. Circumstance of exposure and occupation were unknown for the 2 remaining cases.

Incidents by Parish

Figure 5: Pesticide Incidents by Parish



Of the Louisiana's 64 parishes, 31 parishes or 48%, had a reported pesticide-related incident with associated health effects during 2001- 2002. St. Tammany Parish had the greatest number of reported incidents (4 incidents). Four parishes had 3 incidents: East Baton Rouge, Livingston, Beauregard, and Caddo. Eight parishes (13%) had 2 incidents, and 18 (28%) parishes had one incident.

Circumstance of Pesticide Exposure

Circumstance of pesticide exposure refers to how a person was exposed to a pesticide.

Figure 6: Circumstance of Exposure of Cases with Health Effects Associated with Pesticide Exposure (N=87 cases)

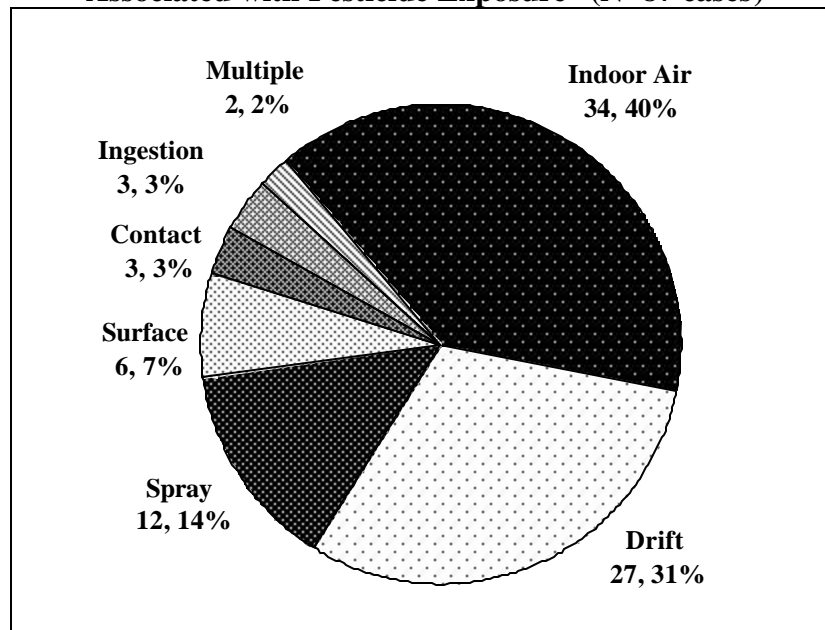


Figure 6 indicates that the majority of cases were exposed either via contaminated indoor air (34 cases, or 40%) or drift (27 cases, or 31%). The remaining cases include exposure by direct spray (12 cases, or 14%), contact with a treated surface (6 cases, or 7%), contact resulting from a spill or leakage (3 cases, or 3%), ingestion (3 cases, or 3%), and multiple routes of exposure (2, or 2%).

Indoor air

Twenty-one of the indoor air cases were related to a single event involving a pesticide misuse at a public elementary school. The 13 remaining cases involved residential pesticide applications: 7 cases reported exposure to foggers, 4 cases sprayed their house to control insects, 2 cases were exposed to fumes from a large misapplication of malathion inside a home, and 1 case developed health effects due to a professional cleaning of his heating, ventilation, and air conditioning system.

Drift

There were 27 cases of pesticide exposure due to drift. Eighteen of the cases (70%) involved drift from an aerial pesticide application, 4 cases were exposed to a roadside application, and 5 cases were exposed to drift from a residential application.

Spray

All 12 cases exposed to pesticide spray involved the accidental spraying of oneself or another person. For example, one case involved a four-year-old who accidentally sprayed insect repellent on his eye and face. Another case involved an individual who was preparing to use a fogger when it went off and sprayed him in the eye.

Surface

There were 6 cases involving contact with a surface treated with a pesticide. Four of the 6 cases involve children coming in contact with a surface and rubbing their eyes and face. One case involved contact with contaminated clothing, and 1 case involved a person who was working in an area shortly after a pesticide application.

Contact

There were 3 cases involving contact with pesticides. One case resulted from contact while mixing pesticides, 1 case resulted from contact of a pesticide strip to the eye, and 1 case resulted from contact of carbamate granules to arms and legs.

Ingestion

There were 3 cases of reported pesticide ingestion. One case involved the accidental ingestion of glyphosate stored in a juice bottle. One case attempted suicide by ingesting pesticides mixed with other ingredients, and one case involved accidentally administering a pediculicide containing lindane to a child.

Multiple type

There were 2 cases involving multiple types of exposure. One case involved a termiticide application by a licensed applicator without the permission of the homeowner resulting in exposure via contaminated indoor air and dermal contact. One case involved use of pesticides occupationally for a period of 2 months, resulting in a direct spray and indoor air exposure.

Location of Pesticide Exposure

The location of pesticide exposure refers to where the case was exposed to the pesticide.

Figure 7: Site of Exposure of Cases with Health Effects Associated with Pesticide Exposure (N=87 Cases)

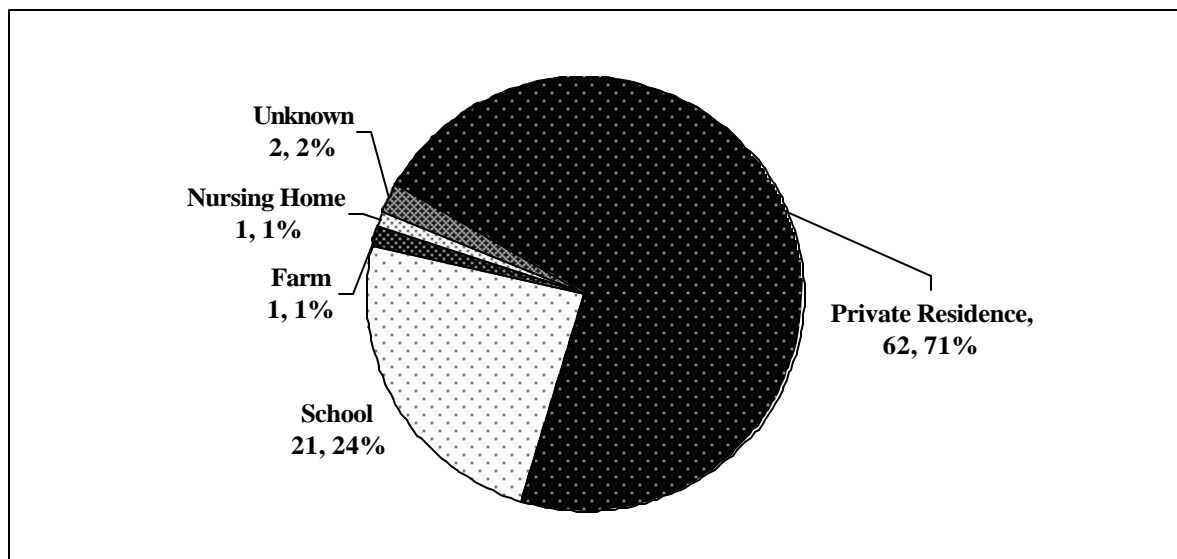
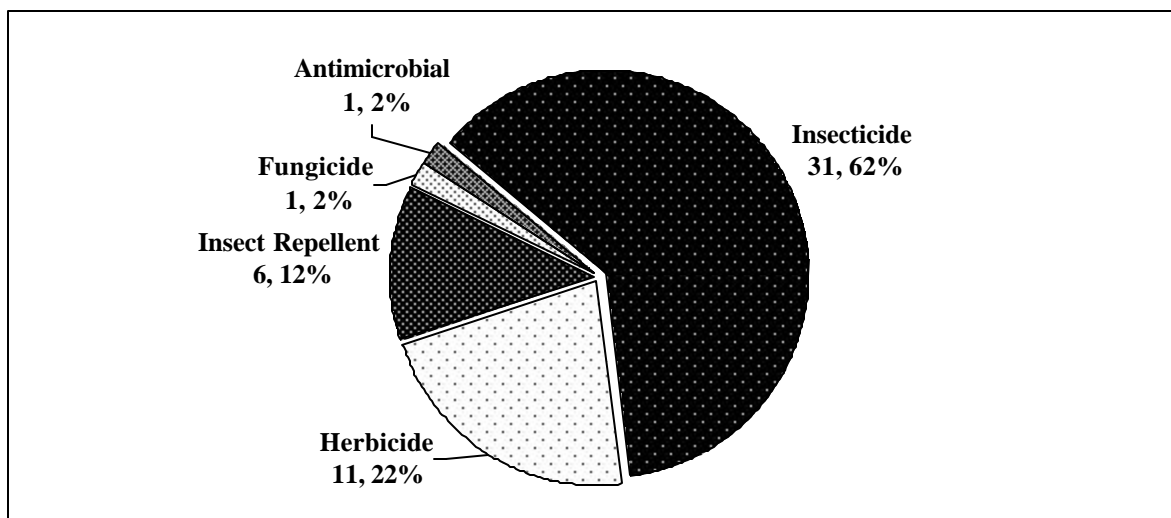


Figure 7 shows that the most common site of exposure to pesticide was at a private residence (62 cases, or 71%). Twenty-one office workers (24%) were exposed while working at a school. The remaining exposure locations include farm (1 case, or 1%), nursing home (1 case, or 1%), and unknown location (2 cases, or 2%).

Type of Pesticide

The type of pesticide product used in each incident was classified for incidents involving a case with health effects associated with pesticide exposure.

Figure 8: Type of Pesticide (N=50 Events)



As indicated in Figure 8, the most common type of pesticide was insecticide (31 events, or 62%). The remaining types of pesticides include herbicides (11 events, or 22%), insect repellents (6 events, or 12%), fungicide (1 event, or 2%), and antimicrobial (1 event, or 2%).

Insecticides

The 31 incidents involving exposure to an insecticide were classified according to the class of insecticide.

Figure 9: Insecticide Class (N=31 Insecticide Incidents)

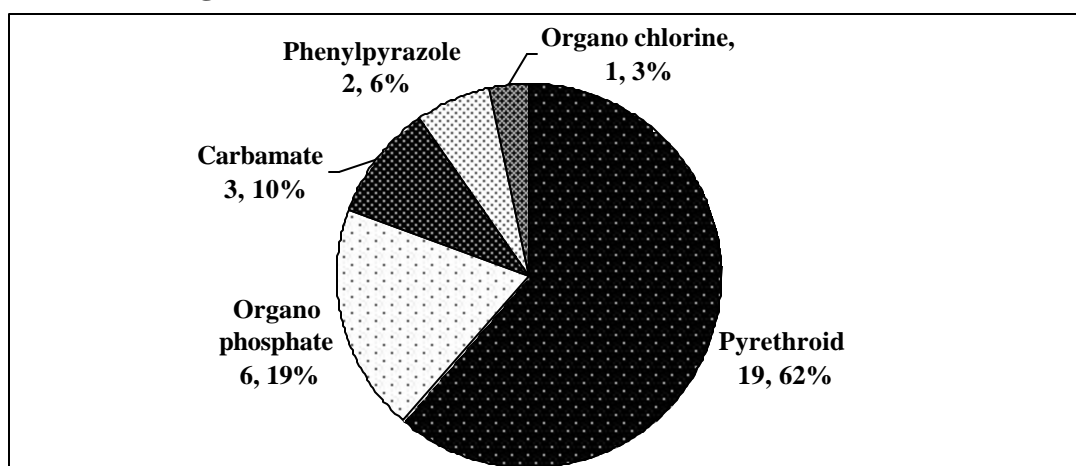
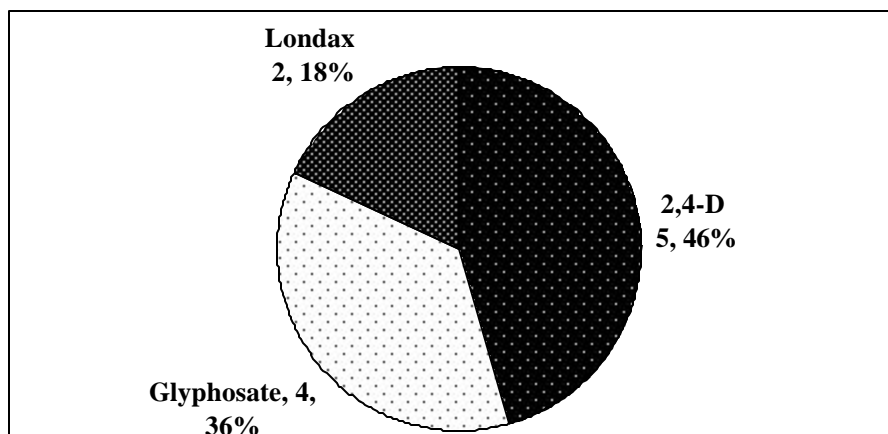


Figure 9 shows the different insecticide classes related to the exposure of confirmed, likely, and possible cases. Pyrethroids account for the largest portion of exposures with 62% of insecticide exposures (19 events). Commonly used pyrethroids include tetramethrin (4 events), efmethrin (4 events) and cypermethrin (3 events). There were 6 incidents involving an organophosphate insecticide: chlorpyrifos (4 events), methyl parathion (1 event) and malathion (1 event). The 3 incidents involving carbamates include carbaryl (2 events) and propoxur (1 event). The insecticide class phenylpyrazole includes 2 fipronil events, and the 1 organochlorine event involved exposure to a lice shampoo containing lindane.

Herbicides

The 11 incidents involving exposure to an herbicide were classified according to the herbicide products active ingredient.

Figure 10: Herbicides (N=11 Herbicide Incidents)

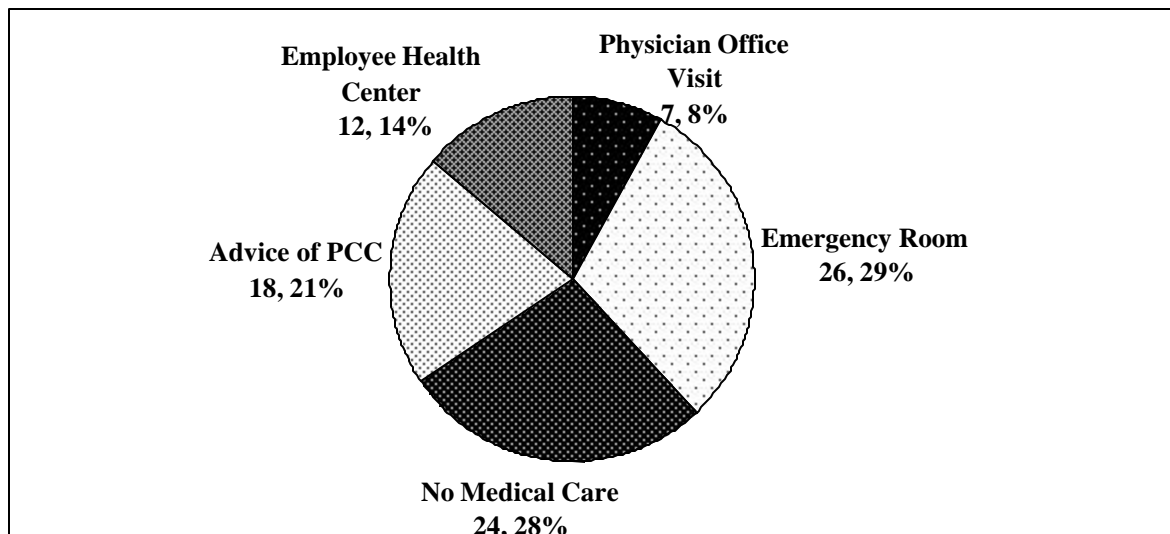


There were 11 incidents involving exposure to an herbicide. As indicated in Figure 10, 5 incidents involved exposure to 2,4-D, 4 incidents involved glyphosate, and 2 incidents involved londax.

Healthcare Utilization

Cases were categorized according to healthcare utilization: emergency room visit, physician office, employee health center, or no medical care sought. Advice of Poison Control Center (PCC) refers to a call made to the PCC but without any visit at a healthcare facility.

Figure 11: Healthcare Utilization of Cases with Health Effects Associated with Pesticide Exposure (N=87 Cases)



As indicated in Figure 11, the majority of case sought some type of healthcare either an emergency room visit (26 cases, or 29%), clinic visit (employee health center (12 cases, or 14%) or physician office (7 cases, or 8%)) or advice of the Poison Control Center (18 cases, or 21%). Twenty-four cases (28%) did not seek any type of healthcare.

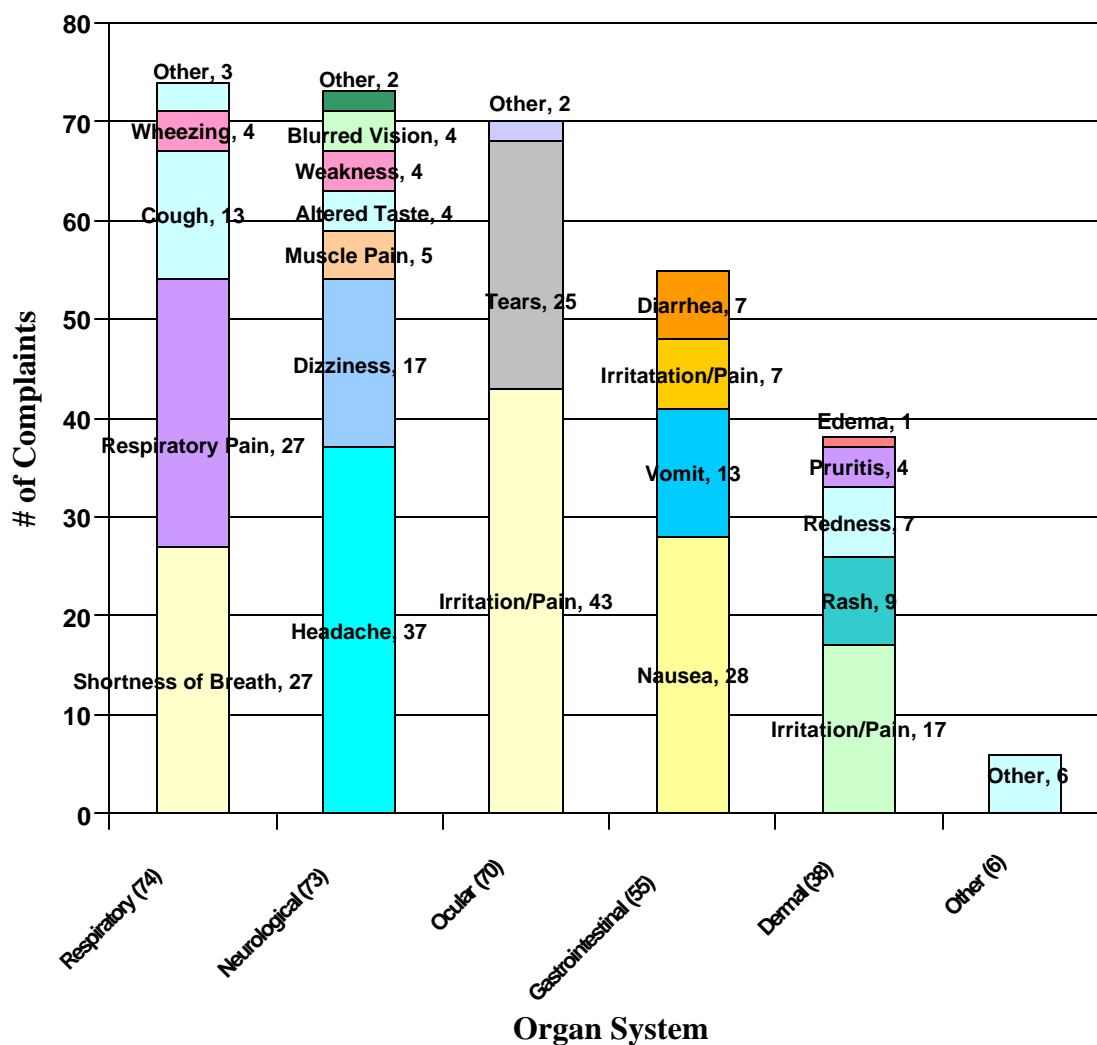
Severity of Health Effects

Cases were categorized according to the severity of their health effects: mild, moderate, severe, and fatal. Severe refers to systemic health effects requiring aggressive medical treatment or hospitalization and topical burns, ulceration, or irritations requiring medical treatment. Moderate health effects typically resolve without medical treatment and are of short duration, and mild health effects are minimally bothersome and rapidly resolved. Of the 87 cases, 83 cases experienced health effects of low severity and 4 cases had health effects of moderate severity.

Symptomology

Reported symptoms were categorized according to organ system. There were a total of 316 reported symptoms. Cases reported, by definition, a minimum of 2 symptoms with an average of 4 symptoms.

Figure 12: Reported Symptoms by Organ System of Cases with Health Effects Associated with Pesticide Exposure (N=87 Cases)



As indicated in Figure 12, respiratory, neurological and ocular symptoms were the most common. Eye irritation/pain was the single most commonly reported symptom (n=43), followed by headache (n=37), nausea (n=28), respiratory pain (n=27) and shortness of breath (n=27).

IV. DISCUSSION

During the one-year period, October 2001 through September 2002, 65 potential pesticide exposure incidents involving 110 cases were investigated by the Louisiana Department of Health and Hospitals Office of Public Health/ Section of Environmental Epidemiology and Toxicology (LDHH). The report focuses on the 50 incidents involving 87 cases that had health effects associated with the reported pesticide exposure. Cases with insufficient information were the largest excluded category (17 cases). Case reports are considered insufficient if there is not enough environmental and/or health evidence to determine if there was an association between a pesticide exposure and health effect.

Reports of pesticide exposure are received from 2 sources: the Louisiana Department of Agriculture and Forestry's Health-Related Pesticide Incident Report Program (HRPIR) and the Louisiana Poison Control Center. A HRPIR is initiated when the Louisiana Department of Agriculture and Forestry Office of Agricultural and Environmental Sciences/ Pesticide and Environmental Programs (LDAF) receives a complaint of health effects possibly associated with pesticide exposure. In August 2002, LDHH began receiving reports from the Louisiana Poison Control Center (PCC). Reports from the PCC are included in the surveillance system if a reported pesticide exposure resulted in one or more health effect related to pesticide exposure.

In this report, the majority of pesticide exposure incidents were received through LDAF's HRPIR Program (65%). There were only 2 months of PCC reports included in this reporting period. Confirmed and likely cases were primarily HRPIRs (48 HRPIRs vs 1 PCC report), and possible cases were primarily PCC reports (33 PCC reports vs 5 HRPIRs). The HRPIRs are more likely to contain environmental samples and medical records than the PCC reports which largely explains the difference in classification.

There were more reported incidents and cases received during the 2001-2002 reporting period than previous reporting periods. During 2000-2001, there were 27 incidents involving 36 cases, and analysis of pesticide surveillance data from 1995 through 2000 indicates a median of 33 incidents and 57 cases per year (Louisiana Department of Health & Hospitals, 2002). The addition of a new reporting source contributed to the increase in reported incidents, although the number of HRPIRs was also greater than previous years.

Pesticide exposure incidents occurred in all areas of the state, although 52% of the parishes did not have any reported pesticide exposure incidents during the one-year period. The parish with the greatest number of reported incidents was St. Tammany.

There were 17 children less than 19 years of age who developed health effects associated with pesticide exposure. Seven children were exposed to drift of a pesticide either from an aerial application (5 cases) or a residential application (2 cases). Accidental misuse of a pesticide affected five children who were exposed to minor misapplications of a product (e.g., spraying DEET® in the eye or face). There were two

potentially serious accidental ingestions: a child was mistakenly given a shampoo containing lindane instead of cough syrup, and a 3-year-old was accidentally given glyphosate to drink. Other exposures involving children include contact with a treated surface and exposure to contaminated indoor air.

There were 25 cases occupationally exposed. Most of the occupational cases were related to a pesticide misapplication at an elementary school. Although there were no children exposed during this incident, pesticide use at schools is a public health concern. Since 1991, LDHH has documented nine pesticide exposure incidents occurring on school property. In order to protect children from pesticides during school hours, thirty-one states, including Louisiana, have adopted rules or regulations that specifically speak to the application of pesticides on or near school property. Louisiana's Pesticide Law stipulates that schools must 1) maintain a record of pesticide use, 2) apply pesticides at least eight hours preceding presence of students, 3) employ a certified commercial applicator for all pesticide applications, 4) submit annually an integrated pest management plan to the LDAF and 5) maintain a hypersensitive student registry. Schools are also encouraged to use the least toxic method of pest control. LDHH and LDAF are in the process of developing a fact sheet for school administrators and parents that discusses laws regulating pesticide use in schools and integrated pest management practices. In addition, LDHH wrote an article in the Louisiana Morbidity Report regarding the pesticide misapplication at the school (Soileau S, Lackovic M, 2004), and co-authored an in depth article discussing national pesticide exposure rates at schools and integrated pest management practices (Alarcon WA, Calvert GM, Blondell JM, 2005).

The location of exposure for the majority of cases was their residence. The most common circumstances of exposure were contaminated indoor air (34 cases, or 40%) and off-target drift (27 cases, or 31%). The indoor air incident at the school involved 21 cases; other commonly reported indoor air incidents include exposure to foggers (7 cases) and insect sprays (4 cases). Exposure to an aerial agricultural pesticide application was the most common type of drift exposure (18 cases).

Sixty-two percent of the incidents involved exposure to an insecticide, followed by herbicides (22% of the incidents). The most frequently reported insecticide class was pyrethroids including tetramethrin, efmethrin, and cypermethrin. Contact dermatitis and allergic respiratory reactions are the most commonly reported symptoms following exposure to synthetic pyrethroids. Organophosphates represent 19% of the insecticides. Some of the most common symptoms resulting from organophosphate exposure are headache, nausea, and dizziness.

Seventy-two percent of the cases sought some type of medical care ranging from the advice of a poison control specialist (21%) to an emergency room visit (29%). Cases reported an average of 4 symptoms. There were a similar number of reported respiratory, neurological and ocular symptoms. The most commonly reported symptoms were eye irritation and pain, headache, shortness of breath, and respiratory pain. Ninety-five percent of the complainants had mild health effects. Mild health effects are considered to be minimally bothersome and rapidly resolved.

Reports of pesticide exposure evaluated by LDHH include Health-Related Pesticide Incident Reports (HRPIR) and Poison Control Reports. Evaluation of reports received from October 2001 through September 2002 provides detailed information about reported pesticide exposures occurring in Louisiana. Data indicate that most pesticide exposures occur at home and involve either exposure to contaminated indoor air or off-target pesticide drift. The majority of pesticide incidents involve insecticide exposure, and pyrethroids are the most common class of insecticide followed by organophosphate. Although the majority of cases sought some type of medical care, most cases experienced mild symptoms that were minimally bothersome and quickly resolved.

V. REFERENCES

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VI. APPENDIX

Appendix A: Contact Information

Louisiana Department of Agriculture and Forestry (LDAF)
Office of Agricultural & Environmental Sciences
Pesticide & Environmental Programs
P.O. Box 3596
Baton Rouge, LA 70821-3596
24-hour Pesticide Hotline: (225) 925-3763
Website: <http://www.ldaf.state.la.us/>

Louisiana Department of Health & Hospitals (LDHH)
Office of Public Health
Section of Environmental Epidemiology & Toxicology
325 Loyola Avenue, Suite 210
New Orleans, LA 70112
Toll-free Number: 1-888-293-7020
Website: <http://www.oph.dhh.state.la.us/>

For information regarding this report, contact LDHH.