

Chemical Exposures in California Environments

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Mentors:

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Overview of My STEER Experience

Art Marker Study; Funder: OEHHA;
(VOC levels measured in markers)

DDE - Body Temp
(CHAMACOS study)

+

VOC exposures in
child care
environments;
Funder: CARB

GIS Fumigant Exposure
estimation in Salinas, California
based on spatial location
(CHAMACOS study)

OPFR and FireMaster 550
Flame Retardants
(CHAMACOS study)



My main focus this summer

Organophosphate and FireMaster 550
Flame Retardants



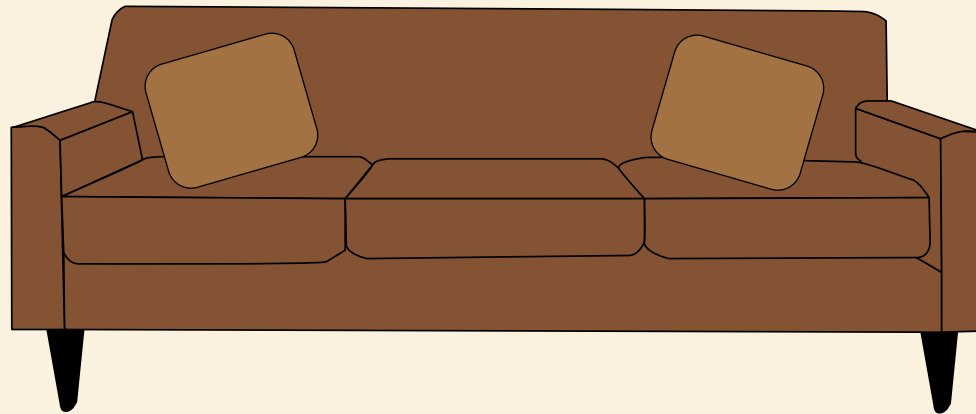
Dust and urinary metabolite concentration
data tables and graphs;
Literature reviews; Presentation slides



Background



Foam in upholstered furniture, carpet backing and other products contain flame retardant chemicals



Background

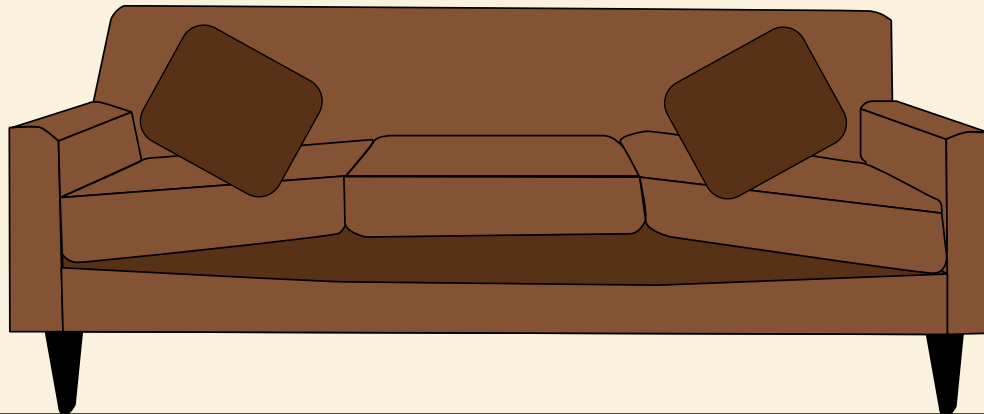


Unique to CA – easiest way to meet rule was to use chemicals.



TB 117

California indoor environments and residents have some of the highest PBDE levels in the world



Background

Pre- 2006

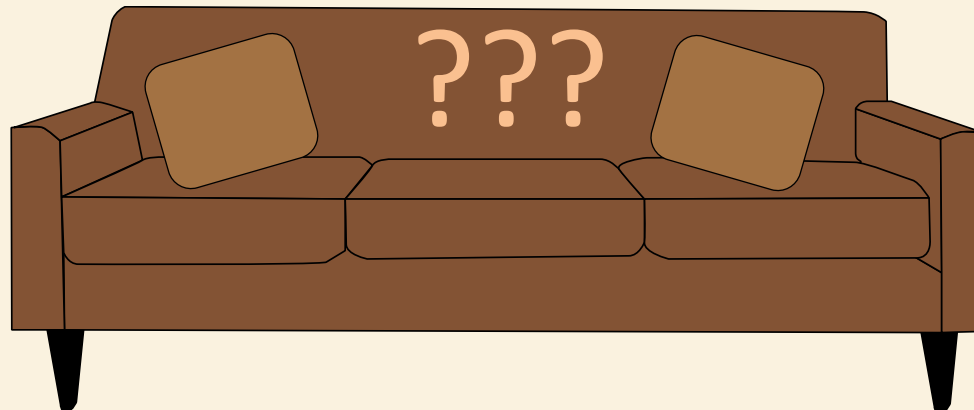


Post- 2006

Contained PBDEs

Trade Secret

OPFRs
and
FireMaster 550



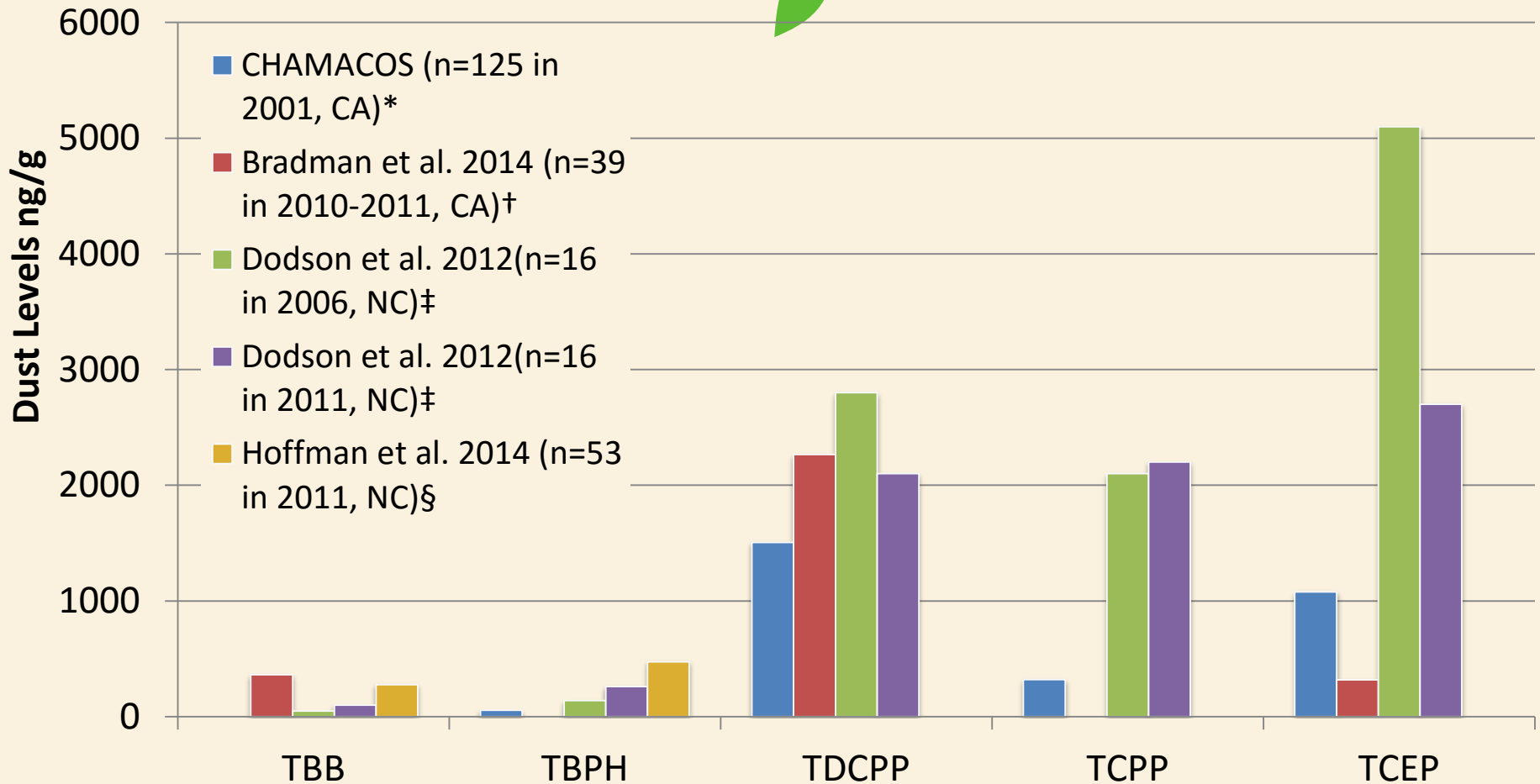
What Did I Accomplish?

Literature Review and Summary Tables

- Levels of FRs in house dust across time and in different locations
- Proportions of different FRs in FireMaster 550
 - Trade Secret!
- Relationship between dust and urinary metabolite levels of replacement FRs
- Changes in levels of urinary FR metabolites over time
- Evidence of associated health effects
 - A few toxicology studies



Median FR Levels in House Dust



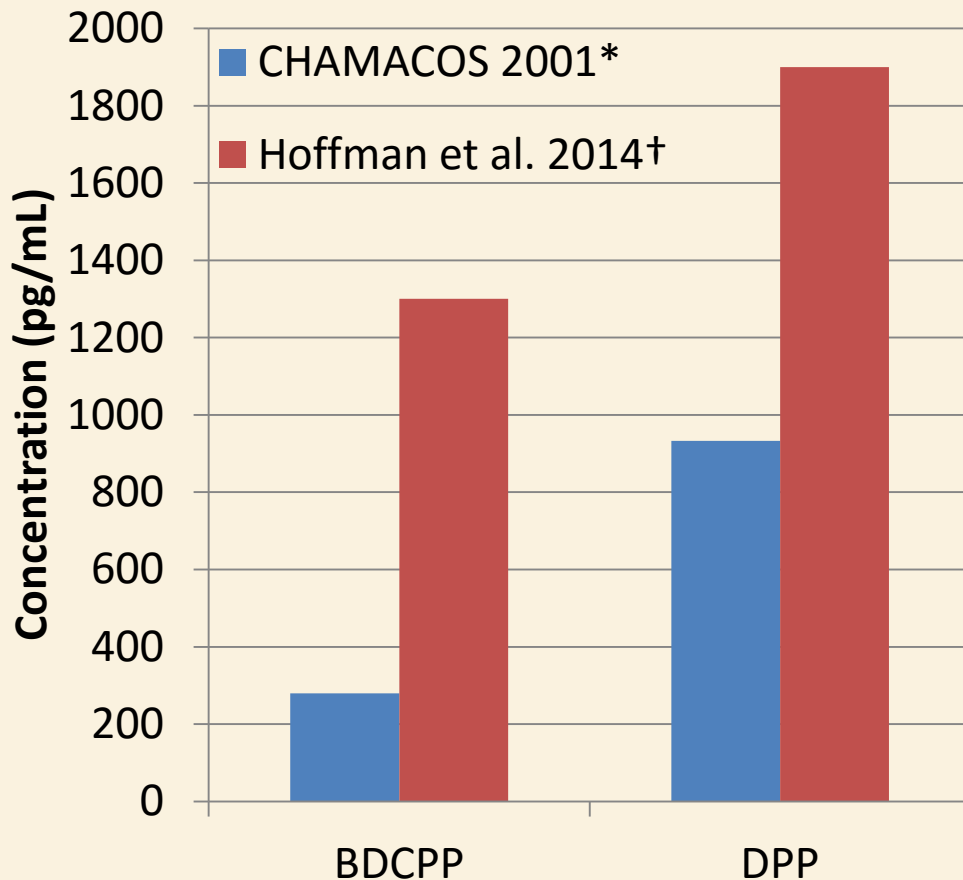
*Residences of pregnant women in California †Child care facilities in California ‡Homes in San Francisco Bay Area §Adult Residences in North Carolina

Correlation between Dust and Urinary Metabolite Levels



Study	Population	N	Flame Retardant	Urinary Metabolite	Dust/Hand Wipe	R _s (Spearman RHO)	P-value
Hoffman et al 2014	Women in North Carolina	39	TDCPP	BDCPP	Dust	0.10	0.06
Hoffman et al 2014		39	TPP	DPP	Hand Wipes	0.37	0.006
Meeker et al 2013	Men in Massachusetts	45	TDCPP	BDCPP	Dust	0.25	0.10
CHAMACOS	Pregnant women in Salinas	125	TDCPP	BDCPP	Dust	0.17	0.10

Urinary Metabolite Levels



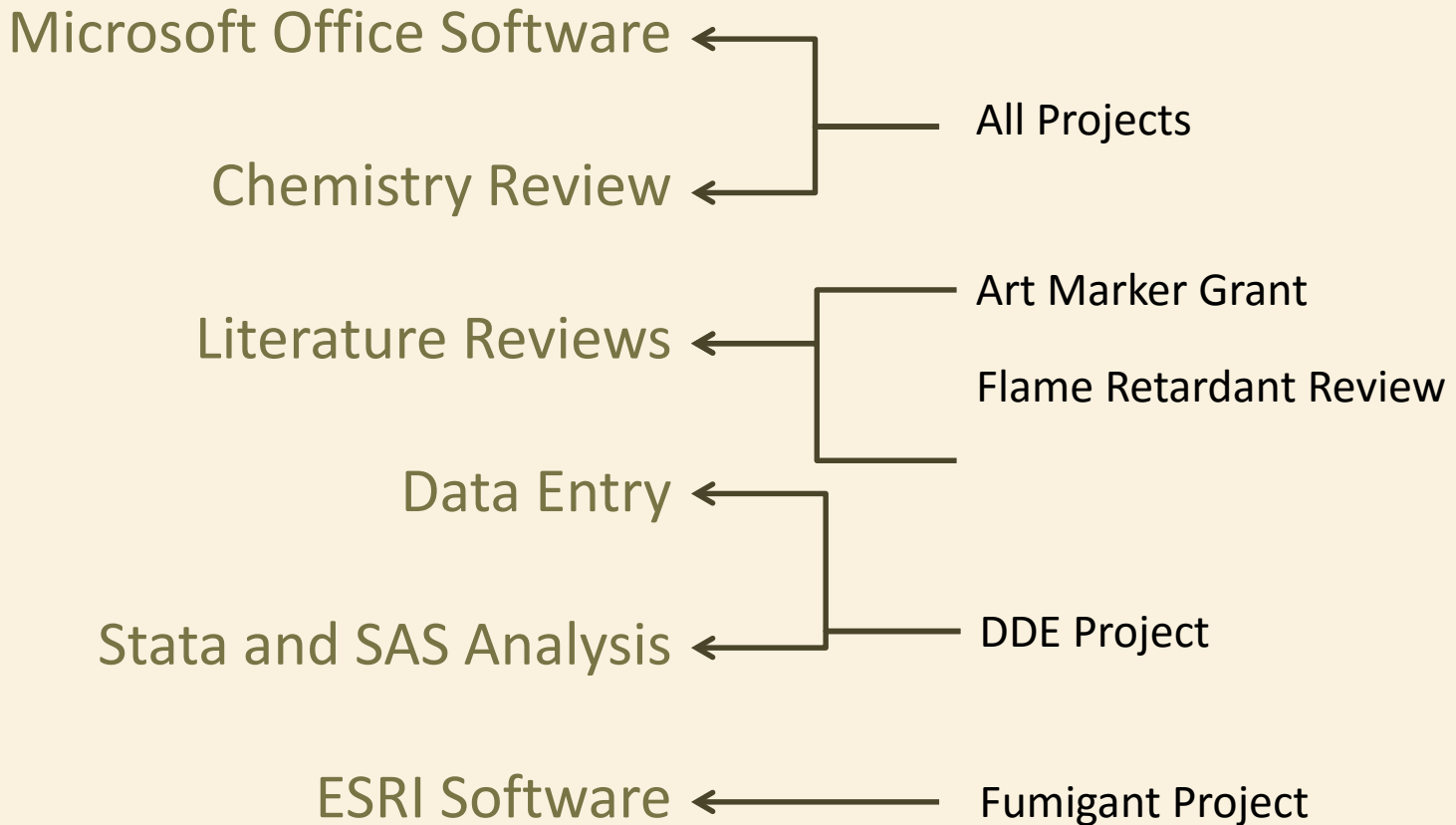
- Comparison of urinary metabolite levels measured in pregnant women
- Suggests higher levels of BDCPP and DPP after PBDE phase out

Evidence of Health Effects

- Aryl and chlorinated phosphate esters: early developmental stages may have heightened susceptibility to exposure in zebra fish (Noyes et al. 2015)
 - Developmental toxicity research in embryonic zebra fish
 - Aryl phosphate esters and chlorinated phosphate esters impaired motor functioning in zebra fish (OPFRs and FM550)
- TCEP: Loss of hippocampal pyramidal cells suggesting possible impaired spatial memory (Tilson et al., 1990 Tox & Applied Pharm)
 - Toxicity study on rats
 - Hippocampal damage related to seizures caused by TCEP
- TDCPP (Wang et al., 2015 ES&T):
 - Thyroid hormone homeostasis and neuronal development was studied in the progeny of adult zebra fish
 - Study shows TDCPP can be transferred to the offspring of exposed adults, causing thyroid endocrine disruption and developmental neurotoxicity.



What did I learn?



What is next for me?

- Continue to work on projects for CERCH in the fall
- Begin working on a senior thesis
- Explore creating a GIS centered student org. on campus



Acknowledgements

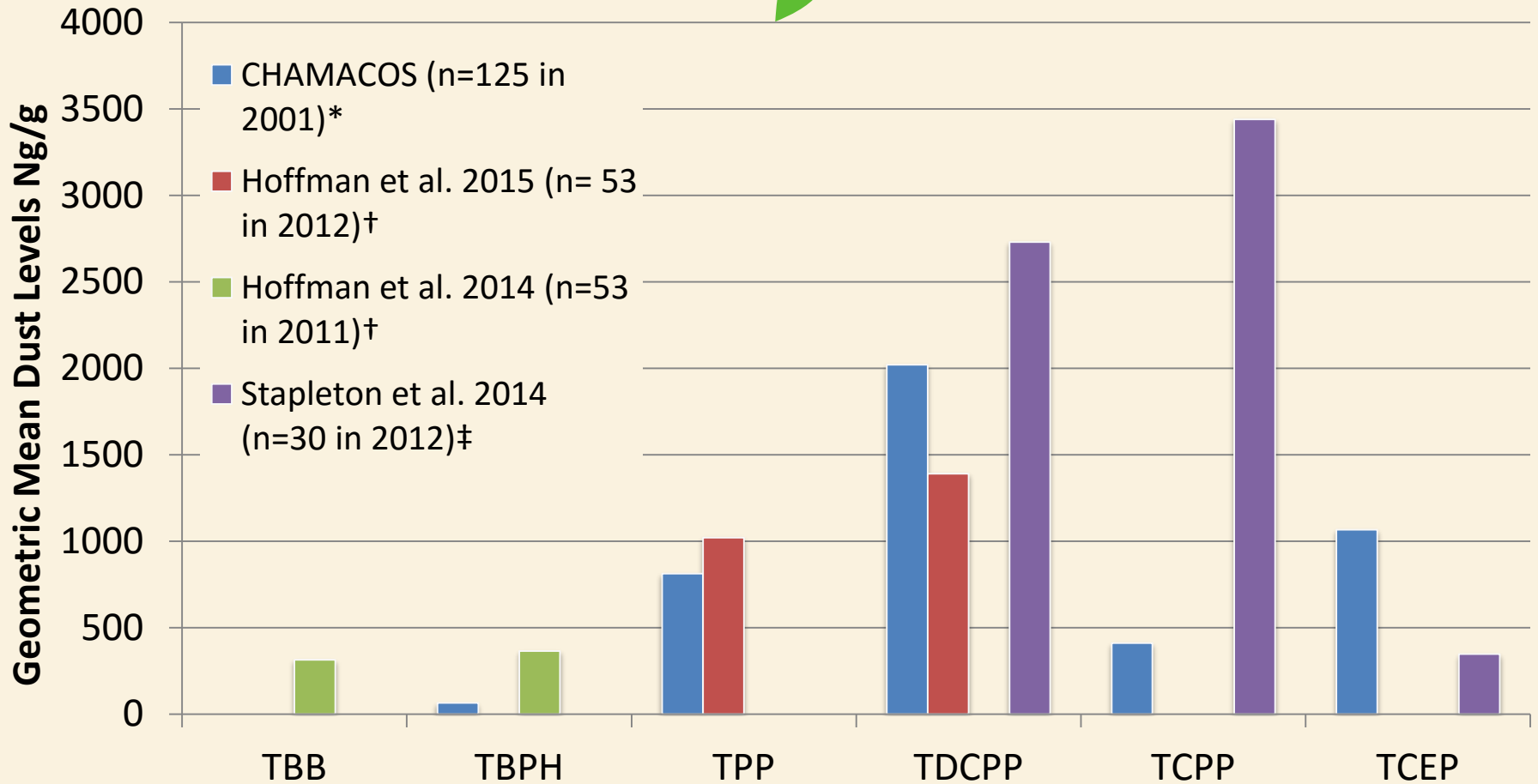
- Mentors: Asa Bradman, Rosemary Castorina, Robert Gunier
- Steer: Gayle Cepparo, Sadie Costello, Michael Bates, Shizuka Kuroiwa
- Fellow CERCH interns: Alex Shi, Abu Sikder, Diana Bahena, Marie Tysman, Rachel Tenerelli, Tina Hoang



Sources

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FR levels in House Dust



*Residences of pregnant women in California †Residences of adults in North Carolina

‡Toddler Cohort in North Carolina