Monitoring the Effects of Pesticide Use in North Carolina

NC Pesticide Incident Surveillance Program
NC Division of Public Health

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Outline

- Purpose
- Background
- Methods
- Results
- Discussion

Purpose

NC Pesticide Incident Surveillance System

Frequency

Distribution

Risk factors

Risk reduction

Background

- Pesticides can be toxic to humans
- Pesticides are ubiquitous in the community
- Heavy use in agriculture
- Large at-risk groups

U.S. Pesticide Use Agriculture

Top 15 highest pesticide using states:

1. CA
2. FL
3. WA
4. IL
5. IA
6. ID
7. TX
8. NE
9. MN
10. IN
11. KS
12. GA
13. **NC**
14. MO
15. ND

Source: Keily, EPA, 2010

Background

Pesticide use NC	Lbs. per year	Pesticide class
Field crops	7,901,015	Herbicides (69%)
Fruit/Vegetables	726,065	Fumigants (40%)
Tobacco	14,398,078	Fumigants (77%)
Lawn and Garden	1,383,000	Herbicides (75%)
Ind/Commercial/Govt.	1,964,000	Herbicides (66%)

Source: 2009 ,Dr. Bob Bruss, NCDACS

At- Risk Groups

- NC ranks 5th in the nation for number of farms with migrant farm labor
- NC ranks 7th in the nation for number of hired labor on farms

Source: Census of Agriculture , 2007

- NC pesticide applicators:
  - 15,923 private pesticide applicators (rank #13 in U.S.)
  - 17,813 commercial applicators (rank #4 in U.S.)

Source: Washington State Univ: Certification Plan and Reporting Database (CPARD) 2012

Methods

- Obtain physician reports of acute pesticide illness

  (NC 10A NCAC 41F .0101 - .0103)
- Conduct follow up
- Classify the case *
- Refer for investigation
- Periodically analyze the data for trends

* Case definition and classification scheme provided by National Institute of Occupational Safety and Health/CDC SENSOR Pesticides Program

- Pesticide applicator training – recertification/ NCSU
- NC Farmworker Health Program; outreach worker training
- NCSU agriculture students; Pesticide Utilization Course
- ECU Agricultural Medicine: Occupational & Environmental Health for Rural Health Professionals

Education

Health alerts

Illnesses and Injuries Related to Total Release Foggers --- Eight States, 2001—2006 MMWR 2008 57(41);1125-1129

Publications

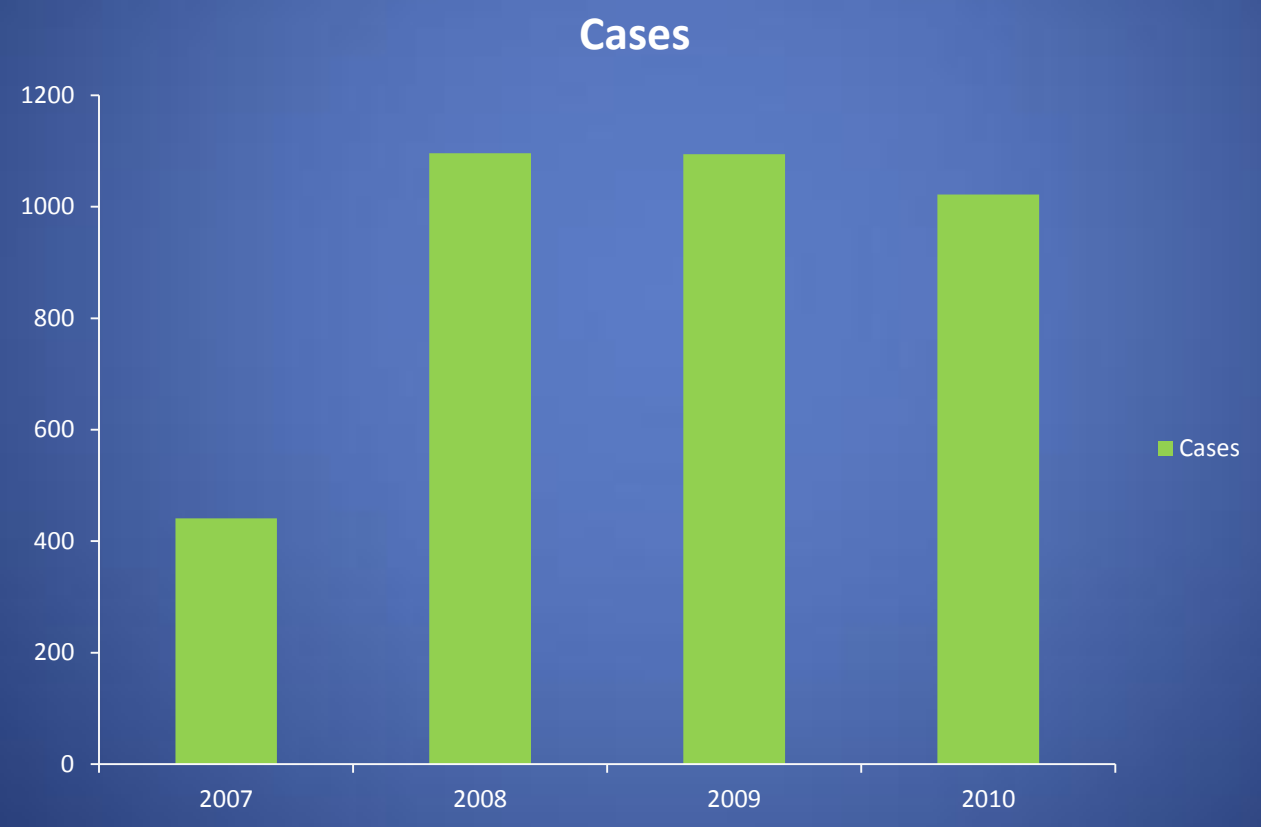
Characteristics and magnitude of acute pesticide-related illnesses and injuries associated with pyrethrin and pyrethroid exposures-11 states, 2000-2008. 2013 AJIM 9999: 1-16

EPA

New EPA Total Release Fogger Videos Encouraging Safe Use Practices
EPA Office of Pesticide Programs, April 30th 2012; Label changes required Sept 2012

Results

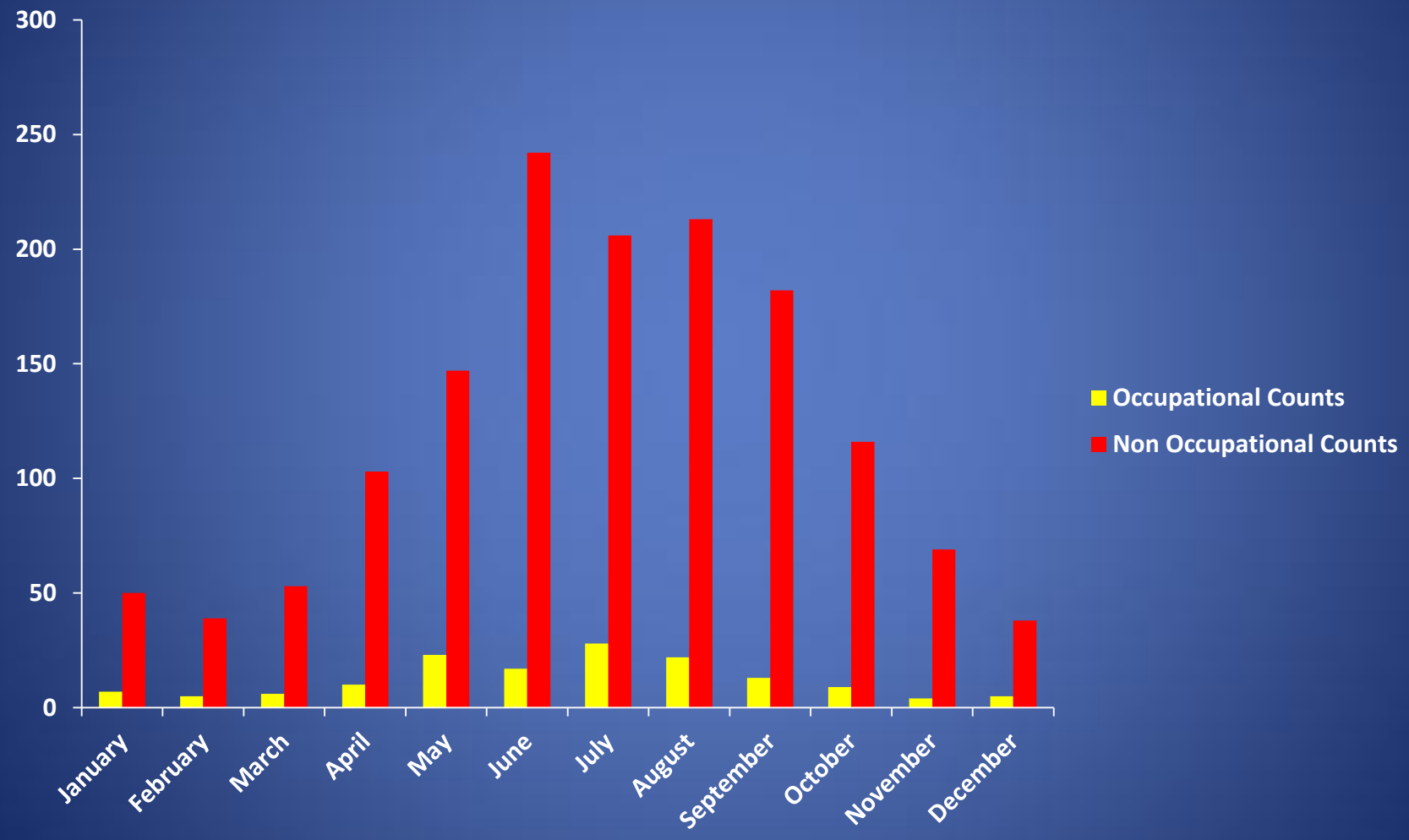
All Reported Cases 2007 - 2010



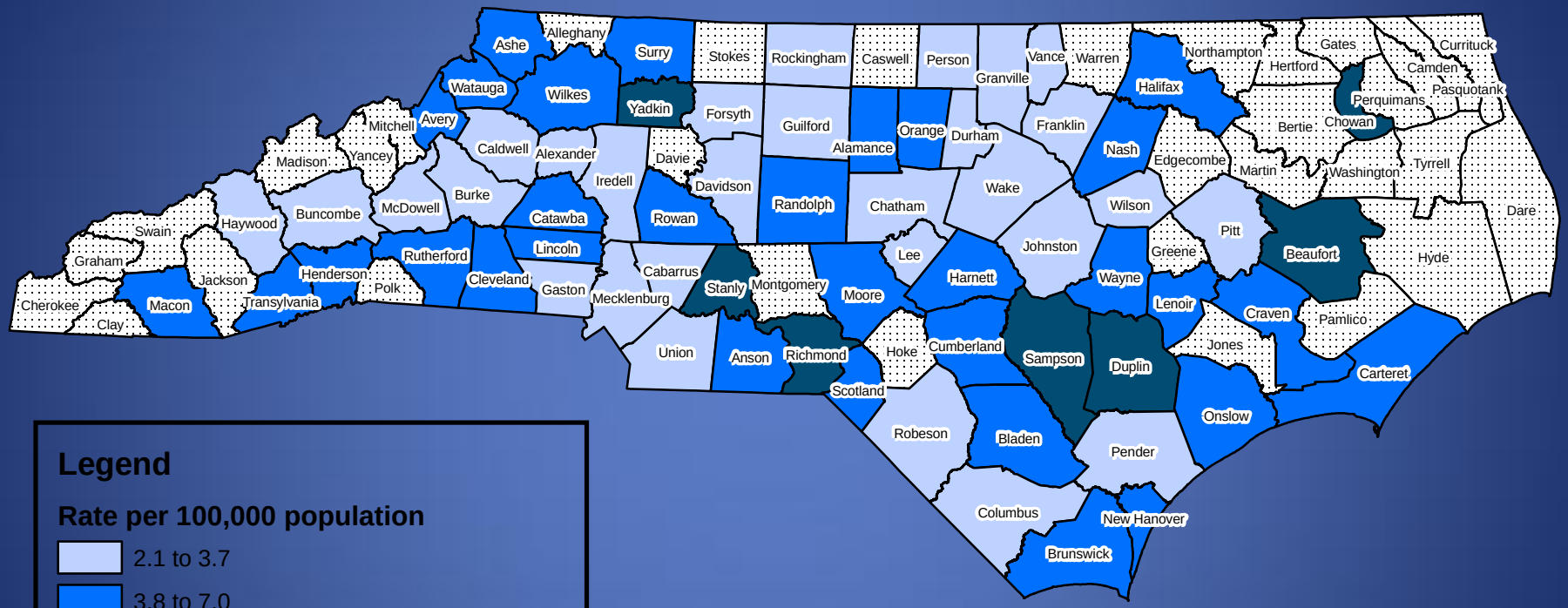
All Confirmed Cases 2007-2010

Status	Occupational	Non-Occupational	Total
Definite Case	11	37	48
Probable Case	16	51	67
Possible Case	118	1333	1451
Suspicious Case	4	37	41
Total	149 (9%)	1458 (91%)	1607

All Confirmed Cases by Month 2007-2010



Rate of Pesticide Exposures (Occupational and Non-occupational) by North Carolina County, 2007-2010



Legend

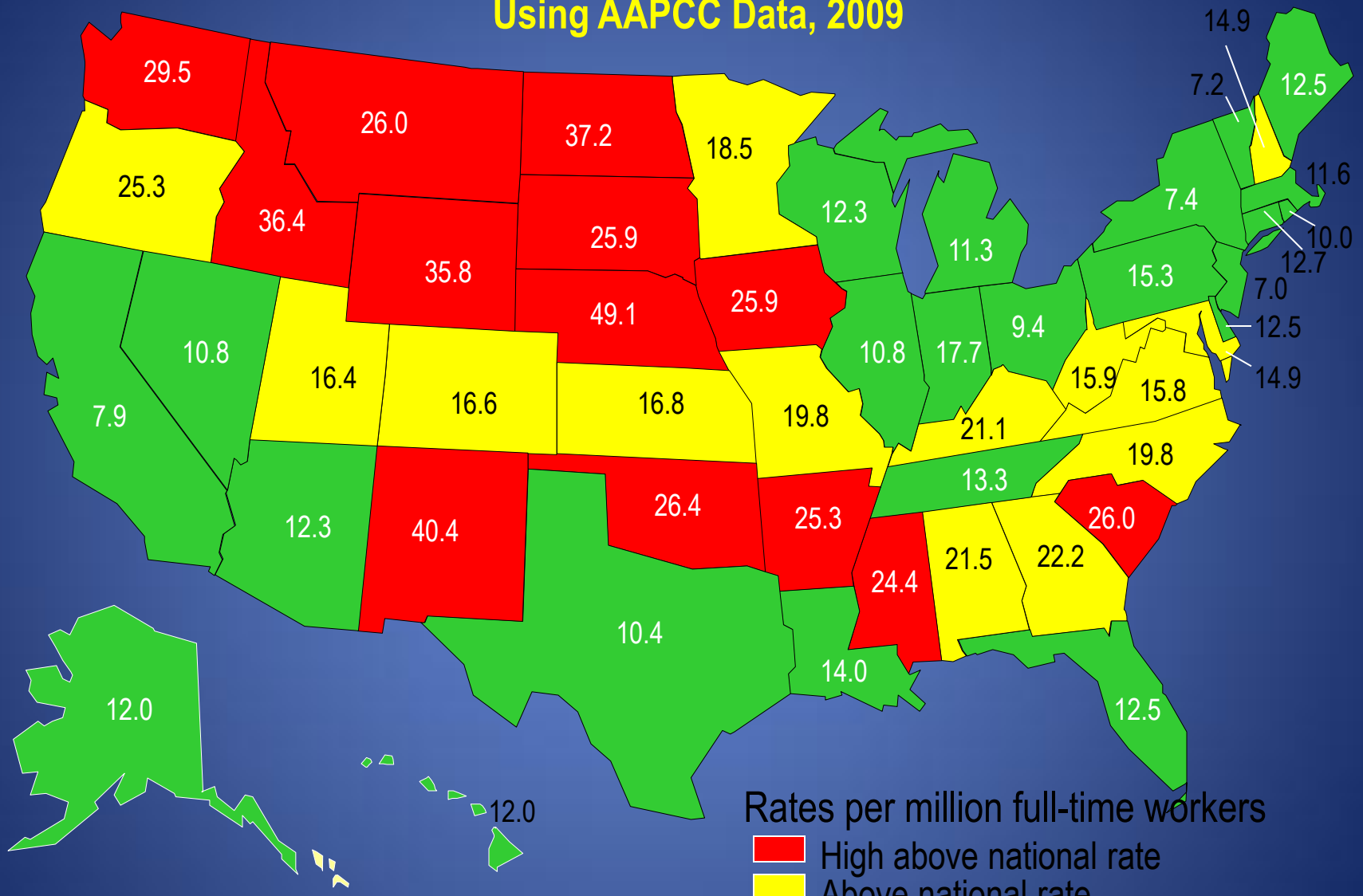
Rate per 100,000 population

- 2.1 to 3.7
- 3.8 to 7.0
- 7.1 to 10.2
- Rate not calculated due to small numbers

State rate = 3.7 per 100,000 population

(excludes exposures with missing county information)

Acute Occupational Pesticide-Related Illness Rates by State Using AAPCC Data, 2009



Source: NIOSH Sensor Pesticides

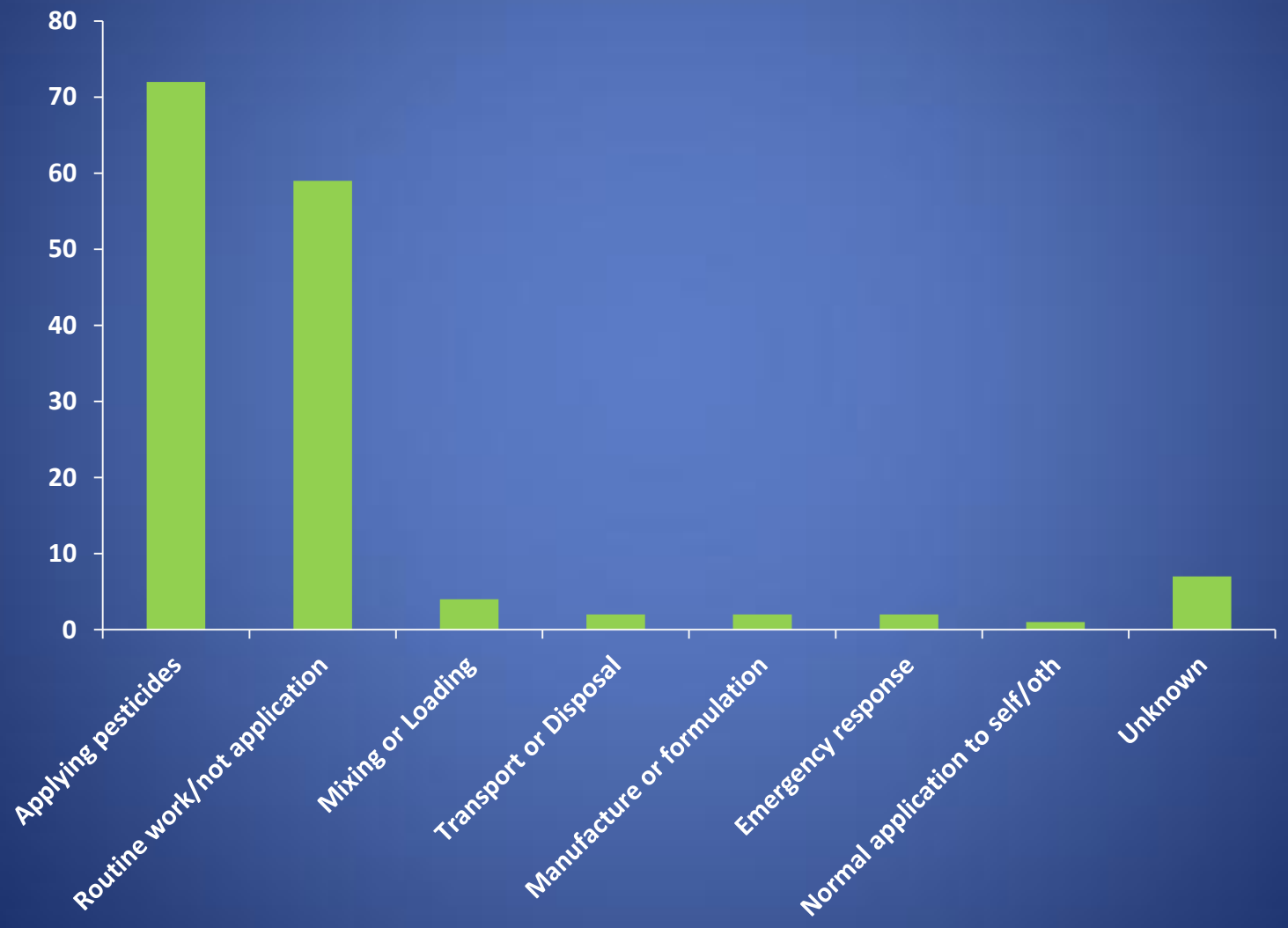
US National Rate = 14.6 / million full time workers

Confirmed Occupational Cases 2007 - 2010

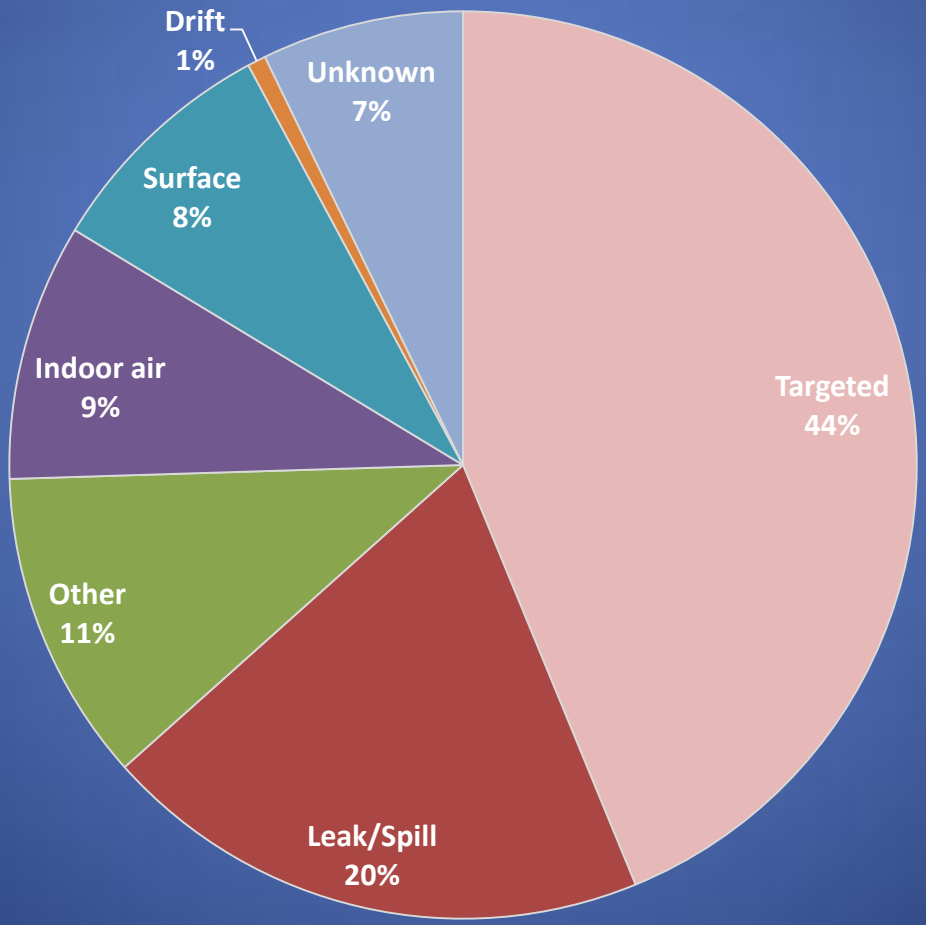
Demographics

- 149 confirmed work-related cases
- Slightly more than half were white (56%)
- 27 (18%) workers were identified as Hispanic
- Median age was 32 years, and over half were between the ages of 20 – 39 years (59%); cases were predominately male (73%)
- Agriculture, Forestry, Fishing, Hunting (33%) followed by Administrative and Support, Waste Management and Remediation Services (21%)

Exposure: Activity of Confirmed Occupational Cases



Type of Exposure for Confirmed Occupational Cases

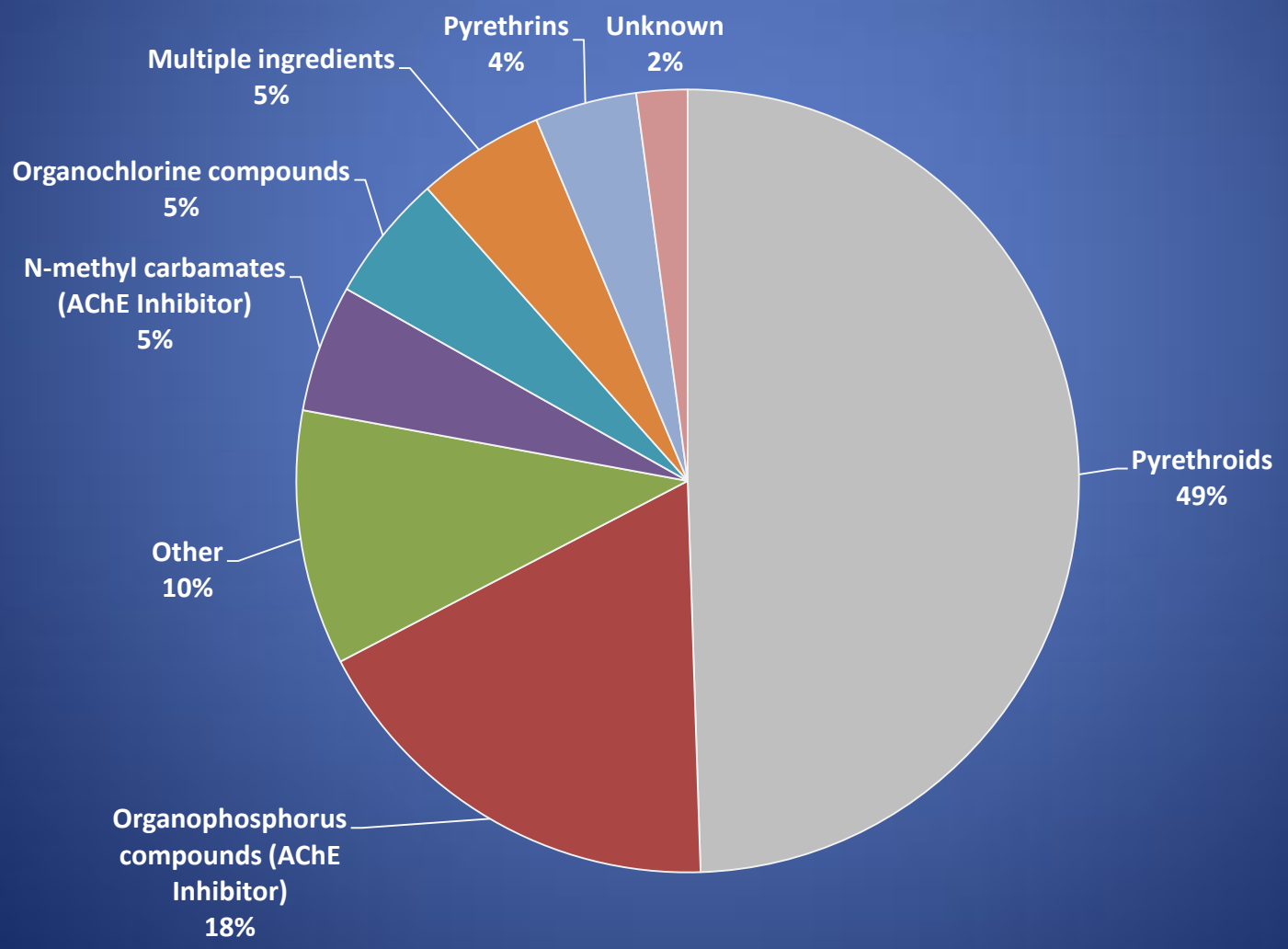


Pesticide Product Types for Confirmed Occupational Cases

Pesticide Type	Number	Percent
Insecticide	83	50.90%
Herbicide	38	23.30%
Disinfectant	11	6.70%
Insecticide & Other	11	6.70%
Fungicide	8	4.90%
Insect Growth Regulator	1	0.60%
Fumigant	5	3.10%
Rodenticide	1	0.60%
Insect Repellent	1	0.60%
Other	1	0.60%
Multiple	1	0.60%
Unknown	2	1.20%
Total	163	100.00%

*Some products contain more than one type of pesticide and some exposures involve more than one product

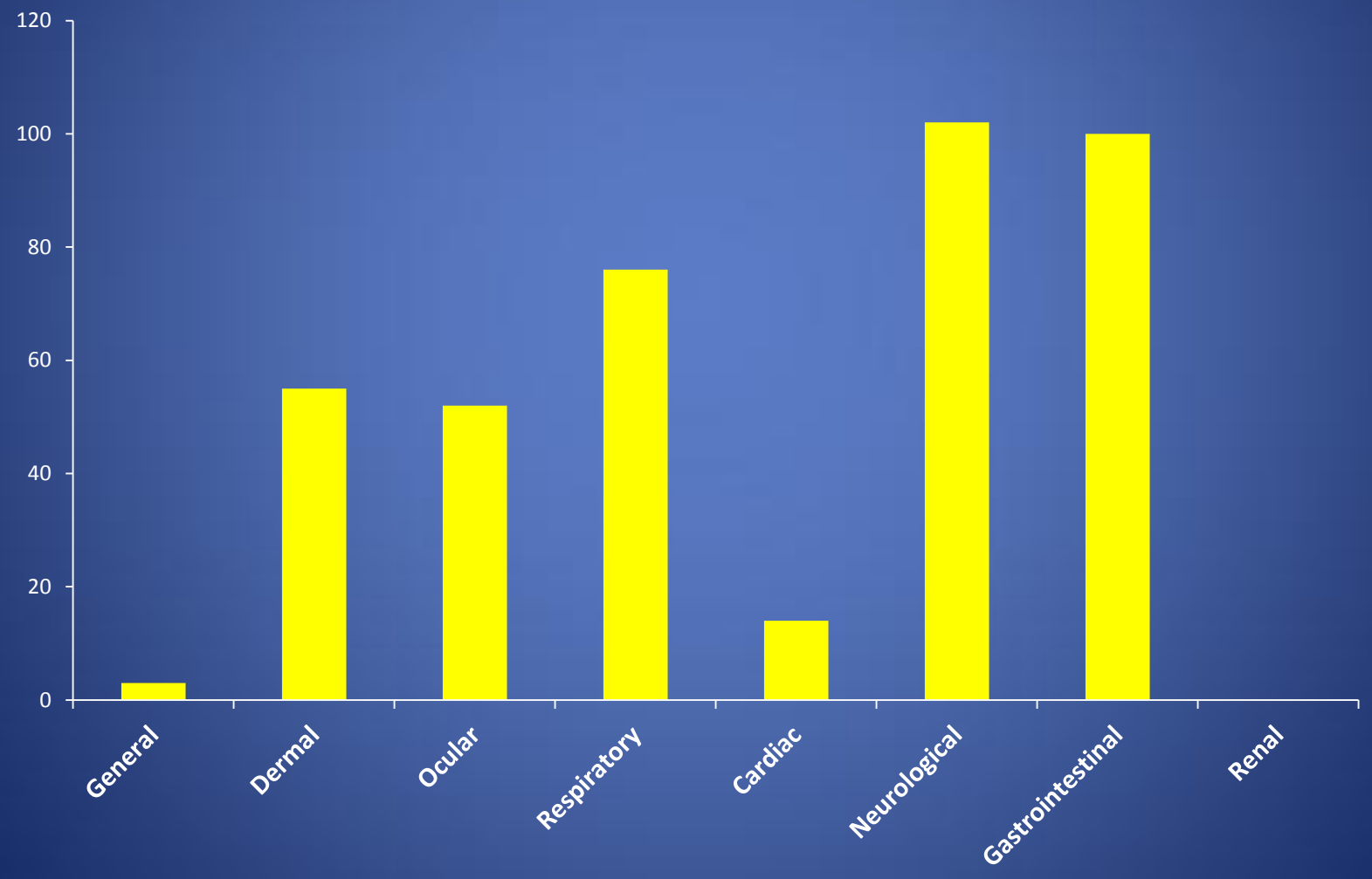
Chemical Class, Insecticides Only Associated with Confirmed Occupational Cases



Health Effects: Severity of Confirmed Occupational Cases

Severity	Number	Percent
Fatal	0	0.0%
High	4	3.0%
Moderate	9	6.0%
Low	136	91.0%
Total	**149**	**100.0%**

Signs and Symptoms Associated with Confirmed Occupational Cases



High Severity Cases

Private applicator was preparing soil for cantaloupe planting, using fumigating rig and tractor, pesticide leaked out of the line sprayed into his left eye requiring 2 surgeries. Had left safety glasses in tractor.

Lawn care business owner used weed killer (Roundup) for 2 days double strength, no PPE. Admitted to hospital.

Ground work crew worker loading work equipment at the end of the work day picked up a Gatorade bottle from the back of the truck and drank small amount of liquid (organophosphate) in the bottle before spitting it out. Admitted to the hospital.

U.S. Data

- Analysis of multi-state data for occupational exposure
- Some similar trends to NC
- Mean age 36 years
- 54% white, 34% Hispanic
- Agriculture largest proportion of cases followed by Services
- Most cases were performing routine work (67%)
- Incidents occurred in summer months
- Severity low and insecticides involved most

Calvert et al., 2003 Acute pesticide-related illness in the U.S. 1998 – 1999; surveillance findings from the SENSOR-Pesticides Program. AJIM. 45: 14 -23

Confirmed
Non Occupational Cases
2007 - 2010

Demographics

- 1,458 confirmed non work-related cases
- Limited race and ethnicity data available
- Median age was 34 years; over half of cases were between the ages of 18 – 54 years (66%); one in 5 were children ≤ 12 yo. Males and females almost evenly distributed

Exposure

- Most exposures occurred at a private residence (97%)
- Most cases were applying pesticides when exposed (44%)

Application Target for Confirmed Non-Occupational Cases 2007-2010

Application Target	Cumulative	Percent
Building surface	432	29.6%
Human - skin/hair & clothing	150	10.3%
Veterinary - domestic animals	112	7.7%
Landscape/ornamentals	78	5.3%
Building structure	62	4.3%
Undesired plant	56	3.8%
Pool, Spa, Hot Tub, Jacuzzi	48	3.3%
Garden crops	40	2.7%
Bait for rodent, bird, predator	30	2.1%
Other	22	1.5%
Building space treatment	7	0.5%
Forest trees/land	3	0.2%
Veterinary - livestock	2	0.1%
Aquatic-pond,stream,lake,canal	2	0.1%
Soil	1	0.1%
Not applicable	217	14.9%
Unknown	196	13.4%
Total	1458	100.0%

Exposure

- The equipment types associated with most exposures were: manual placement (26%), pressurized can (23%), trigger pump (17%), and total release foggers (13%).
- Examples of products manually placed = lice medicine, mothballs, pet treatments, pool products (chlorine tabs), insect and rodent baits, and insect dust and powders.
- The most common type of exposure was “targeted” (58%)
- Insecticides accounted for most of the exposures, and the type of insecticide (60%) most often involved was pyrethroids (52)%

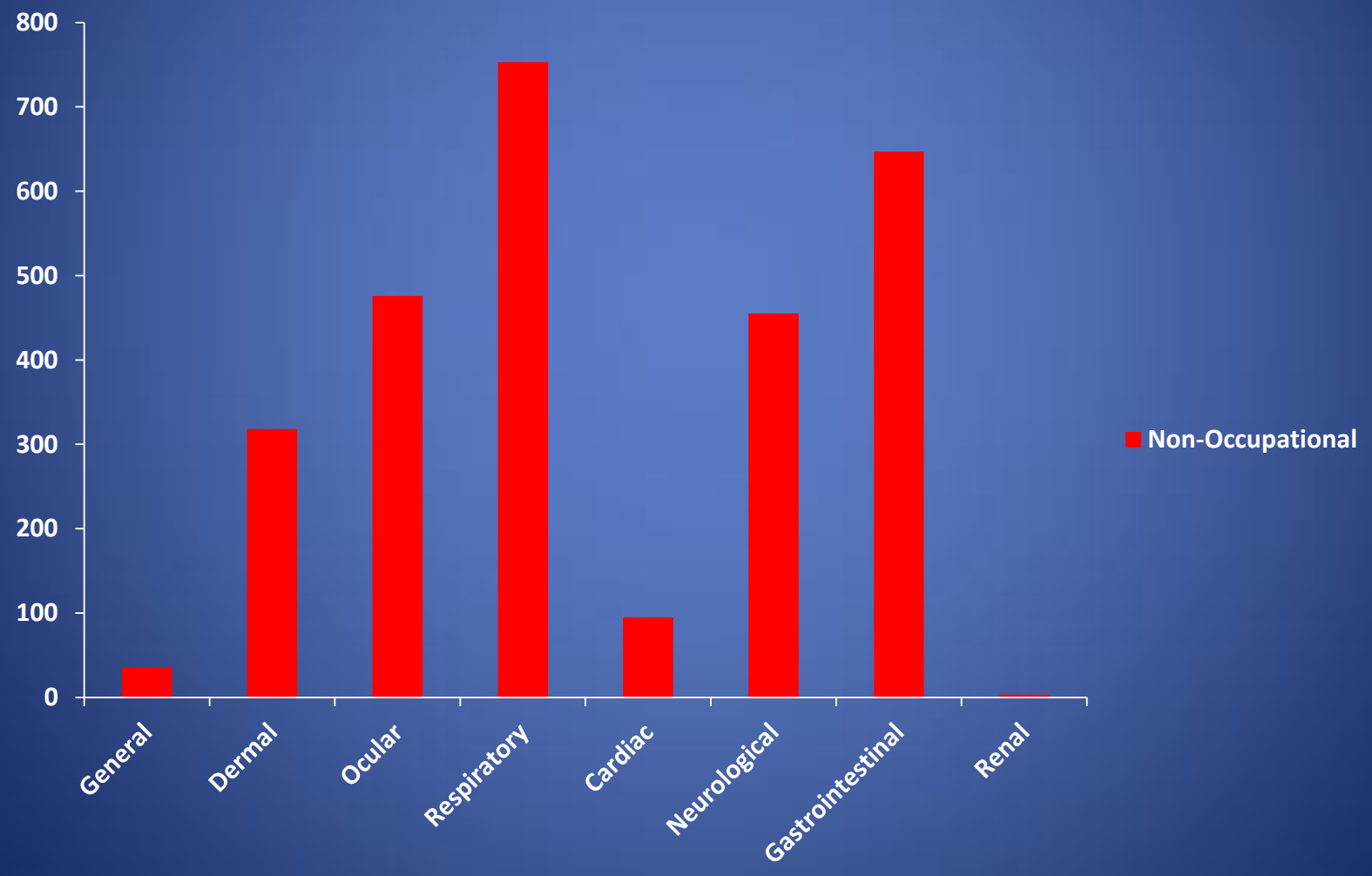
Pesticide Product Types for Confirmed Non Occupational Cases, 2007-2010

Pesticide Type	Number	Percent
Insecticide	916	60.2%
Insect Repellent	158	10.4%
Herbicide	129	8.5%
Disinfectant	120	7.9%
Insecticide & Other	65	4.3%
Insect Growth Regulator	24	1.6%
Rodenticide	26	1.7%
Other	26	1.7%
Insecticide & Fungicide	16	1.1%
Fungicide	12	0.8%
Fumigant	5	0.3%
Multiple	4	0.3%
Unknown	20	1.3%
Total	1521	100.0%

Health Effects: Severity of Confirmed, Non Occupational Cases

Severity	Number	Percent
Fatal	3	0.2%
High	10	0.7%
Moderate	51	3.0%
Low	1394	96.0%
Total	**1458**	**100.0%**

Signs and Symptoms Associated with Confirmed Non-Occupational Cases



Case Narratives for Fatal Cases

- An 8 yo child drank weed killer (paraquat) that had been put in a soda bottle and stored in garage. He died 2 weeks later.
- 65 yo woman with bedbugs sprayed a rag with bug killer and wiped herself down with it before going to bed. Family had also reportedly used up to 18 foggers in the previous 2 weeks and did not ventilate the trailer. Family found her unresponsive and she died 9 days later.

Discussion

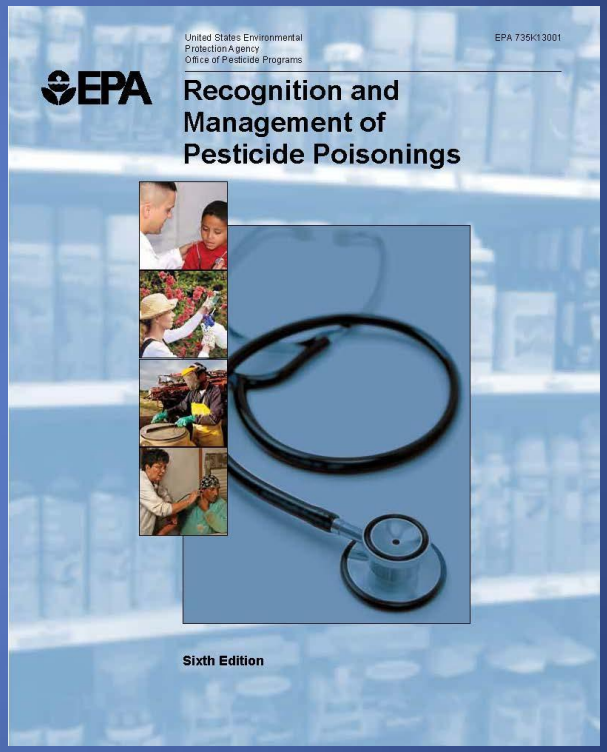
- Data suggest most exposures occur at home, during the summer months
- Children frequently exposed, careful storage is important
- Variety of targets at home, consider IPM
- Careful bed bug control, foggers can be dangerous

Discussion

- Workers in agriculture, pest control, lawn care and landscaping are frequently exposed; usually when applying.
- Insecticides responsible for most exposures across groups especially pyrethroids
- Need more information on behaviors that commonly lead to miss application

Need Help From Health Care Providers

- Report cases of acute pesticide poisoning to poison center



- Consider adding an occupational/ environmental history

New Safety Measures for Soil Fumigant Pesticides – EPA

- 2013 four fire fighters respond to call from family of five living in rural eastern NC county. Tobacco field across the street fumigated the day before and that morning with chloropicrin. Firefighters all exposed and went to ED with symptoms
- Fumigants are strong irritants, can drift
- Early detection and appropriate response
- Rural areas; applied in early spring, some in summer (strawberries)

Limitations

- Case-based surveillance provides “snapshot”
- Likely under reporting
  - people not seeking care
  - misdiagnosis
  - non compliance with requirement to report
- Incomplete information for some cases

Acknowledgements

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