The Role of Pesticide Use Reports in Environmental Public Health Tracking

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Discussion plan

1. What is Environmental Public Health Tracking (EPHT)?
2. What is the role of the PUR in Tracking in general?
3. What is the role of the PUR in the CVSC Demonstration Project?

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EPHT Background

- 2000: Pew Foundation report identifies "environmental health information gap"
  - Diseases with known or suspected environmental links:

Asthma	Alzheimer's, Parkinson's
Neurodevelomental disorders	Endocrine disruption
Autoimmue diseases	Endometriosis
Cancer	Heart disease

  - Besides pain and suffering, treatment of environmental diseases costs at least US$10 billion annually in California alone

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EPHT Background

- 2000: Pew Foundation report identifies "environmental health information gap"
  - Lack of data regarding
    - Demographic, geographic, and temporal patterns of disease
    - Exposures of populations to known or suspected health hazards
- Defining the problem this way emphasizes:
  - Each kind of information is useful on its own
  - Also valuable is the ability to link the two kinds of information, so that ***capacity*** should be developed

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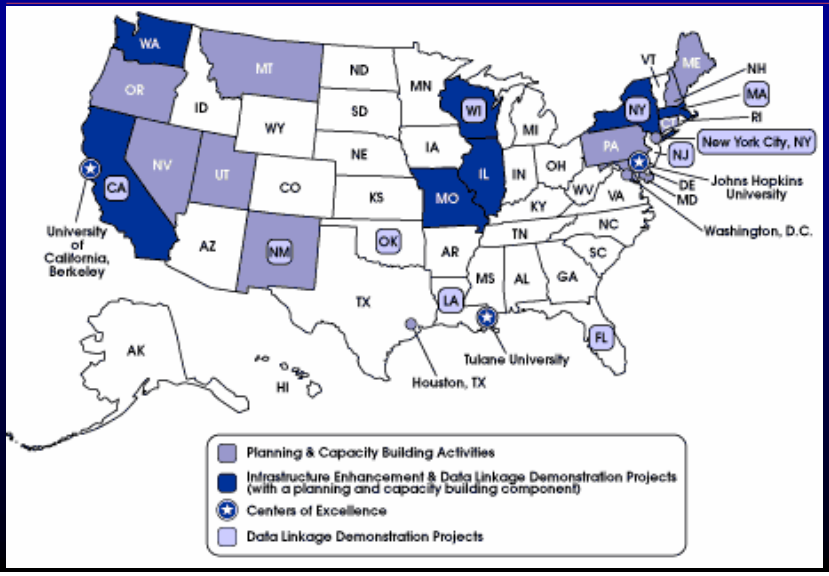
CDC Program in EPHT



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EPHT in California

- PEW Environmental Health Commission 2000
- California Env. Health Surveillance System 2001
  (SB 702-Escutia)
- CDC Tracking Cooperative Agreement 2002
  CA Wellness Foundation award
- CA Environmental Health Tracking Act 2003
  (SB 189-Escutia)
- CDC Data Linkage Demonstration Award 2003

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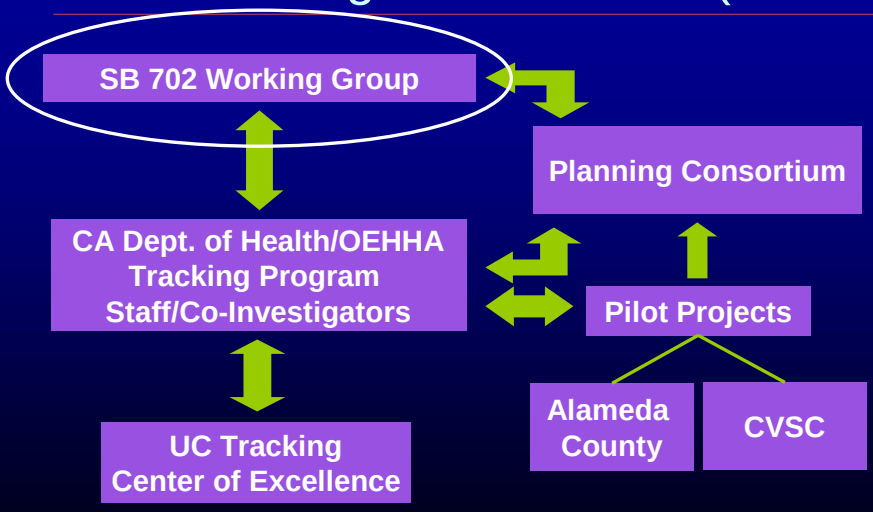
California Program Structure (Partial)



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Expert Working Group Report

- **SB 702 mandate was to convene an Expert Working Group build on PEW report to develop California-specific EPHT plan**
- **Available at www.catracking.com**

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Selected EWG Recommendations on Pesticides

- Fund county agricultural commissioners to more closely monitor adherence to reporting requirements
- Develop field-level data entry system with error checking protocols
- DPR should provide data in two different formats
  - For restricted and public use
  - To maintain the confidentiality of potentially effected people, high-resolution restricted files could be accessed only by qualified researchers with Human Subjects Protection approval

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Selected EWG Recommendations on Pesticides

- DPR and EHIB should develop ways to model pesticide drift incorporating meteorological data
- DPR and ARB should develop air models to take into account applications from multiple growers, potential accumulations of pesticides, and volatilization factors
- Air monitoring should be implemented to validate these models

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Selected EWG Recommendations on Pesticides

- Clinicians should be better educated to know when to order cholinesterase testing
- Clinical laboratories should be required to report all cholinesterase and other pesticide-related testing results for incorporation into the poisoning surveillance system
- The DHS Environmental Health Laboratory should proceed with biological monitoring of OPs, OCs, and pyrethroids, and to develop methods for carbamates and phenoxy herbicides

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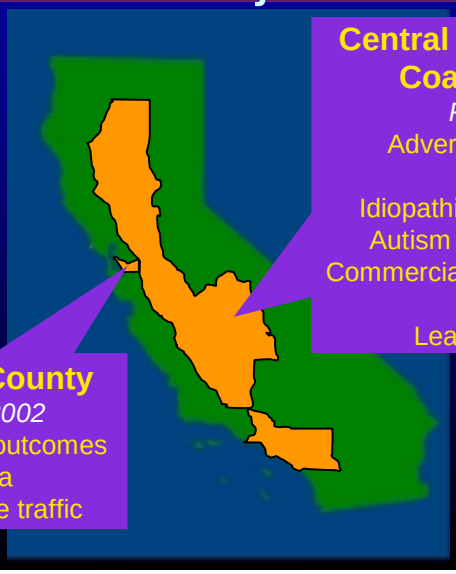
CEHTP Demonstration Projects



Central Valley and South Coast Air Basins
Funded 2003
Adverse birth outcomes
SIDS
Idiopathic mental retardation
Autism spectrum disorders
Commercial pesticide applications
Air toxics
Lead biomonitoring

Alameda County
Funded 2002
Adverse birth outcomes
Asthma
Motor vehicle traffic

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Theoretical linkage model

Putative hazard data:
- **Pesticide applications**
- **Modeled air toxics**

Proxy for gestational exposure:
Maternal address at delivery

Health outcomes:
- **Preterm birth**
- **Low birthweight at term**
- **SIDS**
- **Autism spectrum disorders**
- **Idiopathic mental retardation**

- Thinking about linkage helps spot ways to improve data reliability, geographic resolution, and exposure modeling

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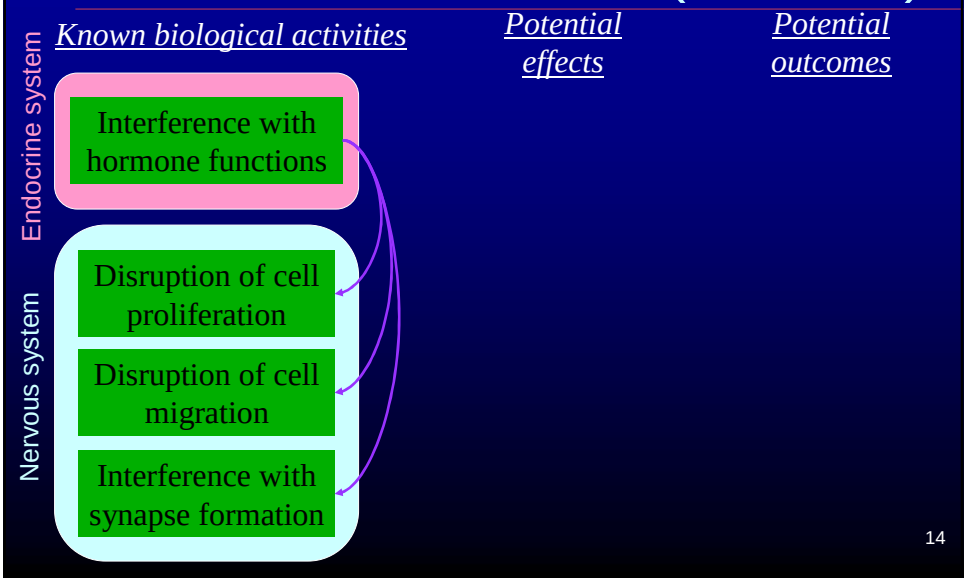
Postulated connections (selected)



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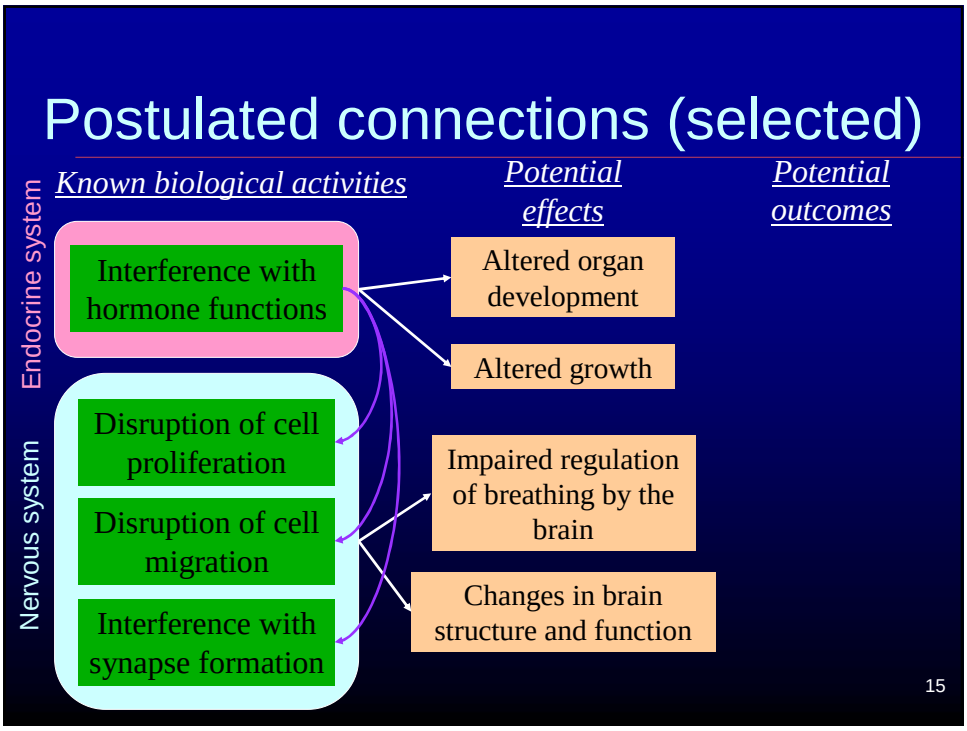
Postulated connections (selected)
Known biological activities
Potential effects
Potential outcomes
Endocrine system
Nervous system
Interference with hormone functions
Disruption of cell proliferation
Disruption of cell migration
Interference with synapse formation
Altered organ development
Altered growth
Impaired regulation of breathing by the brain
Changes in brain structure and function
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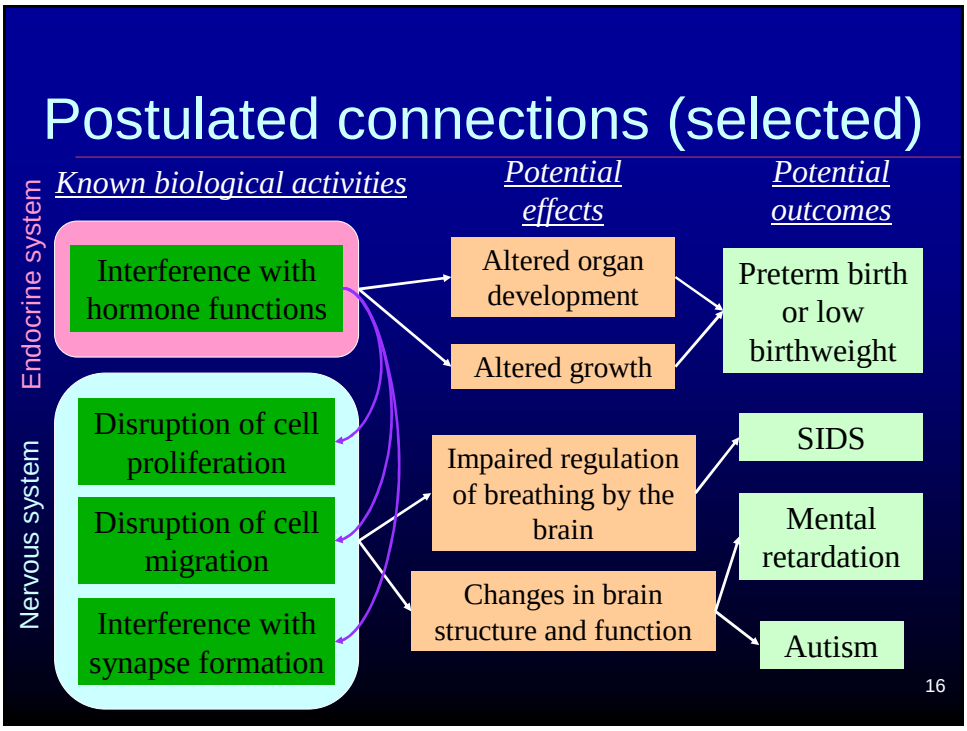
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Altered organ development
Altered growth
Impaired regulation of breathing by the brain
Changes in brain structure and function
Preterm birth or low birthweight
SIDS
Mental retardation
Autism
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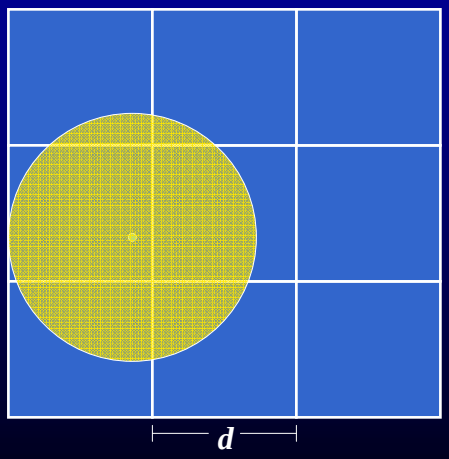
GIS data queries between agencies: Model developed for ARB CHAPIS system

- ***Input from DHS to ARB*** is circular buffer or polygon
- ***Output from ARB to DHS*** is proportional summation of metrics from all overlapping grids
- ***Resolution*** varies; grid size (*d*) may be as small as 250 m



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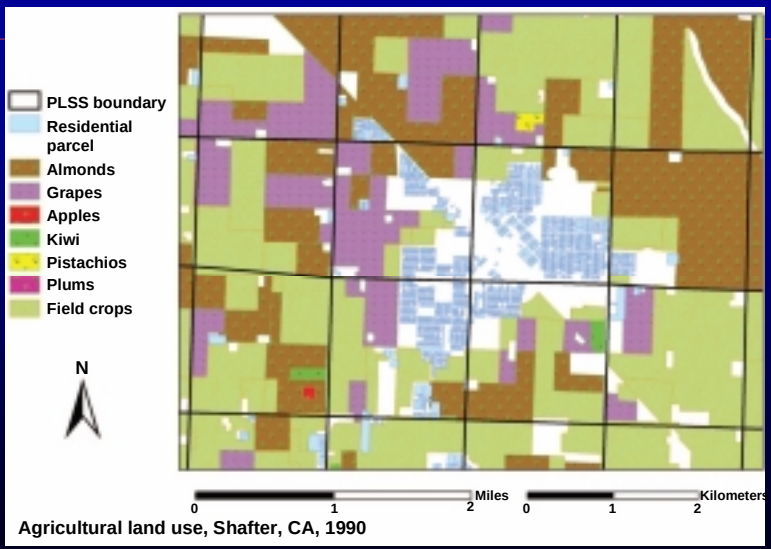
PLSS sections and Land Use



Agricultural land use, Shafter, CA, 1990

Rull and Ritz, *Env Hth Persp* 2003;111:1582-9

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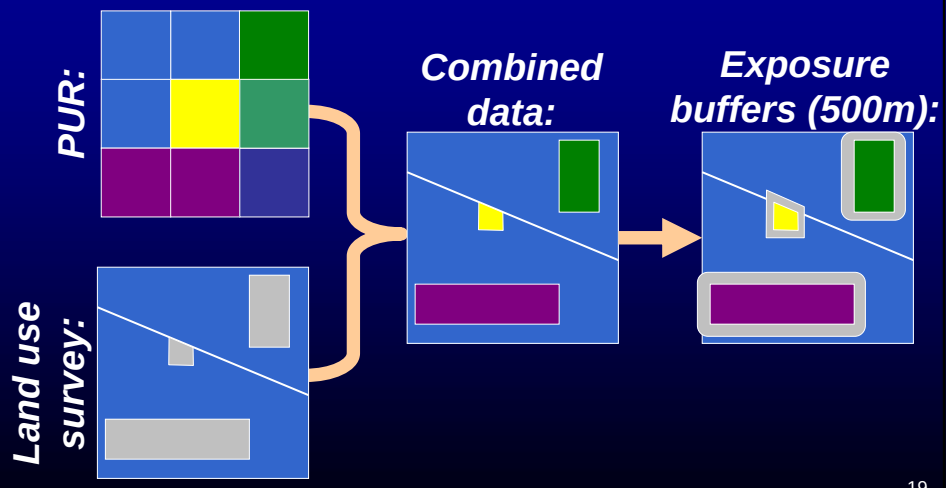
Refining PUR with Land Use data
(Rull and Ritz, *Env Hth Persp* 2003;111:1582-9)



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Refining PUR with Land Use data
(Rull and Ritz, *Env Hth Persp* 2003;111:1582-9)

Table 3. Simulated estimates (percentage) based on 1,000 replicates of 200 randomly sampled residential parcels.

	Annual exposure prevalence ± SD			Sensitivity and specificity ± SD of zonal PUR-only model vs. PUR/land-use model			
	PUR/land-use	PUR-only model		Narrow[b]		Broad[c]	
Pesticide	model 500 m[a]	Narrow[b]	Broad[c]	Sensitivity	Specificity	Sensitivity	Specificity
Methomyl	17.1 ± 2.6	7.0 ± 1.8	48.6 ± 3.5	36.9 ± 8.4	99.1 ± 0.7	100.0 ± 0	62.0 ± 3.7
Paraquat	10.8 ± 2.3	4.5 ± 1.5	36.2 ± 3.4	35.3 ± 10.6	99.3 ± 0.6	100.0 ± 0	71.5 ± 3.4
Parathion	8.4 ± 2.0	5.0 ± 1.5	27.1 ± 3.2	45.4 ± 12.9	99.7 ± 0.8	100.0 ± 0	79.6 ± 3.0
Endosulfan	5.3 ± 1.7	3.2 ± 1.3	24.5 ± 3.0	42.8 ± 16.0	99.0 ± 0.7	100.0 ± 0	79.7 ± 2.9
Maneb	0.9 ± 0.7	1.0 ± 0.7	6.9 ± 1.8	54.8 ± 38.9	99.4 ± 0.5	100.0 ± 0	93.9 ± 1.7

[a]Residential buffer radius. [b]Residence within a PLSS section with a reported pesticide application. [c]Residence within or adjacent to a PLSS section with a reported application.

Sensitivity 35-55%

Specificity 62-94%

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Refined PUR and Land Use data

- Returns to question of maternal residence as proxy for exposure
- For neurological outcomes, particularly interested in exposures early in pregnancy (first month)
- Looking at associations with:
  - Neural tube defects (*Rull, Ritz, and Shaw, unpublished data*)
  - Autism spectrum disorder and idiopathic mental retardation (*CVSC project, in progress*)

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