The MATCH Study

(Metals Assessment Targeting Community Health)
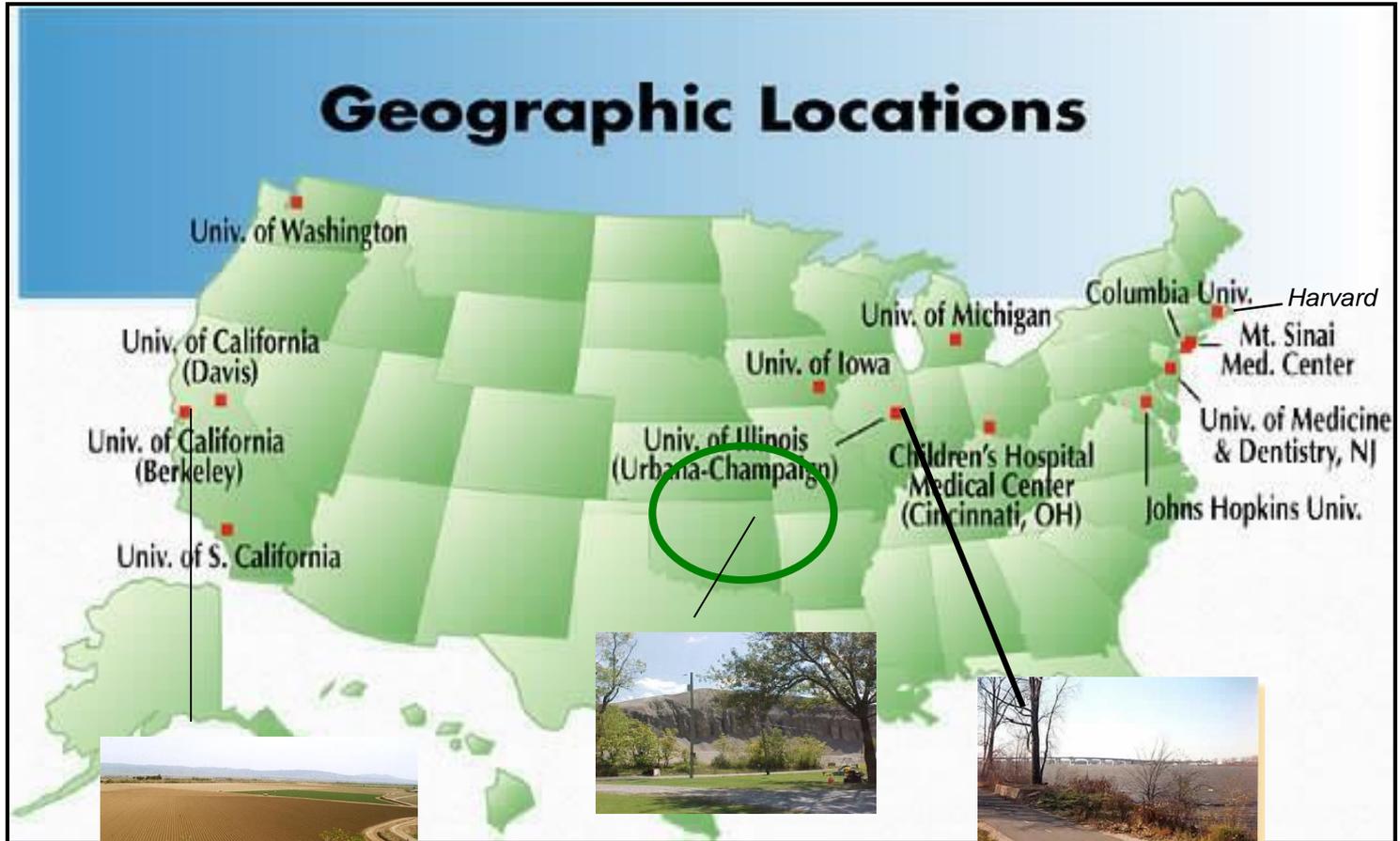
"Ga-Du-Gi"

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Geographic Locations

Univ. of Washington

Univ. of California (Davis)

Univ. of California (Berkeley)

Univ. of S. California

Univ. of Michigan

Univ. of Iowa

Univ. of Illinois (Urbana-Champaign)

Children's Hospital Medical Center (Cincinnati, OH)

Columbia Univ.

Harvard

Mt. Sinai Med. Center

Univ. of Medicine & Dentistry, NJ

Johns Hopkins Univ.

Population: Agricultural Workers

Salinas Valley, California

Population Ottawa county Former mining community

Population:

*Fox River, **Wisconsin***

Our Center

- Project 1
  - Birth cohort study
- Project 2
  - Environmental Assessment project
- Project 3
  - Animal study on routes of exposure
- Project 4
  - Animal study on neurtoxicity of Mn

Project 1

- Metals, Stress, Nutrition and Child Development

  - Epidemiologic Birth cohort
  - Project Leader: Robert Wright
  - 2004-2009

Specific Aim 1

Specific Aim 1, we will test the hypothesis that biological markers of exposure to manganese will be associated with children's Mental Developmental Index scores at 12 & 24 months of age.
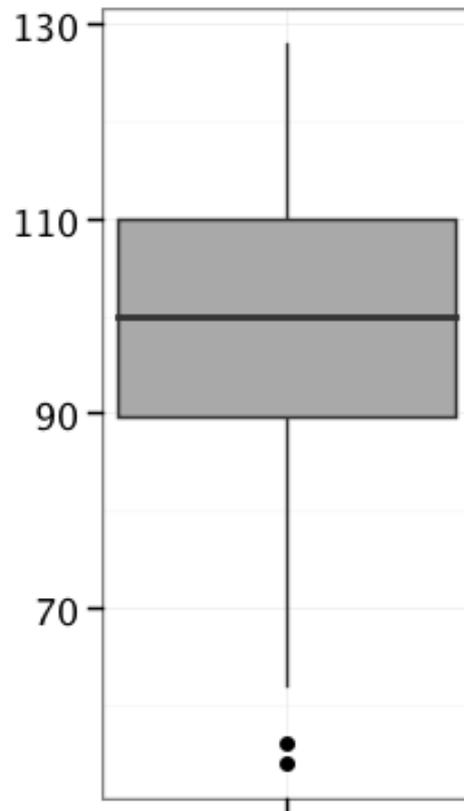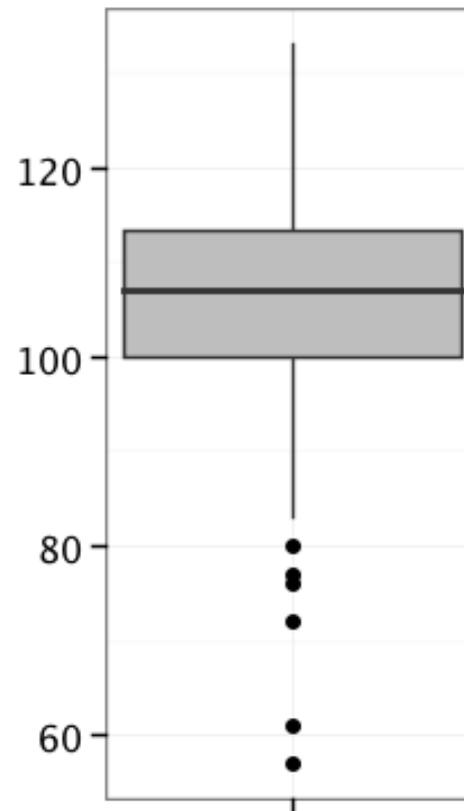
Enrollment and Follow up

- We enrolled 590 mother-infant pairs (another 110 enrolled under a birth outcome study funded by SF but not followed.
    - We saw about 250 at age 1 year
    - We saw about 150 at age 2 years
    - At least 1 follow up on ~325 by study's end with data on Bayley scales and biomarkers of lead and Manganese exposure

Neurodevelopment Scores at 2 years

	Mean	SD	Min	Max
MDI	98.8	15.9	54	128
PDI	105.3	12.2	57	133

Mental (MDI)   Motor (PDI)

Maternal Blood Metals Concentrations (μg/dl)

Mn-As correlation: 0.3

Mn-Pb correlation: 0.2

Pb-As correlation: 0.2

Takser 2003, 2004; Smargiassi 2003; Sanders et al. 2012; Concha et al. 1998; Lee et al. 2005
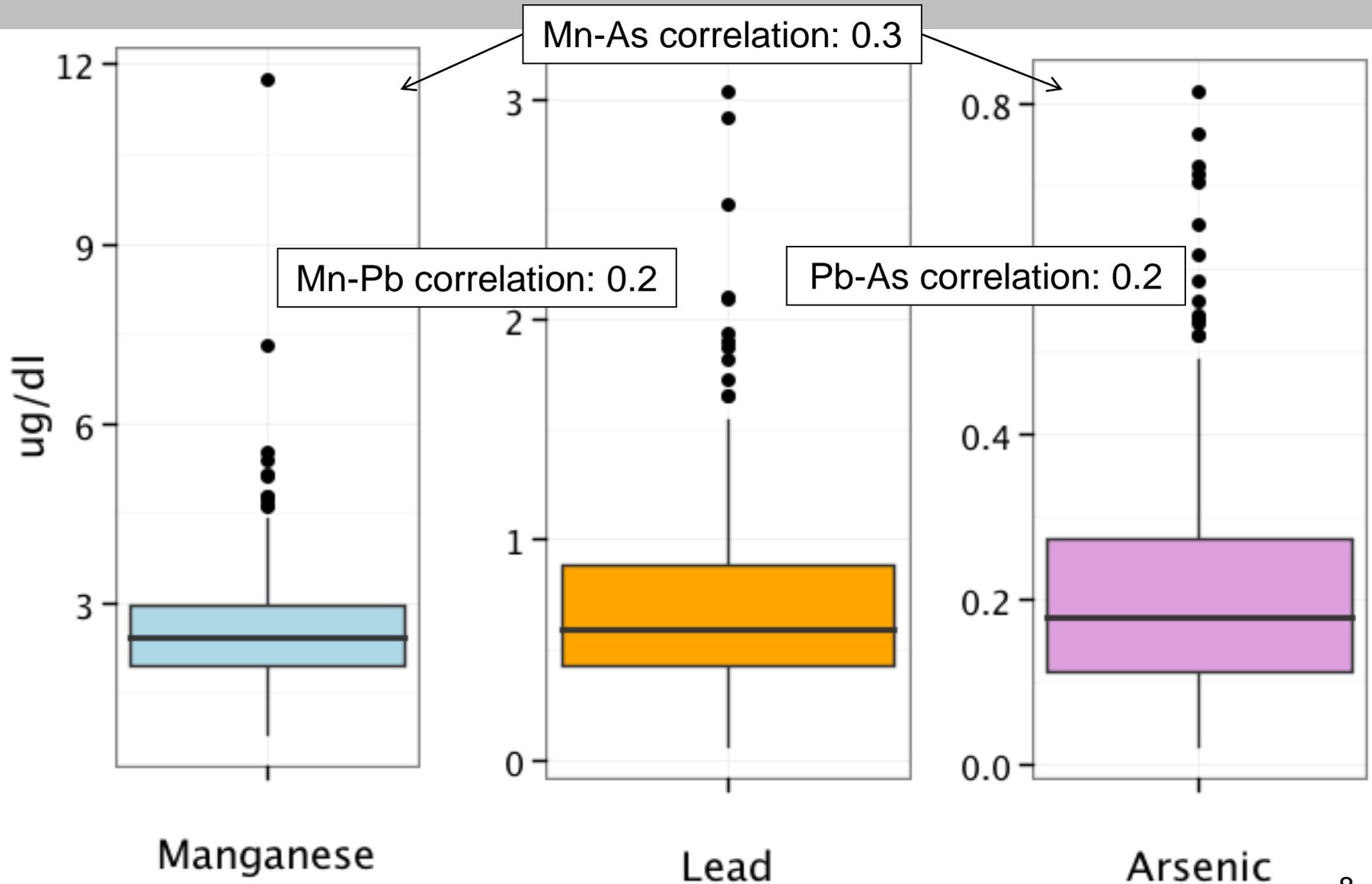
Main Effects of Metals (µg/dl) on Neurodevelopment

$$E(Y_i|Mn_i, Pb_i, As_i, \mathbf{C}_i) = \beta_0 + \beta_1 \mathbf{C}_i + \beta_2 Mn_i + \beta_3 Pb_i + \beta_4 As_i$$

	MDI		PDI	
	beta	(95% CI)	beta	(95% CI)
Manganese	**-3.05**	**(-5.44 to -0.67)**	-1.76	(-3.71 to 0.20)
Lead	-1.05	(-5.91 to 3.81)	0.51	(-3.47 to 4.49)
Arsenic	6.02	(-9.88 to 21.92)	-0.13	(-13.15 to 12.89)

> **Higher manganese associated with lower mental scores**

* C_i = s(mom IQ), child gender, mom education; Metals concentrations centered at arithmetic mean; 1 Mn outlier excluded

$$E(Y_i) = \beta_0 + \beta_1 C_i + \beta_2 Mn_i + \beta_3 Pb_i + \beta_4 As_i + \beta_5 Mn_i*Pb_i + \beta_6 Mn_i*As_i + \beta_7 Pb_i*As_i$$

	MDI		PDI	
	beta	(95% CI)	beta	(95% CI)
Manganese (Mn)	-3.39	(-5.83 to -0.95)	-1.75	(-3.75 to 0.26)
Lead (Pb)	-1.49	(-6.54 to 3.56)	-0.23	(-4.37 to 3.91)
Arsenic (As)	2.69	(-14.13 to 19.52)	-3.15	(-16.96 to 10.65)
Mn * Pb	-2.14	(-7.60 to 3.31)	0.77	(-3.71 to 5.25)
Mn * As	-10.86	(-31.86 to 10.14)	-4.59	(-21.83 to 12.64)
Pb * As	16.59	(-11.73 to 44.91)	16.04	(-7.20 to 39.28)

> ➢ **No strong evidence of 2-way interactions**

* C_i = s(mom IQ), child gender, mom education; Metals concentrations centered at arithmetic mean; 1 Mn outlier excluded

Some Challenges

- Local Political strife
- 100 year flood closed office for about 9 months
- More closures due to 2 ice storms.
- Tornado hit Picher
- Follow-up was extra challenging

Other Outcomes

- Cohort became part of Harvard Superfund grant (2010-2014) focus on Mixtures
- Participated in many local community conferences
- Learned EPA terminology
  - OU, ROD
- Clean up has progressed over the years

Thanks

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Mary Happy

Karen Fields

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Several papers on Tar Creek