



ARIZONA CHILDREN'S HEALTH AND ENVIRONMENT

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Air Pollution and Children's Health

- Parental Occupational Exposure
- Outdoor Pollution
- Indoor Pollution
 - Smoking during pregnancy
 - Environmental tobacco smoke

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Parental Occupational Exposure and Childhood Cancer

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Childhood Brain Tumor Study

92 Matched Pairs

Cases - Los Angeles County
Age 0-10
BRAIN TUMOR Diagnosed 1972-1977

CONTROLS - Friends (57)
Neighbors (35)

Matched - (+/-3)
Sex
Race

Telephone Interviews (Mothers)
Work History Both Parents
Other Risk Factors

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FACTOR	CONCORDANT PAIRS, BOTH EXPOSED	DISCORDANT PAIRS		RELATIVE RISKS
		CASES EXPOSED	CONTROLS EXPOSED	
MOTHER				
Got Chemicals On Skin	0	10	3	3.3
Inhaled Chemicals Or Fumes	1	12	4	3.0
One Or Both Of The Above	1	14	5	2.8
FATHER				
Exposed To Chemical Solvents	3	17	6	2.8
Exposed To Paints	0	7	1	7.0
Work In Aircraft Industry	2	10	0	8

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Occupational Information on Parents of Cases and Controls Who Worked in the Aircraft Industry				
Diagnosis	Child's	Mother's	Father's	Exposure
		Occupation	Occupation	
Astrocytoma	9	Wire Soldering	Electronics Assembler	Solder
Oligodendroglioma	8		Machinist	Trichloroethylene
Astrocytoma	6		Machinist	Dust, Oils
Astrocytoma	7		Production Scheduling	Trichloroethylene
			Parts Inspection	Methyl Ethyl Ketone
Medulloblastoma	4		Electrical Engineer	
Glioma	4	Secretary		
Astrocytoma	4	Keypunch Operator	Computer Operator	
Medulloblastoma	<1		Scientist-physicist	Ionizing Radiation (Wore Film Badge)
Astrocytoma	<1		Plane Painter	Spray Paint
Astrocytoma	9		Engineer	
Astrocytoma	8		Wing Parts Inspector	
Medulloblastoma	4	Stockroom Clerk		Dust, Exhaust
Control		Secretary		
Medulloblastoma	3		Flight Line Mechanic	Exhaust
Control			Electrical Engineer	
Medulloblastoma	<1		Student -Aircraft Mechanic Sch.	
Control		Secretary	Technician -student	

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	Solvent Exposure in Fathers of Children with Brain Tumors		
	12_cns	10_Controls	Odds Ratio
Solvents	12	7	∞
Daily Solvents	11	6	7.3
CCl ₄	3	1	3.0
TCE	5	0	∞
MEK	7	1	12.6
Toluene	2	0	∞
Freon	4	0	∞
Paints	3	1	3.0
Petroleum Products	10	6	3.3
Asbestos/Fiberglass	4	3	1.1

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Childhood Leukemia Study	
123 Matched Pairs	
Cases -	Los Angeles County Age 0-10 LEUKEMIA Diagnosed 1980-1984
Controls -	Friends (65) Random Digit Dialing (58)
Matched -	Age (+/-3) Sex Race (SES By Census Tract 84%)
Telephone Interviews	(Mothers And Fathers) Work History 50 Specific Exposures Other Risk Factors Before, During, After Pregnancy

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Childhood Leukemia Study Fathers' Occupational Exposures

EXPOSURE (After Delivery)	ODDS RATIO (Discordant Pairs)	P Value (One Sided)
Chlorinated Solvents (TCE, PCE, CCL4)	3.5 (14/4)	.01 *
Spray Paint	2.0 (24/12)	.02
Dyes/Pigments	4.5 (9/2)	.03
Methylethyl Ketone	3.0 (9/3)	.05
Cutting Oils	1.7 (27/16)	.05
Exposure (During Pregnancy)		
SPRAY PAINT	2.2 (18/8)	.03
Chlorinated Solvents	2.2 (9/4)	.09

Exposure (Before Pregnancy) - None Significant
* Remains Significant After Adjusting For Each Of The Others

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Childhood Leukemia Study

Average Frequency Of Exposure To Chlorinated Solvents (FATHERS Personally Exposed: 12 Cases, 4 Controls) (days/person/month)

	One Year Before	During Pregnancy	After Delivery
Cases	8.2	10.4	9.5
Controls	1.8	1.8	1.8

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Frequency of Fathers' Exposure to Chlorinated Solvents and Risk of Childhood Leukemia

Exposure	NEVER	LOW (<50/Y)	HIGH (>50/Y)	P OF TREND
Chlorinated Solvents	1.0	1.7	8.0	.03

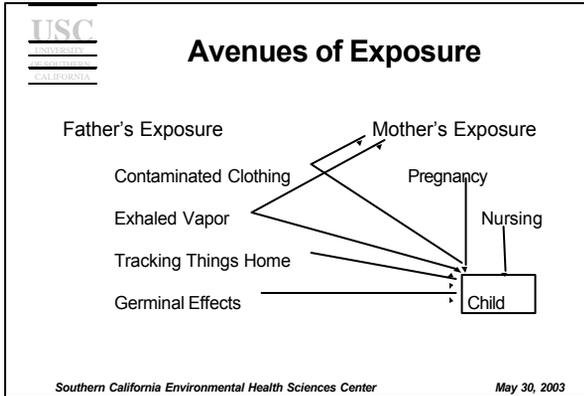
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Childhood Leukemia Study Home Exposures of Either Parent

Exposure (Pregnancy/Nursing)	Odds Ratio (Discordant Pairs)	P-value (One Sided)
Household Pesticides	3.8 (19/5)	.004
Garden Sprays	6.5 (13/2)	.007
Burned Incense	2.7 (22/8)	.007

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Outdoor Air Pollution and Children's Health

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Reason for Children's Health Study (CHS)

- Are chronic respiratory effects caused by Southern California air pollution?

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12 CHS Communities

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Summary of Pollutants

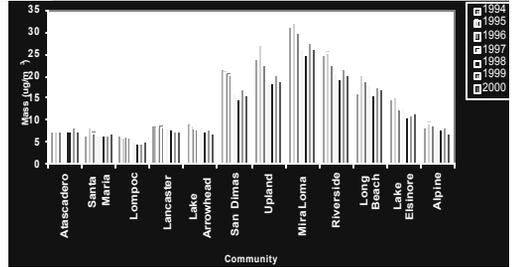
- **Particulate Matter (PM):** Bits of dust from exhaust, unpaved roads, etc. (PM₁₀ and PM_{2.5})
- **Nitrogen Dioxide (NO₂):** Brownish haze due to auto exhaust and other combustion sources
- **Acid vapor:** Primarily nitric acid from auto exhaust + atmospheric reactions
- **Ozone (O₃):** Created in the atmosphere through a series of chemical reactions

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Annual Average PM_{2.5}



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Child Groups Studied and Their Ages Each Year

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Do We See Differences In Health Associated With Air Pollution?

- YES
 - Lung function
 - School absence
 - Asthma symptoms and risk

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What is Lung Function?

- **Primary measure: FEV₁**
 - Forced Expiratory Volume in 1 second
 - How large of a balloon can you make in 1 second, blowing as hard as you can?
- **Several other measures:**
 - Total volume of air blown out of the lung
 - How quickly air can be blown out of the lung

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Lung Function Testing

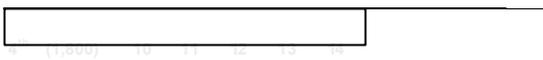


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Child Groups Studied and Their Ages Each Year

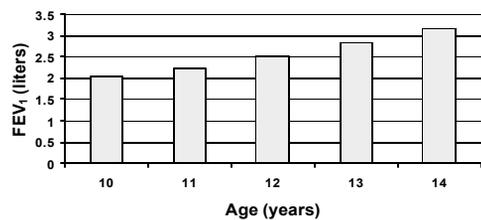


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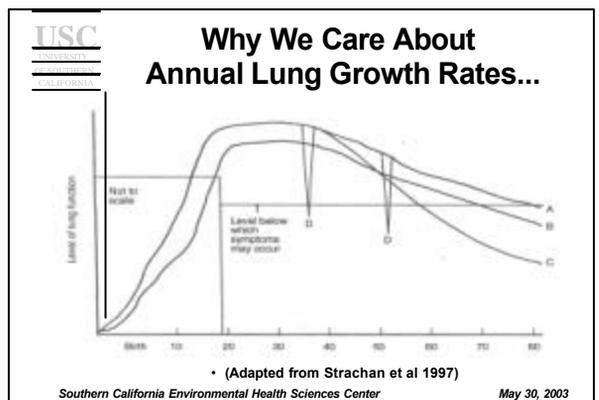
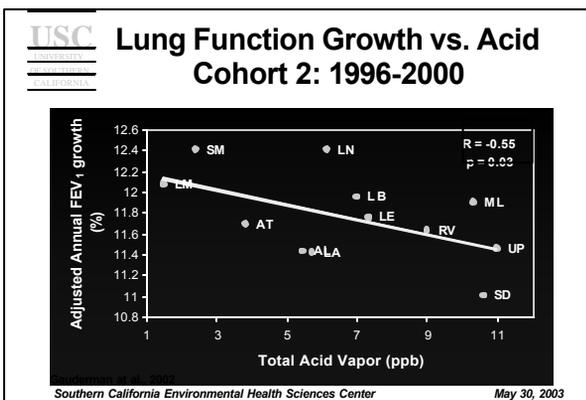
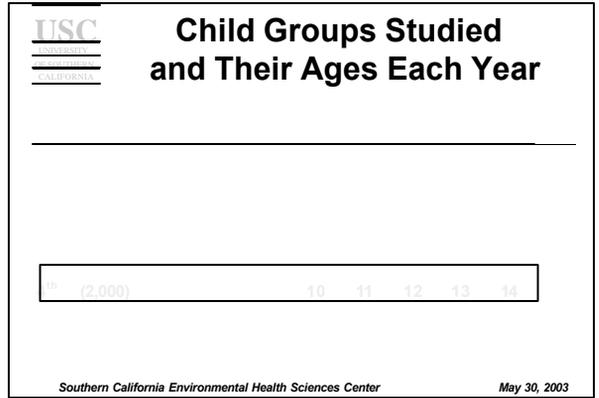
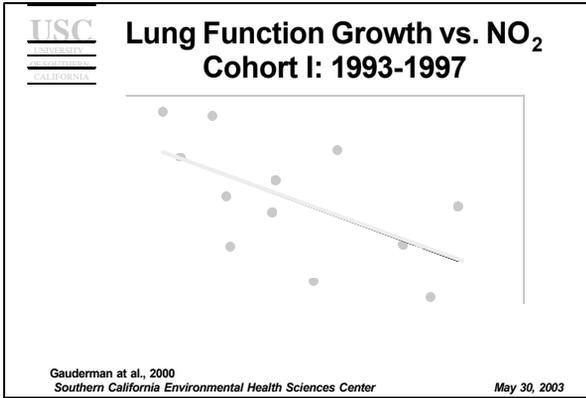
Average FEV₁ Over 5 Years 4th Grade Cohort (1993-1997)



On average, FEV₁ increased by 11.8% per year

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Do We See Differences In Health Associated With Air Pollution?

- YES
 - Lung function
 - School absence
 - Asthma symptoms and risk

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School Absence

- 20 ppb increase in O₃ associated with 83% increase in school absence due to acute respiratory disease

(Gilliland et al., 2001)

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Do We See Differences In Health Associated With Air Pollution?

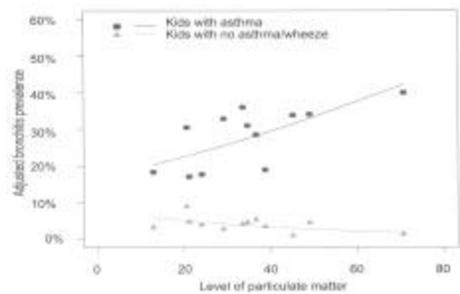
- YES
 - Lung function
 - School absence
 - Asthma symptoms and risk

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Asthma: PM and Bronchitis in Asthmatics



(McConnell, et al., 1999)

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Local Traffic Exposure and Asthma

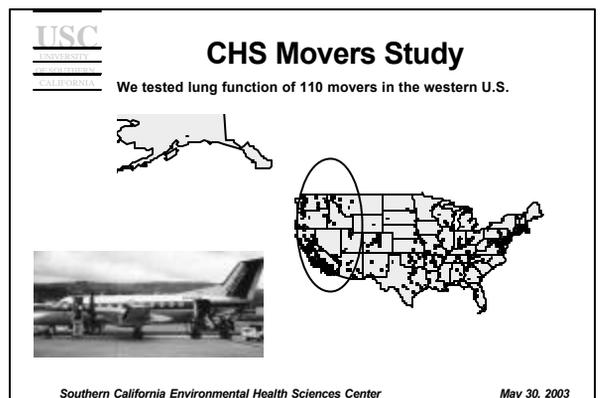
Traffic	Asthma		
	N (%)	RR*	p-value
< 50%	62 (13.2)	1.0	--
50-75%	28 (11.9)	1.0	0.91
75-90%	17 (12.3)	1.2	0.82
>90%	20 (21.7)	7.0	0.01

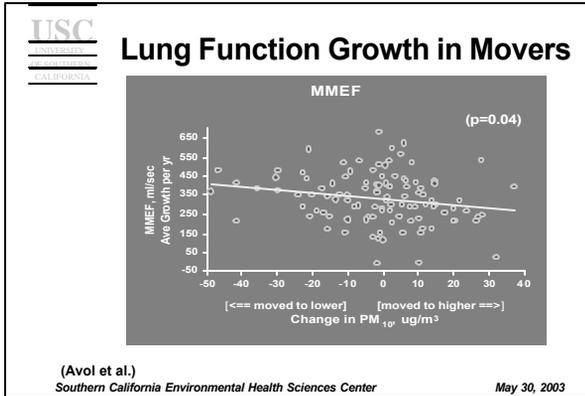
> * adjusted for age, race, sex, and community

(McConnell et al.)
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- ### CHS Movers Study
- Many study participants have moved away from their communities
 - What happens to their health after they leave and change their air pollution exposure?
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Summary

- Air pollution causes acute *and* chronic effects

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Summary

- Children are a susceptible group
 - Rapid growth
 - More exposure than adults
- Regional and local exposures are important

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Summary

- Reductions in air pollution will likely lead to measurable improvements in health

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Indoor Pollution

- Smoking during pregnancy
- Environmental tobacco smoke

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Interaction Between Genes & Environment Increases Asthma Severity GST M1 (-)

	No <u>in utero</u> GST M1 (-)	<u>In utero</u> GST M1 (+)	<u>In utero</u> GST M1 (-)
Asthma meds	0.9	0.7	1.8 (1.1-2.8)
Persistent wheeze	0.8	1.6	2.2 (1.3-4.0)
SOB/wheeze	1.0	1.4	2.3 (1.4-3.5)
Emergency room	0.9	1.0	3.7 (1.9-7.3)

(Gilliland et al., 2002)
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Risk of School Absence from Environmental Tobacco Smoke

	One Smoker	Two Smokers
No Asthma	1.3	1.8
Asthma	2.4	4.5

(Gilliland et al., 2003)
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Grand Summary

- Our knowledge of children's environmental health problems is changing rapidly
- Important research is being conducted
- Agencies and citizens must promptly apply this information to protect our children

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