

ENVIRONMENTAL POLLUTION AND SOCIAL FACTORS AS CONTRIBUTORS TO PRETERM BIRTH IN FRESNO COUNTY

An Application of the



Collaborative on Health and the Environment Webinar
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Outline

- CalEnviroScreen
 - Environmental Justice Tool
 - Cumulative Exposures
 - Social Factors
- Preterm Birth
 - Fresno County
 - California
- Next Steps
 - Racism and Inequities





CalEnviroScreen



About























The Office of Environmental Health Hazard Assessment, on behalf of the California Environmental Protection Agency, announces [CalEnviroScreen 3.0](#). CalEnviroScreen is a screening tool used to help identify communities disproportionately burdened by multiple sources of pollution and with population characteristics that make them more sensitive to pollution. To learn more about CalEnviroScreen, go to the [OEHHA website](#).

Community engagement in tool development

<http://oehha.ca.gov/calenviroscreen>



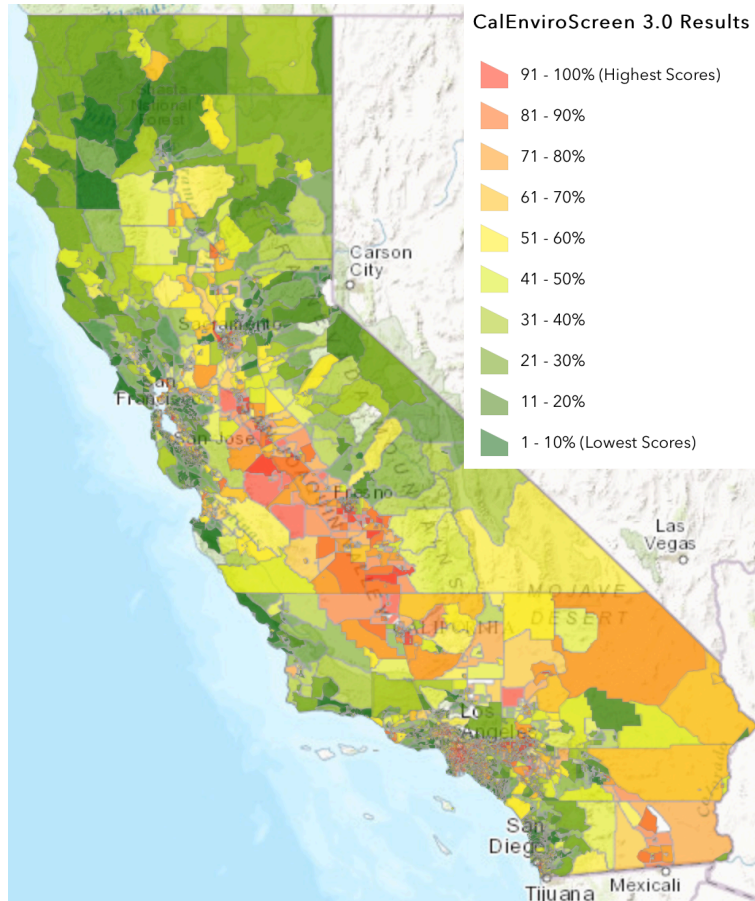


Pollution Burden		Population Characteristics	
Exposures	Environmental Effects	Sensitive Populations	Socioeconomic Factors
 Ozone  PM2.5  Traffic  Drinking Water Contaminants  Diesel Particulate Matter  Toxic Releases from Facilities  Pesticide Use	 Groundwater Threats  Solid Waste Sites and Facilities  Hazardous Waste Generators and Facilities  Cleanup Sites  Impaired Water Bodies	 Asthma  Cardiovascular Disease  Low Birth Weight Infants	 Educational Attainment  Housing Burdened Low Income Households  Poverty  Linguistic Isolation  Unemployment

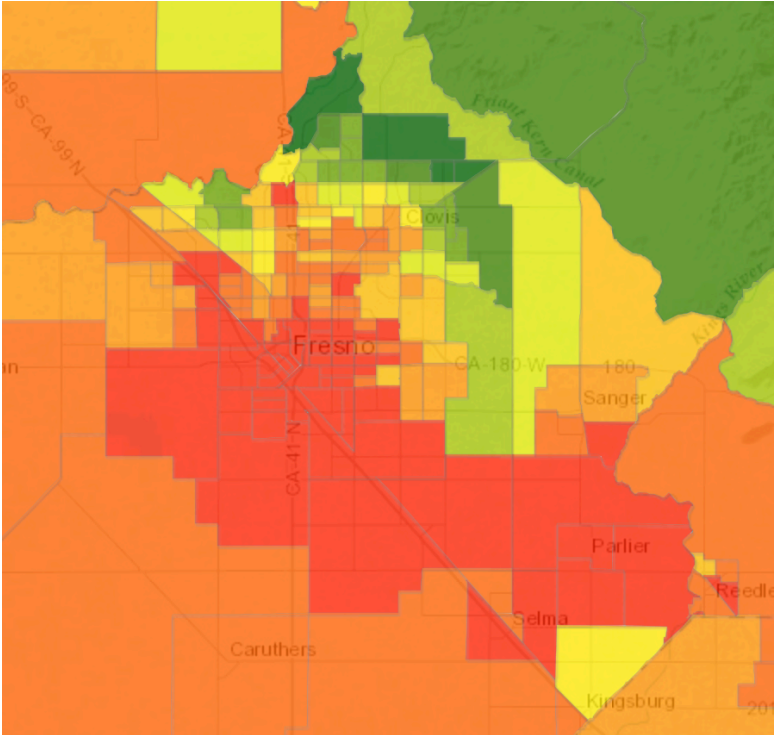




CalEnviroScreen



Fresno Area



CalEnviroScreen 3.0 Results

- 91 - 100% (Highest Scores)
- 81 - 90%
- 71 - 80%
- 61 - 70%
- 51 - 60%
- 41 - 50%
- 31 - 40%
- 21 - 30%
- 11 - 20%
- 1 - 10% (Lowest Scores)

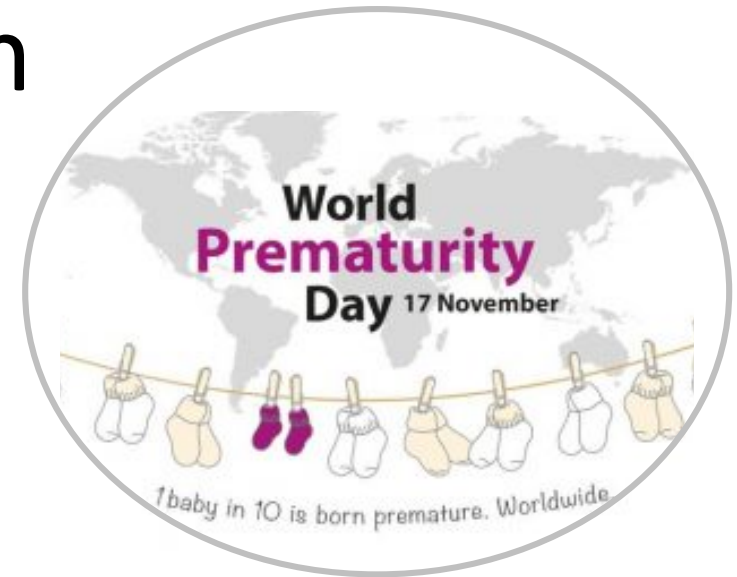
CalEnviroScreen 3.0 Results

High Pollution, Low Population



Preterm birth

- All singleton live births 2009-2012
 - N=53,843
 - Fresno county
- Preterm birth (<37 weeks)
 - 9.3%
- Early preterm birth (<34 weeks)
 - 2.1%



Pollution Burden

Padula et al. *Environmental Health* (2018) 17:70
<https://doi.org/10.1186/s12940-018-0414-x>

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Environmental pollution and social factors as contributors to preterm birth in Fresno County

Amy M. Padula^{1*}, Hongtai Huang^{1,2}, Rebecca J. Baer³, Laura M. August⁴, Marta M. Jankowska⁵, Laura L. Jellife-Pawłowski⁶, Marina Sirota² and Tracey J. Woodruff¹

Percentile	Odds Ratio	95% CI
0-19 th	Reference	----
20-39 th	1.38	0.79, 2.40
40-59 th	1.78	1.09, 2.88
60-79 th	1.98	1.23, 3.19
80-100 th	1.98	1.23, 3.19

Odds ratio adjusted for maternal education, payer status, race/ethnicity, maternal age



Drinking Water

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Indicators	Odds Ratio	95% CI
Drinking water score	1.67	1.15, 2.41
Trichloroethylene (TCE)	1.09	1.01, 1.17
Uranium	1.68	1.17, 2.43

Odds ratios adjusted for maternal education, payer status, race/ethnicity, maternal age
Comparing highest to lowest quintile of exposure



Double Jeopardy



Socioeconomic Factors

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Indicator >median	High SES	Low SES
Exposures Score	1.07 (0.98, 1.17)	1.16 (1.06, 1.25)
Drinking Water Score	1.00 (0.90, 1.12)	1.29 (1.09, 1.52)

Low SES defined as below the median in education and above the median for linguistic isolation, unemployment and poverty (from CalEnviroScreen/American Community Survey)

Relative risks adjusted for maternal education, payer status, race/ethnicity, maternal age



Early Preterm Birth <34 weeks

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Indicator >median	High SES <34 weeks	Low SES <34 weeks
Diesel Particulate Matter	1.28 (1.07, 1.52)	1.48 (1.26, 1.74)
Toxic Release	1.31 (1.10, 1.57)	1.42 (1.18, 1.70)
Traffic	1.17 (0.99, 1.39)	1.31 (1.12, 1.54)
Drinking Water	0.96 (0.77, 1.19)	1.40 (0.98, 1.98)
Pollution Exposures Score	1.08 (0.90, 1.28)	1.41 (1.19, 1.67)

Low SES defined as below the median in education and above the median for linguistic isolation, unemployment and poverty (CES socioeconomic factors)

Relative risks adjusted for maternal education, payer status, race/ethnicity, maternal age



Race/ethnicity

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Indicator >median	White NH N=10,620	Non-white NH N=10,921	Hispanic N=32,302
Exposures Score	1.08 (0.93, 1.24)	1.08 (0.94, 1.22)	1.10 (1.02, 1.19)
Diesel PM	1.10 (0.95, 1.27)	1.16 (1.02, 1.32)	1.03 (0.96, 1.12)
Toxic Release	1.20 (1.03, 1.40)	1.17 (1.03, 1.33)	1.09 (1.01, 1.17)
Nitrate	1.02 (0.89, 1.18)	1.12 (1.00, 1.27)	0.94 (0.87, 1.01)

Relative risks adjusted for maternal education, payer status, race/ethnicity, maternal age



California



Contents lists available at ScienceDirect

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journal homepage: www.elsevier.com/locate/envint



Investigation of association between environmental and socioeconomic factors and preterm birth in California

Hongtai Huang^{a,b,*}, Tracey J. Woodruff^b, Rebecca J. Baer^{c,d}, Komal Bangia^e, Laura M. August^e, Laura L. Jelliffe-Palowski^{d,f}, Amy M. Padula^{b,1}, Marina Sirota^{a,g,**,1}

Indicator	Odds Ratio	95% CI
Pollution Burden	1.03	(1.01, 1.04)
PM2.5	1.03	(1.02, 1.04)
Drinking Water Score	1.04	(1.03, 1.05)



Hypertensive Disorders in Pregnancy

- Birth records from vital statistics and hospital discharge records from 2007-2012
- Drinking water contaminants → gestational hypertension, preeclampsia and eclampsia
 - Cadmium
 - Lead
 - Trihalomethane
 - Hexavalent chromium



How to address environmental justice and environmental racism in studies?

- Pregnancy cohorts → Questions about discrimination
- Public data → Index of concentration of extremes
 - Racial/ethnic segregation and income inequality (Chambers *et al.* J Urban Health, 2019)
- Address multiple stressors
 - G-computation (Goin *et al.* Epidemiology, 2020)
- Ask policy relevant questions
 - Methods that estimate health effects associated with targeted changes at communities

- Chambers BD, Baer RJ, McLemore MR, Jelliffe-Pawlowski LL. Using Index of Concentration at the Extremes as Indicators of Structural Racism to Evaluate the Association with Preterm Birth and Infant Mortality-California, 2011-2012. J Urban Health. 2019 Apr;96(2):159-170. PMID: 29869317; PMCID: PMC6458187.
- Goin DE, Izano MA, Eick SM, Padula AM, DeMicco E, Woodruff TJ, Morello-Frosch R. Maternal experience of multiple hardships and fetal growth: Extending environmental mixtures methodology to social exposures. Epidemiology. 2020 Oct 5. PMID: 32921217





For more information
prhe.ucsf.edu

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UCSF Program on Reproductive Health
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