The Case for Pesticide Surveillance in a National EPHT Network

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Topics

- Existing Pesticide Surveillance Efforts
- Differing Nature of NYC Pesticide Findings
- Gaps in National Surveillance Systems
- A Framework for National Surveillance

Existing National Pesticide Surveillance Systems

- Toxic Exposure Surveillance System (TESS)
- NIOSH Sentinel Event Notification System for Occupational Risk (SENSOR)
- CDC National Health and Nutrition Examination Survey (NHANES)
- USGS National Water-Quality Assessment (NAWQA) Program
- USDA Pesticide Data Program (PDP)

TESS

- National warehouse of standardized data from Poison Control Centers (62 participating centers in 2004)
- TESS includes data on populations from all 50 states & Washington, DC
- Data includes (where available)
  - Individual data (age, gender, geographic descriptor)
  - Agent data (pesticide product or type, location of exposure)
  - Clinical / symptom data (symptom, medical consequence)
- Effective in capturing data on exposures to children due to parental / caregiver concern
- Aggregate data available for fee

Source: Annual Report, 2004, American Association of Poison Control Centers Toxic Exposure Surveillance System (TESS) at http://www.aapcc.org/2004.htm

TESS Limitations

- Data often self-reported over the phone
  - No confirmation of poisoning or symptoms
- Activity type or occupation of exposed individual not captured
- Strong evidence of under-reporting by physicians and hospitals to PCCs
- Captures only acute pesticide exposures

TESS Highlights (2004)

- Greatest number of reported exposures were from pyrethroids, rodenticides, and DEET
- Children < 6 years of age are:
  - 52% of exposure cases overall
  - 89% of rodenticide cases
  - 69% of DEET cases
  - 83% of borate/boric acid cases
- Trends 2002 to 2004:
  - 105% increase for DEET insect repellents
  - 46% increase for pyrethroids
  - 11% increase for pyrethrins
  - 27% decrease for organophosphates

Source: AAPCC TESS Annual Reports, 2002-2004, at http://www.aapcc.org/annual.htm

SENSOR

- NIOSH – State health department partnerships for pesticide illness and injury surveillance
- Begun in 1987, covers 12 states (2006)
  - Funded States: CA, MA, MI , NM, NY, OR, TX, WA
  - Unfunded States: AZ, FL, IA, LA
- Sources of reports are principally:
  - Health care providers
  - Poison Control Centers
  - Workers' compensation records

SENSOR Data

- Data includes:
  - Individual level: age, race/ethnicity, gender
  - Agent: product and type, exposure circumstances, route of exposure, occupation, activity at time of exposure, use of PPE
  - Clinical / symptom data: biological monitoring, medical consequence, symptom
- Useful tool to highlight emerging problems and occupational exposures and risks
- Provides information on possible risk factors for investigation and intervention
- Most of the largest states participate
- Some case follow-up data available

SENSOR Limitations

- Majority of cases collected are occupational
- Data not collected nationally
- Under reporting problems (Calvert, 2001):
  - Workers may not seek medical attention
  - Cases may be misdiagnosed
  - Health care workers or other officials may not make required report of cases
- Only provides information on acute exposures

SENSOR Highlights

- Frequent reporting of case data in MMWRs:
  - Unintentional Topical Lindane Ingestions - United States, 1998-2003 (June 3, 2005 / 54(21);533-535)
  - Surveillance for Acute Insecticide-Related Illness Associated with Mosquito-Control Efforts - Nine States, 1999-2002 (July 11, 2003 / 52(27);629-634)
- Peer-reviewed journal articles using SENSOR data:
  - Acute pesticide-related illness among emergency responders, 1993-2002. (Calvert, Barnett, Mehler, et al., 2006)
  - Acute Illnesses Associated With Pesticide Exposure at School (Alarcon, Calvert, et al., 2005)
  - Acute Pesticide-Related Illnesses Among Working Youths, 1998-1999 (Calvert, Mehler, Rosales, et al., 2003)

NHANES Pesticide Biomonitoring

- NHANES involves an interview, clinical examination and biomonitoring
- Representative sample of U.S. population
- Biomonitoring of commonly used pesticides or their metabolites

NHANES Data

- Provides actual exposure estimates for the general population
- Useful source of background exposure level to compare with other monitoring or poisoning data.
- Presents exposure levels at the 50^{th}, 90^{th} and 95^{th} percentiles of the population.
- Stratifies exposure by age group, gender, and race/ethnicity

NHANES Limitations

- No regional specificity or further sub-group differentiation
- Specific sources of exposure are unknown and for some metabolites indeterminate
- Epidemiology not well established to link metabolite levels to health outcomes
- Biomonitoring reflects recent and not necessarily chronic exposure.

NHANES Highlights

- Data trends from ’99-’00 to ’01-’02:
  - OP metabolites:
    - Dimethylthiophosphate (creatinine corrected) levels lower in all groups & percentiles
    - Diethylphosphate (creatinine corrected) showed a similar trend possible reflecting reduction or phase out of some OP uses
    - Chropyrifos metabolite, TCPy (creatinine corrected) showed a slight increase
  - Herbicides:
    - 2,4-D levels remained fairly stable but increased amongst Non-Hispanic blacks
  - Pyrethroid metabolites first analyzed in ’01-’02
    - 3-Phenoxybenzoic Acid levels were detected in most groups
    - *cis* & *trans* -3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid were detected
    - Cypermethrin and Permethrin exposures seem to be most common source of these pyrethroid metabolites

Other National Data Sources

- USGS National Water-Quality Assessment (NAWQA) Program
  - Collected since 1991
  - Data from ground water wells and some surface water
  - Data on sediments and fish
  - Limitations:
    - Seasonal variations, limited sampling locations
- USDA Pesticide Data Program (PDP)
  - Monitoring of food pesticide residues through state agricultural departments/other agencies
  - Special concern for foods heavily consumed by infants and children
  - Limitations:
    - Limited number of commodity samples analyzed
    - Difficult to estimate individual dietary exposure

Pesticide Surveillance in EPHT

- California pesticide tracking
  - Using California Pesticide Use Reports (PUR) for exposures' effect on birth outcomes and early childhood development
  - Determining utility of PUR data as an exposure metric through comparison with biomonitoring data
- Oregon pesticide illness surveillance
  - Incorporating SENSOR surveillance data into EPHT
- Wisconsin pesticide tracking
  - Linking cholinesterase levels, biomonitoring, water levels and incident reports of drift and overspray.
- NYC pesticide tracking
  - Using state use reporting data, biomonitoring, poisoning surveillance, and population survey data.

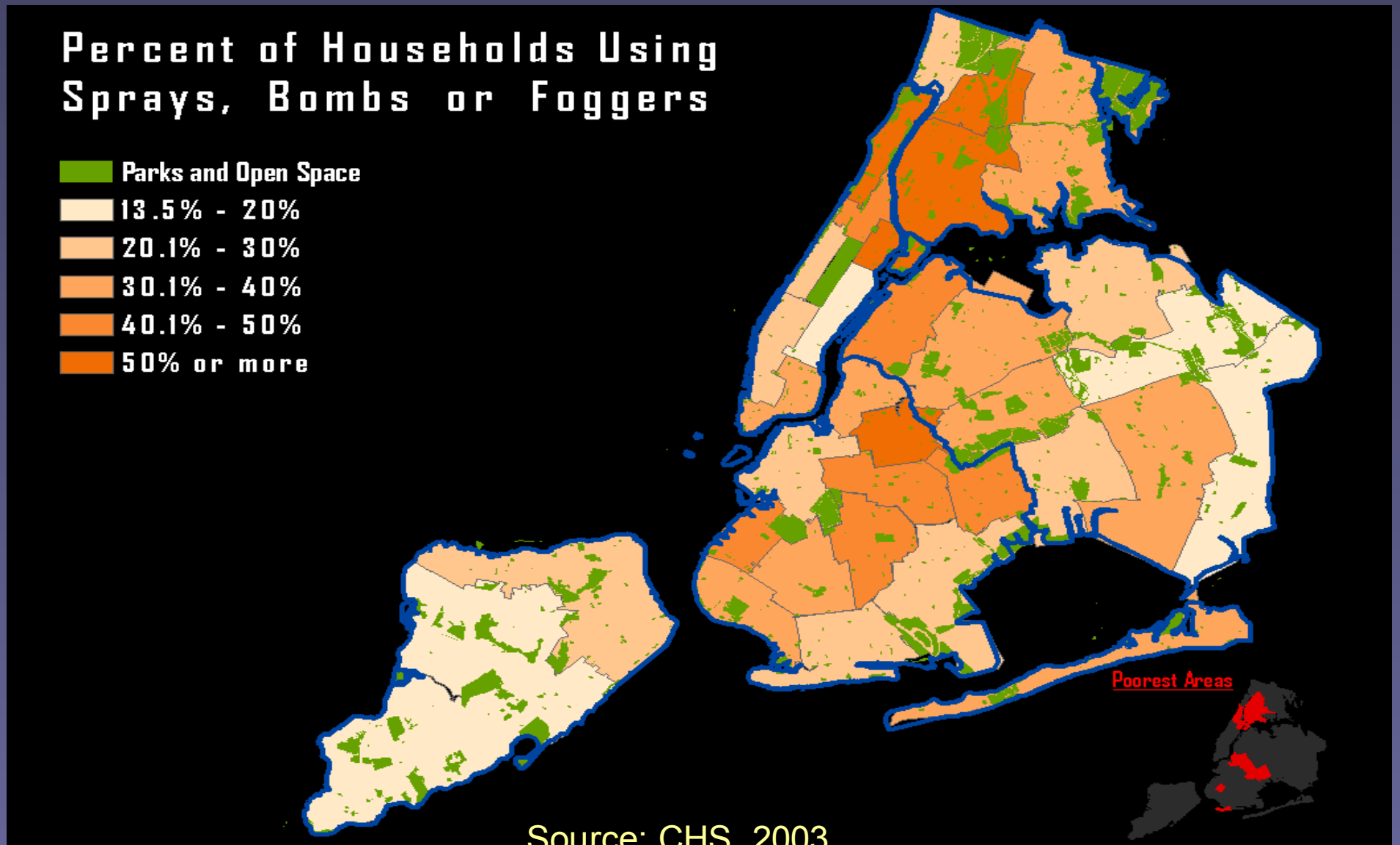
NYC Pesticide Tracking Data Sources

- Population surveys
  - Community Health Survey
    - Use of illegal and off-the-shelf pesticides
    - Prevalence of cockroach infestation
    - Relationship between cockroach infestation and asthma
  - Housing & Vacancy Survey
    - Prevalence of rodent infestations
    - Relationship between rodent infestation and asthma and housing disrepair
  - NYC Health & Nutrition Examination Survey
    - Population based comparison of NYC to National Pesticide Exposure.

NYC Pesticide Tracking Data Sources

- State Pesticide Use Registry
  - Patterns of pesticide use in urban areas
- Poison Control Center
  - Data on possible pesticide poisoning or exposure
- Hospitalization and ED Data
  - Data on pesticide poisoning and illness

Findings of Community Health Survey:



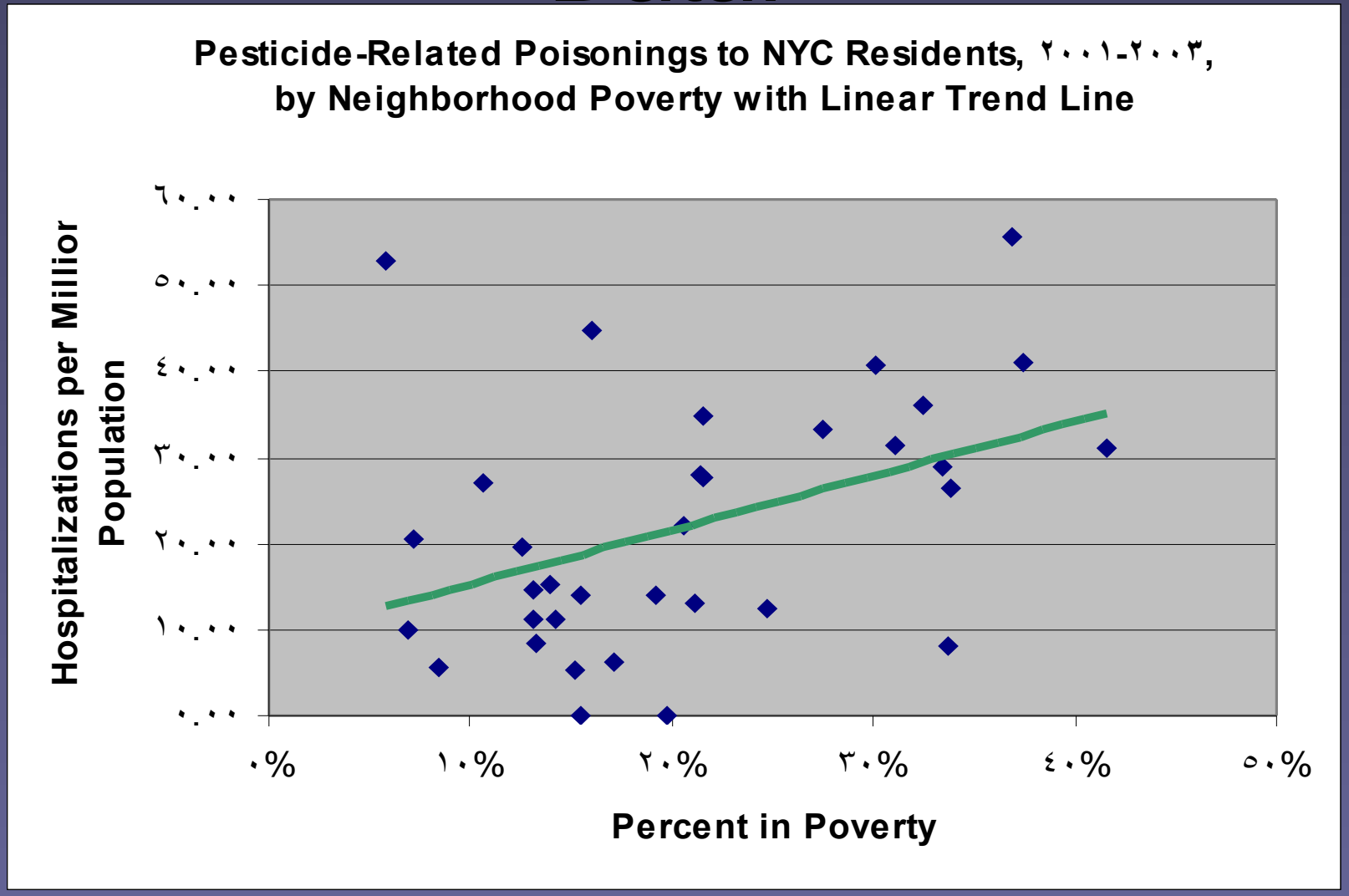
Source: CHS, 2003

Findings of Housing & Vacancy Survey:
Rodent Sightings and Current Asthma in NYC Households

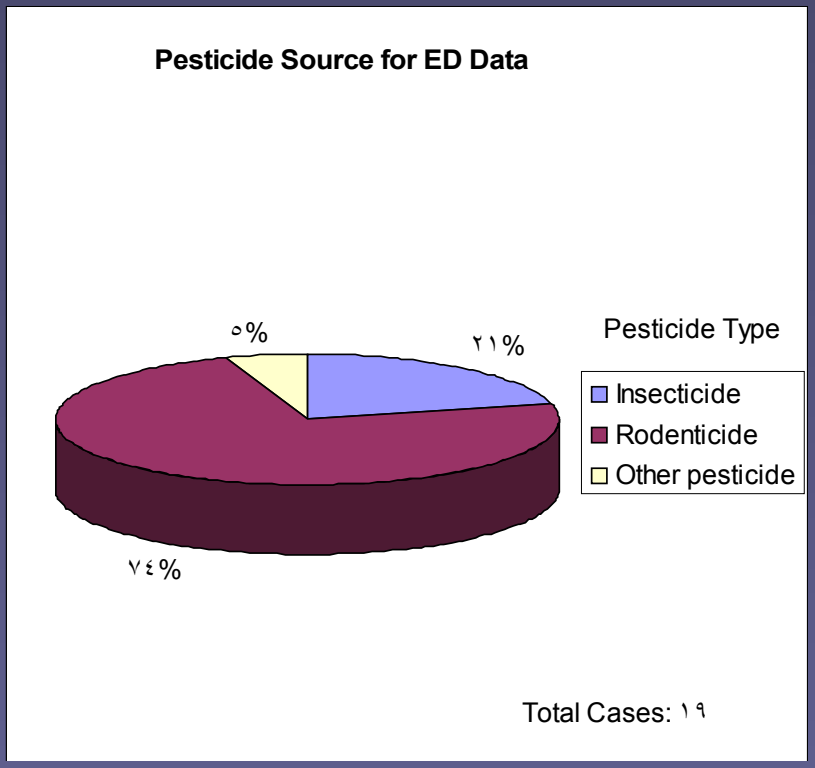
	Current Asthma	No Current Asthma	Total
Rodents	72 K (12%)	509 K (88%)	581 K (100%)
No Rodents	119 K (6%)	1,867 K (94%)	1,986 K (100%)
Total	191 K (7%)	2,376 K (93%)	2,567 K (100%)

Source: HVS, 2002

Findings of Hospitalization Data:



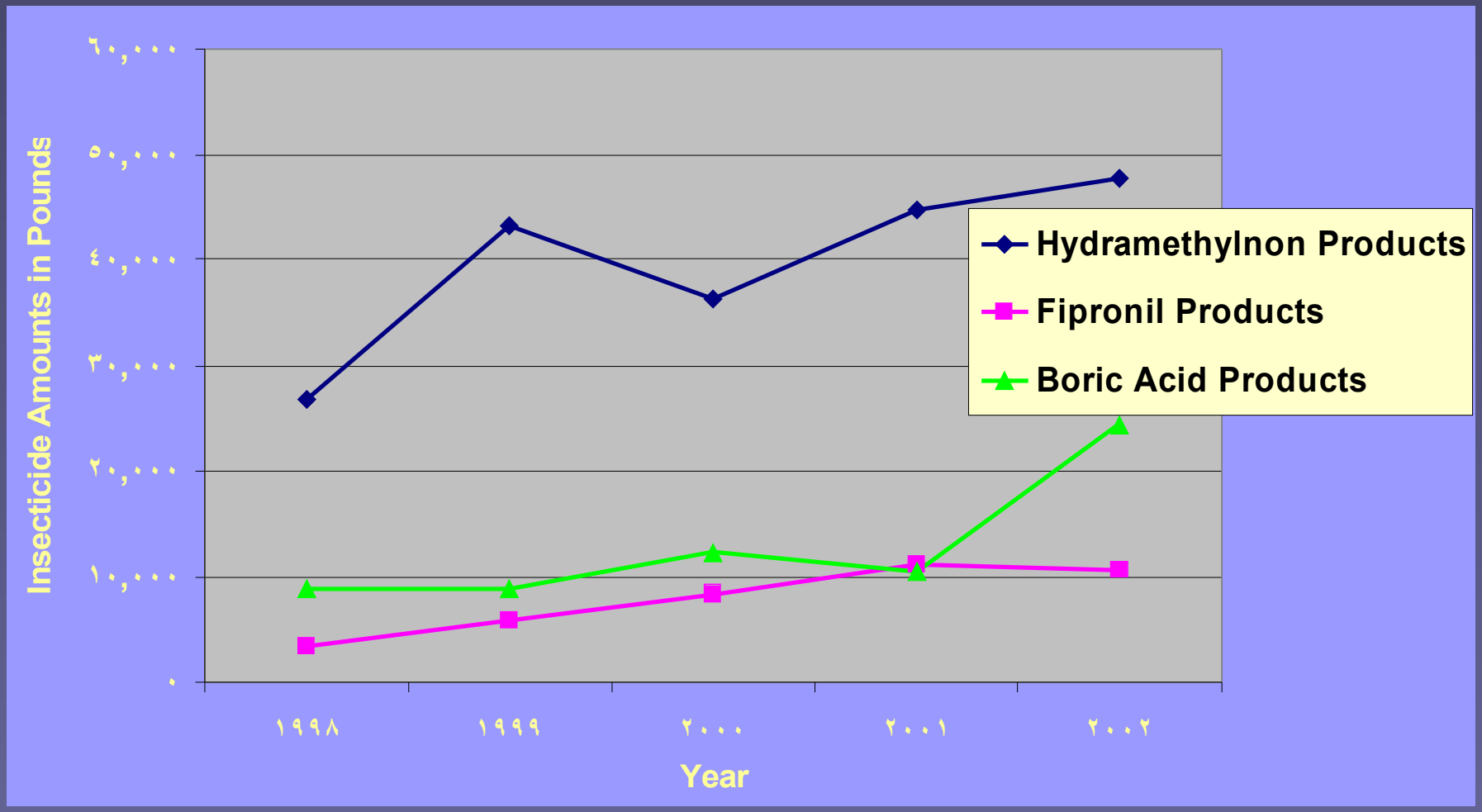
Findings of Emergency Department Data:



Demographic Profile of Pesticide and all other Chemical Poisoning Cases in a Sample of ٢٤ New York City Emergency Departments in a Selection of Weeks, ٢٠٠٣-٢٠٠٤	
	Number (%) of Pesticide Poisoning Cases
Age	
Child, <١ year	٢ (١٠%)
Child, ١-٥ year	**١٤ (٧٤%)**
Child, ٦-١٨ year	٠ (٠%)
Adult, >١٨ year	٣ (١٦%)
Gender	
Male	**١١ (٥٨%)**
Female	٤ (٢١%)
Unknown	٤ (٢١%)
Race/Ethnicity	
Hispanic	٦ (٣٢%)
Non-Hispanic Black	**٧ (٣٧%)**
Non-Hispanic White	٢ (١١%)
Asian	١ (٥%)
Other	١ (٥%)
Unknown	٢ (١١%)
Total	**١٩ (١٠٠%)**

Findings of State Pesticide Use Data:

"Best Practice" Products Trends in NYC 1998-2002



Source: NYS DEC PSURS

Gaps in National Surveillance

- Local findings from data not represented in national surveillance systems
  - Pesticide use and infestation patterns differ based on SES and demographic factors
  - Population survey data show patterns of household and illegal pesticide use
  - Commercial pesticide use not a part of national surveillance systems
  - Non-occupational poisoning and illness data gathered through hospitalization and ED data
    - Many of ED poisoning cases involve children
- No chronic hazard or exposure data
- No single location/source available for complete portrait of exposures

A Framework for National Surveillance

- National EPHT reporting of TESS data
- Strengthen ties between SENSOR and EPHT states
- Leveraging drinking water surveillance for pesticide surveillance
- Pilot efforts to increase dietary sampling for pesticide residues

A Framework for National Surveillance

- Leveraging hospitalization (and ED) data tracking for asthma and MI for the purpose of pesticide tracking
- Enhanced biomonitoring through community/state HANES
- Supporting addition of pest and pesticide questions on population surveys (e.g., BRFSS, Housing Surveys, etc.)

Benefits of a National Pesticide Surveillance Network

- Better fulfill objectives of Healthy People 2010:
  - 8-27. Increase or maintain the number of Territories, Tribes, and States, and the District of Columbia that monitor diseases or conditions that can be caused by exposure to environmental hazards.
  - 8-25. Reduce exposure of the population to pesticides, heavy metals, and selected environmental chemicals, as measured by blood and urine concentrations of the substances or their metabolites.
  - 8-24. Reduce exposure to pesticides as measured by urine concentrations of metabolites.

Benefits of a National Pesticide Surveillance Network

- Findings of an improved pesticide surveillance system have secondary benefits:
  - Better targeted educational efforts for at-risk groups
  - More appropriate programmatic efforts
  - More targeted enforcement of existing regulations
  - More effective public policy interventions