

# The CDC/NIOSH **S**entinel **E**vent **N**otification **S**ystem for **O**ccupational **R**isks (SENSOR) Pesticides Program

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# Session goal

1. Provide an overview of pesticide-related surveillance activities conducted at NIOSH
2. How the SENSOR-Pesticides program obtains data
3. How quality assurance and quality control are maintained
4. Present some results



# Public health surveillance is

- The ongoing systematic collection,
- analysis, and interpretation of data,
- timely dissemination of data
- to prevent and control disease.

(Thacker and Berkelman, 1988)

**Data for action**

<https://pubmed.ncbi.nlm.nih.gov/3066626/>

# Why conduct pesticide poisoning surveillance?

- Ongoing concerns about pesticide toxicity
- Pre-market testing of pesticides is not comprehensive
- Useful for identifying emerging pesticide hazards
- Assess **root causes** of acute pesticide poisonings
  - ➔ apply lessons learned to **prevent** future cases

# SENSOR = **Sentinel** Event Notification System for Occupational Risk

- "**Sentinel**" acute pesticide poisoning case identification, follow-up, case report
- By identifying “sentinel” cases, public health authorities can
  - assess the **root causes** for those cases
  - apply lessons learned to **prevent** future cases
- One of the illnesses supported under SENSOR is **acute occupational pesticide-related illness and injury**

**How the SENSOR-Pesticides program  
obtains data?**

# The SENSOR-Pesticides program

- Goal: protect workers from exposure to pesticides
  - Determine extent and root cause(s)
  - Use this knowledge to prevent these exposures
- A **state-based** surveillance program
- **NIOSH**: cooperative agreement funding + technical support
- **EPA**: uses data + technical support + funding



SENSOR is a  
partnership among  
state programs,  
NIOSH, and the EPA

# States Participating in SENSOR-Pesticides

<u>1988-1997</u>	<u>1998-2000</u>	<u>2001-2006</u>	<u>2007-2010</u>	<u>2011-2012</u>	<u>2013-2016</u>	<u>2017-2018</u>	<u>2019-2020</u>
California <sup>†</sup>	Arizona*	Arizona*	Arizona*	California	California	California	California
New York <sup>§</sup>	California	California	California	Florida	Florida	Florida	Florida*
Oregon	Florida	Florida*	Florida*	Louisiana	Louisiana	Louisiana*	Louisiana*
Texas	Louisiana*	Louisiana*	Louisiana*	Iowa	Iowa*	Illinois	Illinois*
	New York	Michigan	Iowa	Michigan	Michigan	Michigan	Michigan
	Oregon	New York	Michigan	New Mexico*	Nebraska*	Nebraska*	Nebraska*
	Texas	Oregon	New Mexico*	New York	New Mexico*	New Mexico*	New Mexico*
		Texas	New York	North Carolina	New York	North Carolina*	North Carolina*
		Washington	N. Carolina*	Oregon*	North Carolina	Oregon*	Oregon*
			Oregon*	Texas*	Oregon*	Texas	Texas
			Texas*	Washington	Texas*	Washington	Washington*
			Washington		Washington		

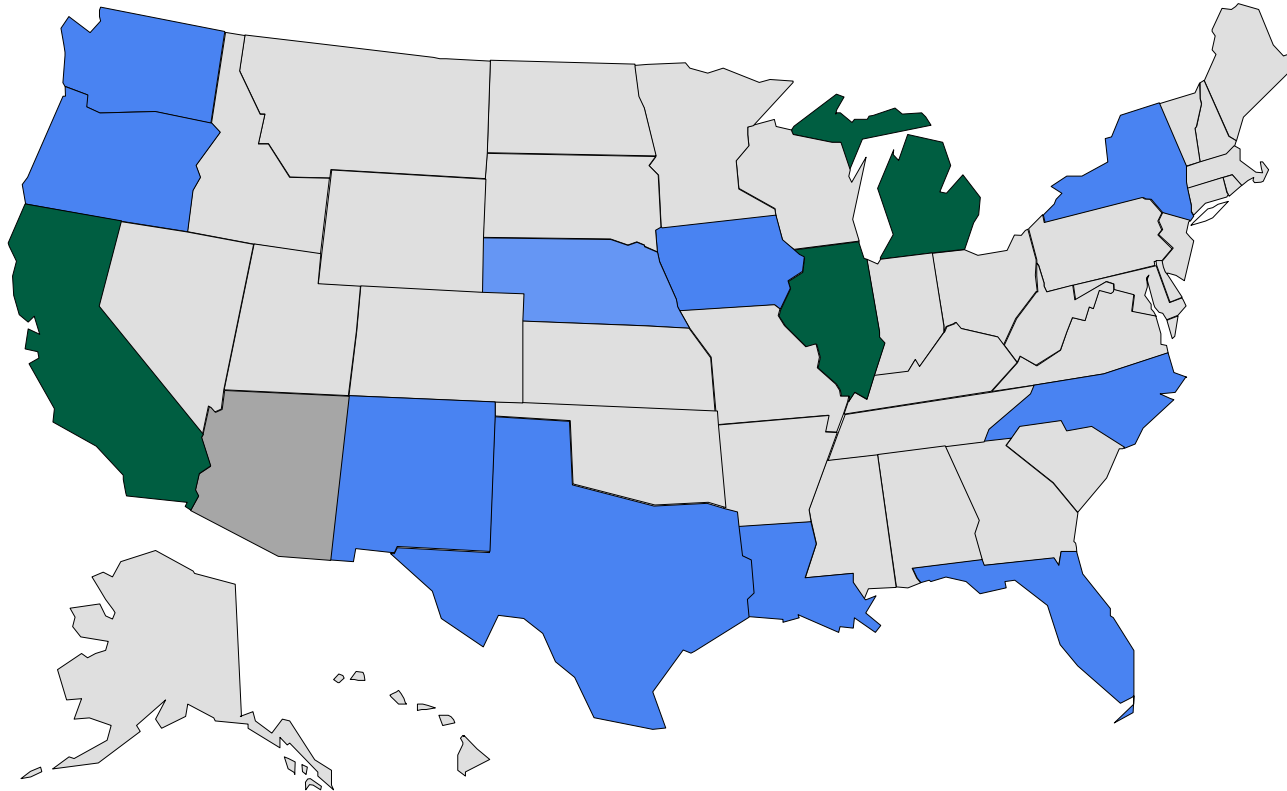
\*receives no federal support

<sup>†</sup> (88-92)

<sup>§</sup> (93-97)

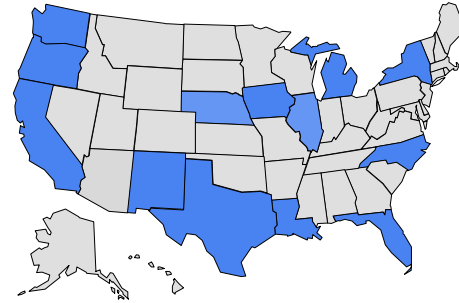


# States that participate or have participated in SENSOR-Pesticides. FY 22-26 awardees shown in green



# Data sources

- Poison control centers
- Report or referral from governmental agency
- Physician and other health care professional reports
- Workers' compensation
- Other reporting sources



**State programs:  
case ascertainment using standardized  
procedures**

**Standardized Variables for State Surveillance of Pesticide-Related Illness and Injury**

**Welcome to SPIDER !**

SENSOR Pesticide Incident Data Entry and Reporting

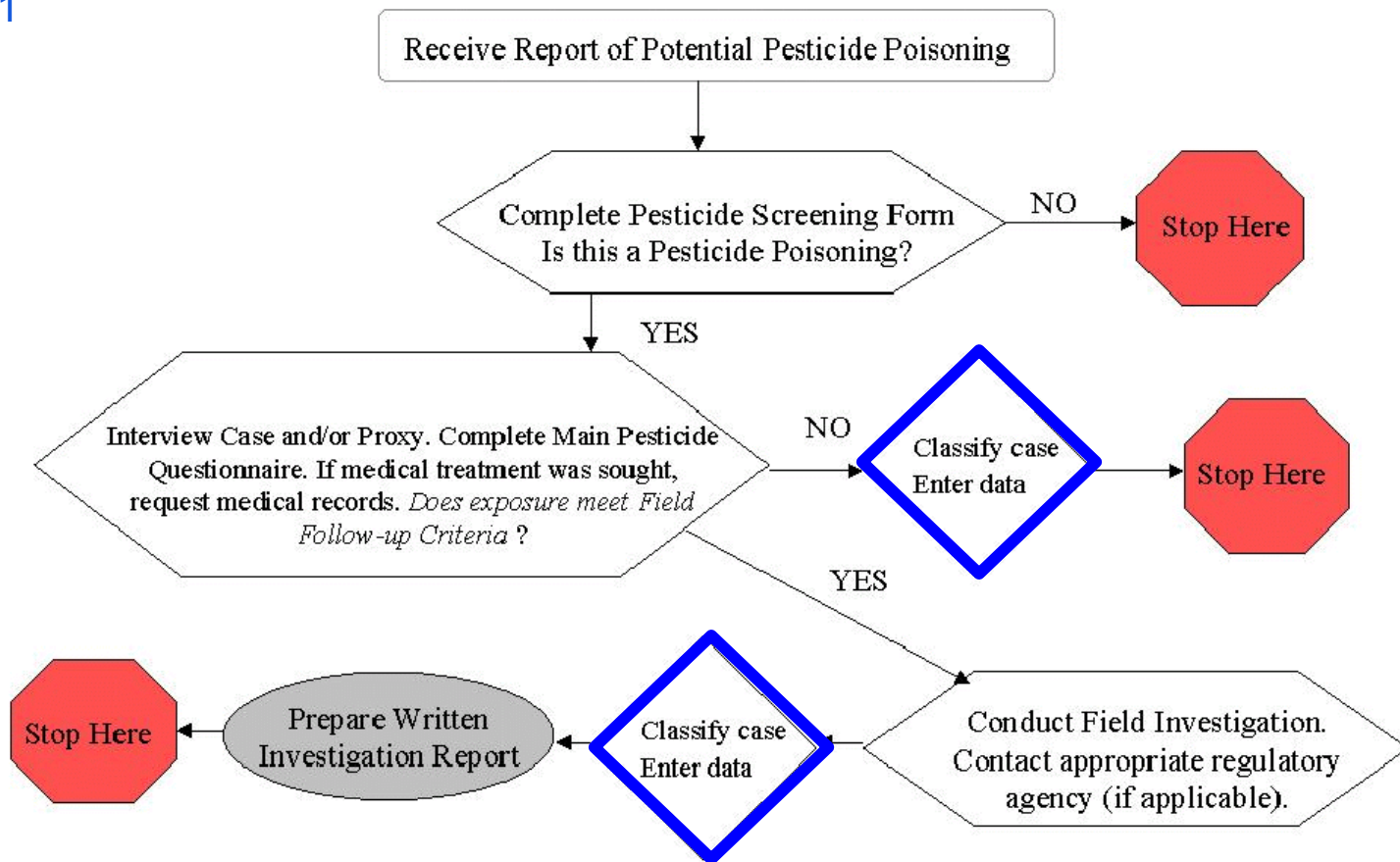
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**SENSOR**

# Pesticide Surveillance Activities

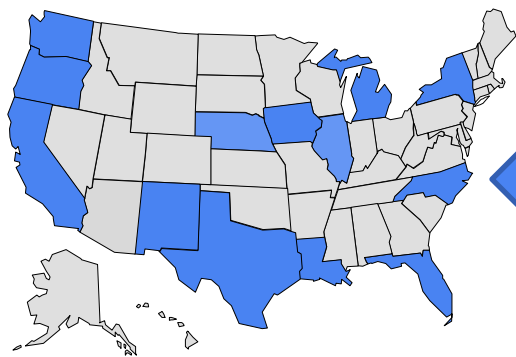
## Sample Report Follow-up Flow Diagram

Adapted from Figure 5.1  
page 48 in PESTICIDE-  
RELATED ILLNESS AND  
INJURY SURVEILLANCE.  
A How-To Guide for  
State-Based Programs



**How quality assurance and quality control  
are maintained?**

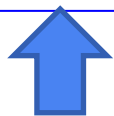
# State programs: Case ascertainment



NIOSH: QA/QC



**Standardized Variables for State Surveillance of Pesticide-Related Illness and Injury**



SENSOR-Pesticides  
Coding Committee

Welcome to SPIDER !  
SENSOR Pesticide Incident Data Entry and Reporting  
This is SPIDER Version 2.0k

SENSOR

Case coding  
exercises



improve coding  
accuracy

# Standardized Variables for State Surveillance of Pesticide-Related Illness and Injury

Developed through collaborations with federal agencies (NIOSH, US EPA, NCEH), non-federal agencies (CSTE, AOEC), and state health departments or their designees

1. Pesticide product information (EPA registration number, product name, active ingredients, ...)
2. Industry, occupation, exposure source, activity performed
3. Health effects and severity index
  - Flow diagram for assigning severity to cases
  - Table of signs and symptoms by severity category
4. Contributing factors (Prevention codes)

# Case Definition for **Acute** Pesticide-Related Illness and Injury

- **Two new** acute adverse health effects resulting from exposure to a pesticide product
  - systemic signs or symptoms
  - dermatologic lesions
  - ocular lesions
- Consists of three parts:
  - Determination of pesticide **exposure**
  - Determination of new **health effects**
  - Evidence of **causal relationship** between pesticide exposure and observed health effects

<https://www.cdc.gov/niosh/topics/pesticides/pdfs/casedef.pdf>

<https://www.cdc.gov/niosh/topics/pesticides/pdfs/pest-casdeffaq.pdf>

# Classification Criteria

- A. Documentation of Pesticide Exposure: A1, A2, A3, A4
- B. Documentation of Adverse Health Effect: B1, B2, B3, B4
- C. Evidence Supporting a Causal Relationship Between Pesticide Exposure and Health Effects: C1, C2, C3, C4

CLASSIFICATION CATEGORIES					
CLASSIFICATION CRITERIA	Definite Case	Probable Case		Possible Case	Suspicious Case
A. Exposure	1	1	2	2	1 or 2
B. Health Effects	1	2	1	2	1 or 2
C. Causal Relationship	1	1	1	1	4



# Severity index

**Severity** is coded only for cases that meet the case definition.

State investigators follow a [flow chart](#) and [table of signs and symptoms](#)

- **Low**: resolves without treatment. Minimal lost time (<3 days) from work or normal activities.
- **Moderate**: treatment is provided.  $\geq 3$ -5 days of time lost from work or normal activities. No residual impairment (but effects may be persistent).
- **High**: life threatening and typically requires treatment. Substantial loss of time (> 5 days) from regular work or normal activities . Permanent functional impairment may be present.
- **Death**. Human fatality.

# Contributing factors (prevention codes) → root causes

- Factors contributing to the exposure and may be useful for developing intervention strategies.

An example:

Code	Code description	Instructions for coding and comment field	Examples of text for comment field
04	Early re-entry	Include the REI or the re-entry statement on label. Indicate how early people entered the area. This applies to WPS/state/local/label requirements.	“REI was 4 hrs, workers report that they followed the spray rig along the row.” “Label states “keep unprotected persons out of area until sprays are dry” but vegetation still wet when worker began pulling out the sprayed plants.”

**Some results:**

**How have these efforts made a difference?**

# Changes in Federal Regulations to Reduce Pesticide-related Health Risks

- In September 2015, the EPA announced final revised rules to the Worker Protection Standard (WPS)
- This was the first major WPS revision in 20 years
- SENSOR-Pesticides program findings were extensively cited in the revised rules.



# Changes in Proposed Federal Regulations to Improve the Training and Certification of Pesticide Applicators

- In December 2016, EPA announced final revised regulations for certification and training of pesticide applicators to ensure the competent use of “restricted use” pesticides
- This was the first major revision to these regulations in 40 years
- Findings from SENSOR-Pesticides were extensively cited in the announcement

# Safer Pest Control in Schools

- Article describing the national incidence of pesticide poisoning at schools
- Five states passed laws requiring schools to control pests using methods with the least possible health hazards

The screenshot shows the JAMA Network interface. At the top, there's a dark header with 'JAMA Network' and a search bar labeled 'Search All' with a placeholder 'Enter Search Term'. Below the header, a red button labeled 'This Issue' is next to 'Citations 56'. A row of action buttons includes 'Download PDF' (with a PDF icon), 'More' (with social media icons for Twitter and Facebook), 'Cite This' (with a quote icon), and 'Permissions' (with a copyright icon). The article title 'Acute Illnesses Associated With Pesticide Exposure at Schools' is prominently displayed in bold black text. Above it, 'Original Contribution' is written in red, and 'July 27, 2005' is in grey. A 'FREE' badge is in the top right corner of the article section. At the bottom, the authors are listed: 'Walter A. Alarcon, MD; Geoffrey M. Calvert, MD; Jerome M. Blondell, PhD; et al'.

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Original Contribution

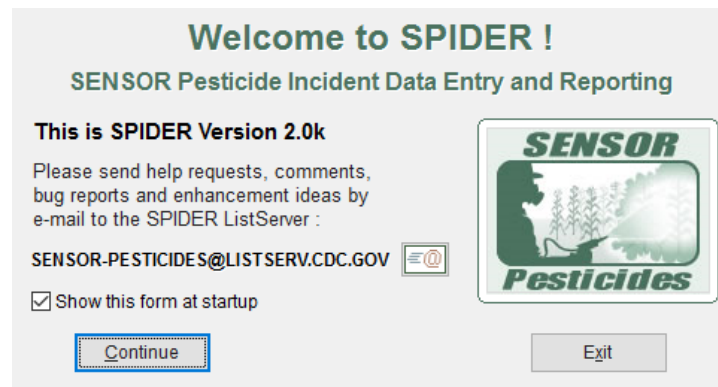
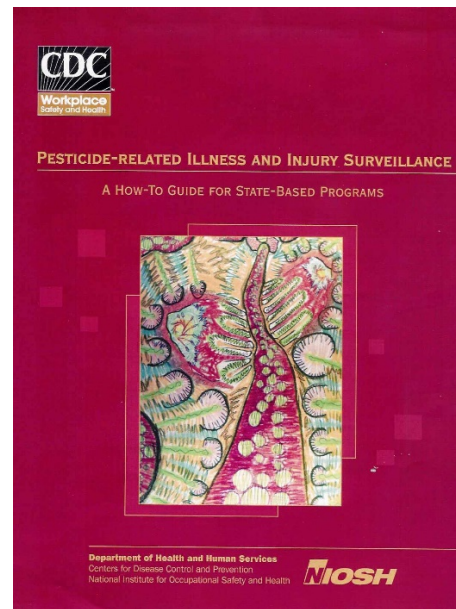
July 27, 2005

**Acute Illnesses Associated With Pesticide Exposure at Schools**

Walter A. Alarcon, MD; Geoffrey M. Calvert, MD; Jerome M. Blondell, PhD; et al

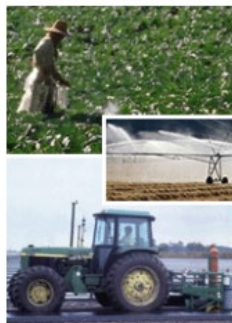
# Guidance documents

- **How-to guide for pesticide poisoning surveillance** (2005). For developing and maintaining a state-based occupational / environmental surveillance program.
- Free **SPIDER** (SENSOR-Pesticides Incident Data Entry and Reporting). Software for incident data entry and reporting.



# <https://www.cdc.gov/niosh/topics/pesticides>

PESTICIDE ILLNESS & INJURY SURVEILLANCE



For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov)

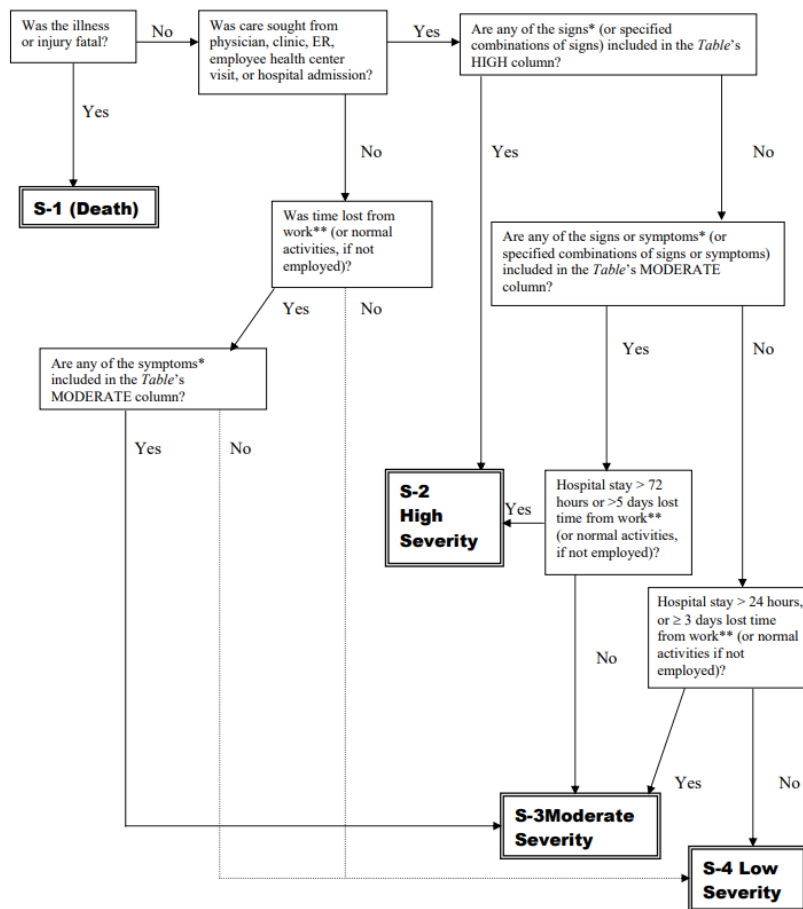
The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



**Supplementary slides**

# Severity

**Figure - Flow diagram for assigning severity to cases of acute pesticide-related illness and injury**



\* Only consider signs or symptoms related to pesticide exposure when assigning severity.

\*\* This can include assignment to light/limited work duties resulting from prolonged illness or injury related to pesticide exposure.

# TABLE: Signs and symptoms by severity category – an example

TABLE: Signs and symptoms by severity category (Modeled after Persson et. al.,1998 and includes SPIDER database elements)

ORGAN SYSTEM	SEVERITY CATEGORY AND CODE			
	FATAL	HIGH	MODERATE	LOW
	1	2	3	4
	Death	Severe or Life-threatening Signs	Pronounced or Prolonged Signs or Symptoms	Mild, transient, and spontaneously resolving symptoms
Gastrointestinal System		<ul style="list-style-type: none"> <li>Massive hemorrhage/perforation of gut</li> </ul>	<ul style="list-style-type: none"> <li>Diarrhea (GI4, <b>sign only</b>)</li> <li>Melena (GI7)</li> <li>Vomiting (GI6, <b>sign only</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Abdominal pain, cramping (GI1)</li> <li>Anorexia (GI2)</li> <li>Constipation (GI3)</li> <li>Diarrhea (GI4, <b>symptom</b>)</li> <li>Nausea (GI5)</li> <li>Vomiting (GI6, <b>symptom</b>)</li> </ul>
Respiratory System		<ul style="list-style-type: none"> <li>Cyanosis (RESP 2) + Respiratory depression (RESP 7)</li> <li>Pulmonary edema (RESP6)</li> <li>Respiratory arrest</li> </ul>	<ul style="list-style-type: none"> <li>Abnormal pulmonary x-ray</li> <li>Pleuritic chest pain/pain on deep breathing (RESP8)</li> <li>Respiratory depression (RESP7)</li> <li>Wheezing (RESP9)</li> <li>Dyspnea, shortness of breath (RESP4, <b>sign only</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Cough (RESP1)</li> <li>Upper respiratory pain, irritation (RESP3)</li> <li>Dyspnea, shortness of breath (RESP4, <b>symptom</b>)</li> </ul>