

Residential Proximity to Pesticide Usage and Developmental Health Outcomes in the Salinas Valley: an overview

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AGRICULTURE IN CALIFORNIA



Figure 1. Salinas, California
Table 1. The top 10 pesticides used by pounds of active ingredients statewide in 2014.

Chemical	Rank	Pounds
Sulfur	1	4,952,5703
Mineral Oil	2	15,717,827
1,3-Dichloropropene	3	13,212,360
Petroleum Oil, Unclassified	4	11,050,428
Chloropicrin	5	8,988,621
Potassium n-methyldithiocarbamate	6	7,707,984
Glyphosate, potassium salt	7	5,597,529
Glyphosate, isopropylamine salt	8	4,853,456
Metam-Sodium	9	4,142,910
Calcium Hydroxide	10	3,701,687



CHILDREN'S HEALTH

Why are children more vulnerable?

- Eat/drink/breathe more per unit body weight
- Hand-to-mouth behavior
- Developmental life stage

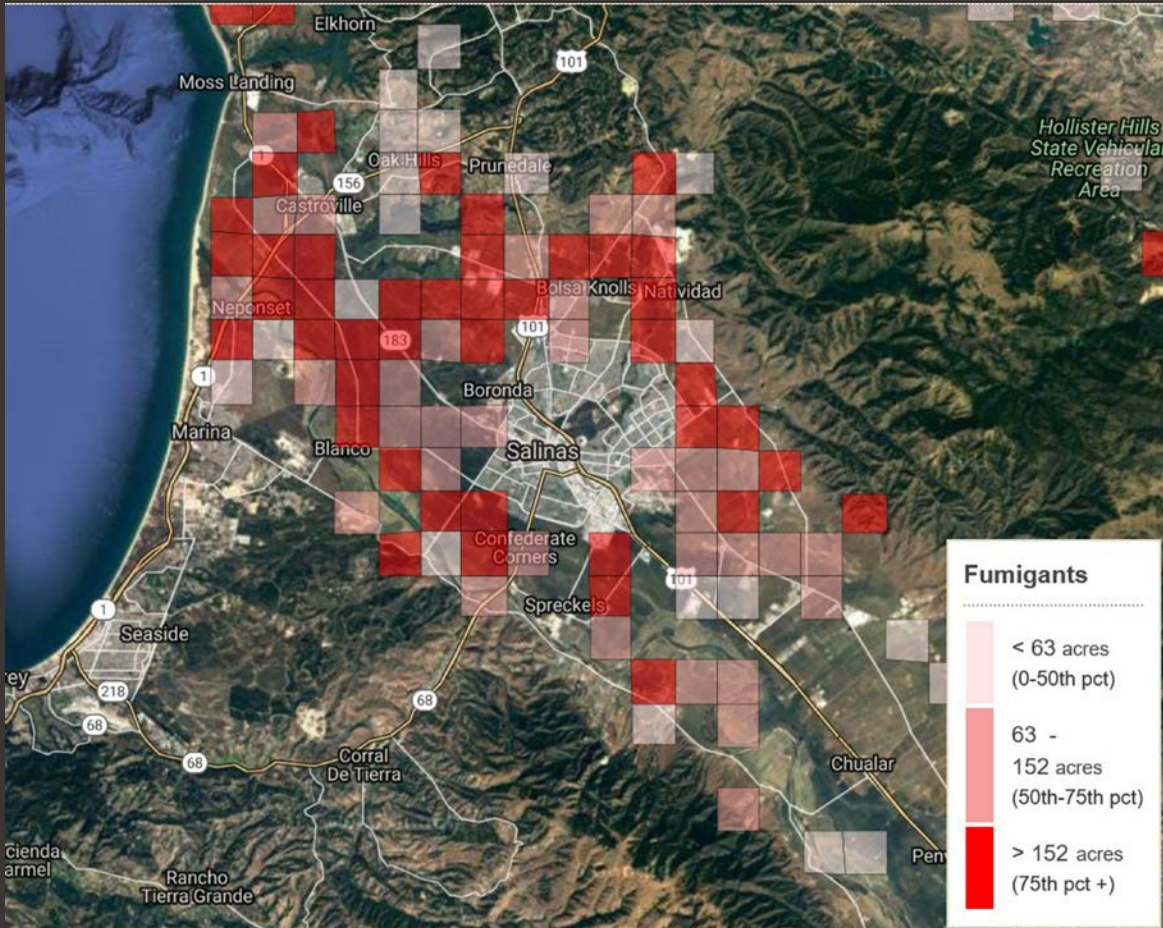


CHAMACOS

- Enrollment: October 1999-2000
- Initial cohort: 601 pregnant women → delivered children
- Exposure assessment:
 - California PUR data, linked to residence GPS coordinates
 - Interviews
 - Collection of biomarkers (blood, urine)
 - Home assessment (dust collection)
- Health Outcomes
 - Respiratory function (spirometry)
 - Cognition (IQ)
 - Attention and Hyperactivity (BASC report)



CALIFORNIA PUR



- Pesticide Use Reporting Data
- California Department of Pesticide Regulations
- Includes:
 - Amount (kg) of active ingredient applied
 - Application date
 - Location of application



MY TASKS

- Literature Review:
 - Fumigant exposure and respiratory function
 - Fumigant exposure and neurotoxicity
 - Glyphosate exposure and neurotoxicity
- Methods:
 - PubMed search
 - Terms: “methyl bromide”, “metam sodium”, “chloropicrin”, “1,3-dichloropropene”, “glyphosate”, “RoundUp”, “Hydrogen sulfide”
 - “respiratory”, “pulmonary”, “function”, “lung”, “breath*”
 - “neuro”, “nervous”, “brain”
 - Compile information in Excel table
 - Draft and edit review
 - Edit manuscript
- Results:



RESULTS: NEURODEVELOPMENT

Table 2*. Adjusted association between a ten-fold increase in wind-adjusted fumigant use (kg) within 8-km of residence and 7-year WISC Scales.

	Full-Scale IQ			Verbal Comprehension			Working Memory			Perceptual Reasoning			Processing Speed		
	N	β	(95%CI)	N	β	(95%CI)	N	β	(95%CI)	N	β	(95%CI)	N	β	(95%CI)
<i>Prenatal Exposure</i>															
Methyl Bromide	257	-0.9	(-2.5, 0.7)	285	-0.8	(-2.4, 0.7)	258	-0.3	(-2, 1.3)	285	-1.0	(-2.8, 0.9)	258	-0.7	(-2.3, 0.9)
Metam Sodium	257	1.0	(-0.4, 2.3)	285	0.4	(-0.8, 1.6)	258	0.7	(-0.7, 2)	285	0.6	(-0.9, 2.1)	258	0.8	(-0.6, 2.2)
Chloropicrin	257	-0.7	(-2.1, 0.6)	285	-0.6	(-1.9, 0.7)	258	-0.3	(-1.7, 1.1)	285	-0.9	(-2.5, 0.7)	258	-0.4	(-1.8, 1)
1,3 - Dichloropropene	257	0.4	(-1, 1.8)	285	0.3	(-0.9, 1.6)	258	0.7	(-0.7, 2.2)	285	0.8	(-0.7, 2.4)	258	0.1	(-1.3, 1.5)
<i>Postnatal Exposure</i>															
Methyl Bromide	228	-2.6	(-5.2, 0)	255	-1.1	(-3.5, 1.4)	229	-1.5	(-4.1, 1.1)	255	-2.7	(-5.6, 0.3)	229	-2.0	(-4.6, 0.6)
Metam Sodium	228	-0.4	(-2.7, 1.9)	255	-0.8	(-2.9, 1.4)	229	0.0	(-2.2, 2.3)	255	-0.4	(-3, 2.2)	229	0.1	(-2.2, 2.3)
Chloropicrin	228	-2.4	(-4.7, -0.2)	255	-0.9	(-3, 1.2)	229	-1.8	(-4.1, 0.4)	255	-2.4	(-5, 0.2)	229	-1.8	(-4, 0.4)
1,3 - Dichloropropene	228	-2.8	(-6.5, 1)	255	-2.5	(-6.1, 1.2)	229	-1.7	(-5.4, 2.1)	255	-3.9	(-8.3, 0.5)	229	-0.4	(-4.2, 3.3)

*Adjusted for age at assessment, language of assessment, sex, maternal intelligence, maternal education, maternal depression at 7-years, maternal country of birth, HOME score, household poverty level at 7-years, prenatal DAPs and prenatal proximity to agricultural OP use.



RESULTS: NEURODEVELOPMENT

Table 3. Adjusted association between a ten-fold increase in wind-adjusted fumigant use (kg) within 8-km of residences and BASC Attention Problems and Hyperactivity Standardized Scores at 7-years.

	Maternal Report ^a					Teacher Report ^b				
	Attention Problems			Hyperactivity		Attention Problems			Hyperactivity	
	N	β	(95%CI)	β	(95%CI)	N	B	(95%CI)	β	(95%CI)
<i>Prenatal Exposure</i>										
Methyl Bromide	284	0.1	(-1.1, 1.4)	0.0	(-0.9, 1)	234	0.0	(-1, 1.1)	0.1	(-1.2, 1.5)
Metam Sodium	284	0.0	(-1, 0.9)	0.5	(-0.3, 1.2)	234	0.5	(-0.3, 1.2)	-0.3	(-1.4, 0.7)
Chloropicrin	284	-0.2	(-1.3, 0.9)	0.1	(-0.7, 0.9)	234	0.0	(-0.9, 0.9)	0.2	(-1, 1.3)
1,3 - Dichloropropene	284	-0.1	(-1.1, 0.9)	0.4	(-0.5, 1.2)	234	-0.1	(-1, 0.7)	-0.5	(-1.6, 0.6)
<i>Postnatal Exposure</i>										
Methyl Bromide	255	-0.5	(-2.5, 1.43)	-0.5	(-2.05, 0.98)	211	-0.6	(-2.25, 1.12)	-0.5	(-2.58, 1.64)
Metam Sodium	255	0.5	(-1.2, 2.27)	-0.1	(-1.44, 1.24)	211	-0.2	(-1.69, 1.22)	0.4	(-1.39, 2.26)
Chloropicrin	255	-0.4	(-2.11, 1.3)	0.2	(-1.02, 1.48)	211	-0.1	(-1.58, 1.3)	0.0	(-1.81, 1.81)
1,3 - Dichloropropene	255	0.7	(-2.09, 3.55)	-1.1	(-3.24, 1.12)	211	-0.7	(-3.12, 1.77)	-0.2	(-3.2, 2.76)

^a Adjusted for sex, age at assessment, maternal country of birth, maternal depression and HOME score at 7-years, prenatal DAPs and OP use.

^b Adjusted for sex, age at assessment, maternal country of birth, HOME score at 7-years, prenatal DAPs and OP use.



FURTHER STEPS

- At CERCH:
 - Continue finalizing manuscripts for fumigant papers
 - Begin designing a research strategy for further study of glyphosate
 - Continuous assessment of CHAMACOS participants
- For me:
 - Pursue further research in college
 - Take public health courses that will develop research skills (Statistics, GIS, Epidemiology, etc.)
- Learning experiences:
 - EndNote/PubMed/Zotero
 - Developing a critical eye for research
 - Attending talks and learning about the complexity of the environmental health industry



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