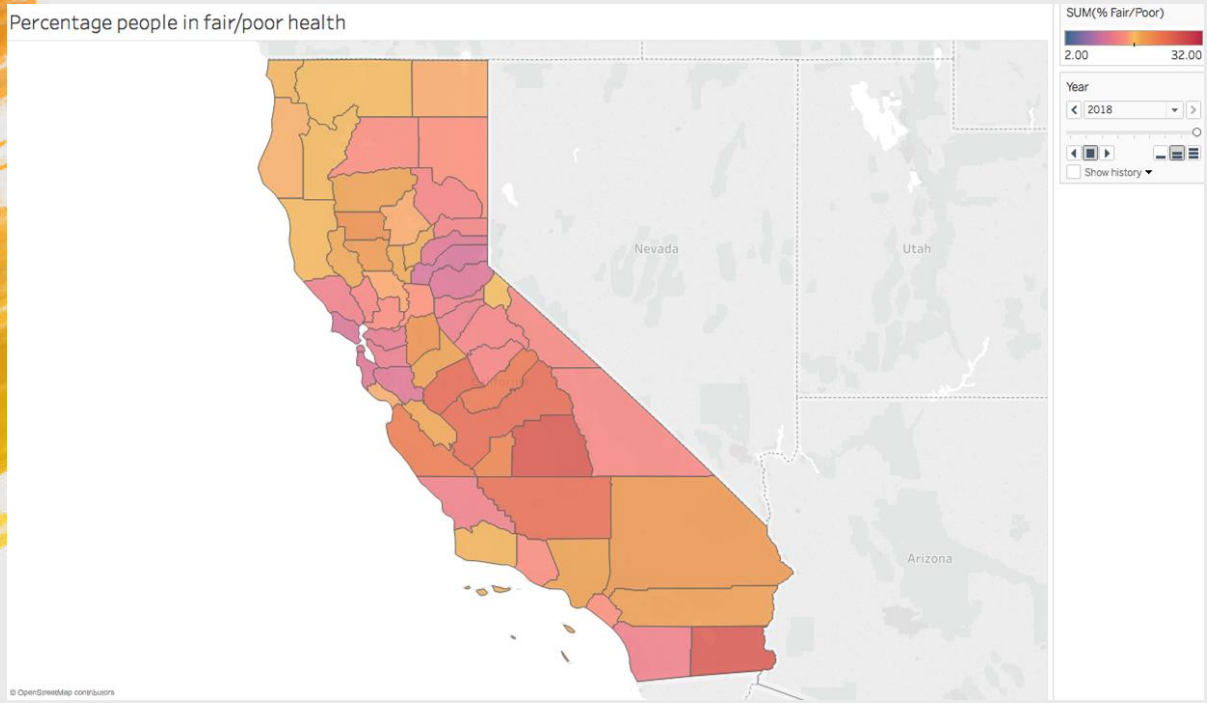
SAVE THE W  LD

Greg Faletto Javier Orraca Shruhi Desai Sam Park Faizan Haque

% PEOPLE IN POOR/FAIR HEALTH FROM 2010-2018



HEALTH IMPACTS (% PEOPLE IN FAIR OR POOR HEALTH)

CALIFORNIA COUNTY WISE

DEPENDING ON:

Population over 65

Rurality

Earnings

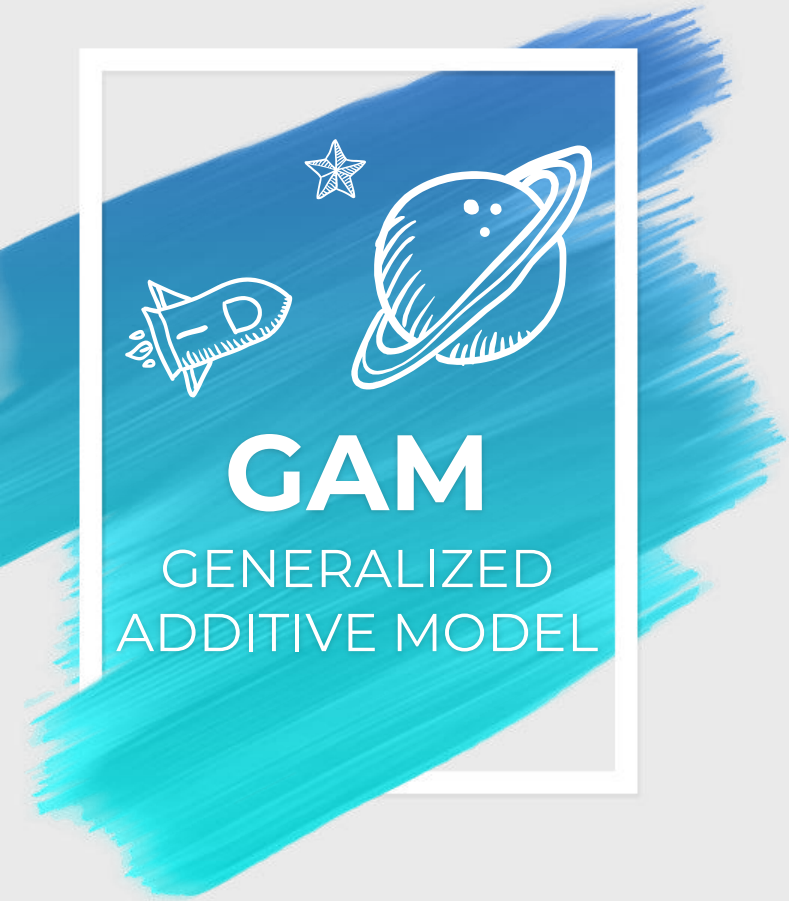
Pollutant levels (uG/L)

% White Population

```
> summary(linear.model.ints)

Call:
lm(formula = Y ~ Arsenic + Nitrates + Uranium + pct.agricultural +
    earnings + pct.white + pct.over.65 + rurality + Arsenic:Nitrates +
    Arsenic:Uranium + Nitrates:Uranium, data = data.ggplot)

Residuals:
    Min      1Q  Median      3Q     Max
-3.8446 -0.8863 -0.0041  1.0687  5.6897

Coefficients:
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)       3.313e+01  4.488e+00   7.381 7.54e-09 ***
Arsenic          -1.155e+00  9.422e-01  -1.226 0.227782
Nitrates         -1.457e+00  7.165e-01  -2.034 0.048943 *
Uranium          -1.451e-01  5.951e-01  -0.244 0.808714
pct.agricultural  1.297e+00  2.885e+00   0.450 0.655478
earnings         -3.191e-04  6.730e-05  -4.741 2.97e-05 ***
pct.white         3.403e+00  4.553e+00   0.748 0.459359
pct.over.65      -9.770e+01  2.275e+01  -4.295 0.000117 ***
rurality.L        5.748e-01  1.198e+00   0.480 0.634156
rurality.Q       -2.831e-01  7.739e-01  -0.366 0.716523
rurality.C        2.859e-01  6.495e-01   0.440 0.662302
Arsenic:Nitrates  8.617e-01  6.002e-01   1.436 0.159279
Arsenic:Uranium   4.493e-01  4.542e-01   0.989 0.328893
Nitrates:Uranium  5.714e-01  6.454e-01   0.885 0.381561
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 2.1 on 38 degrees of freedom
Multiple R-squared:  0.8089,    Adjusted R-squared:  0.7435
F-statistic: 12.37 on 13 and 38 DF,  p-value: 6.485e-10
```

Insights

```
> summary(linear.model.ints.2)

Call:
lm(formula = Y ~ Nitrates + Arsenic + Uranium + earnings + pct.over.65 +
    Arsenic:Uranium + Nitrates:Uranium + Arsenic:Nitrates, data = data.ggplot)

Residuals:
    Min      1Q  Median      3Q     Max
-4.1676 -0.9047 -0.2126  0.9287  5.9700

Coefficients:
                   Estimate Std. Error t value Pr(>|t|)
(Intercept)       3.663e+01  2.540e+00  14.420  < 2e-16 ***
Nitrates         -1.382e+00  6.798e-01  -2.033   0.0482 *
Arsenic          -8.556e-01  7.408e-01  -1.155   0.2545
Uranium          -7.705e-02  5.251e-01  -0.147   0.8840
earnings         -3.736e-04  4.152e-05  -8.997 1.93e-11 ***
pct.over.65      -8.771e+01  1.669e+01  -5.256 4.36e-06 ***
Arsenic:Uranium   4.187e-01  3.868e-01   1.083   0.2850
Nitrates:Uranium  4.408e-01  5.483e-01   0.804   0.4259
Nitrates:Arsenic  9.456e-01  5.385e-01   1.756   0.0862 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 2.02 on 43 degrees of freedom
Multiple R-squared:  0.7999,    Adjusted R-squared:  0.7627
F-statistic: 21.49 on 8 and 43 DF,  p-value: 1.078e-12
```

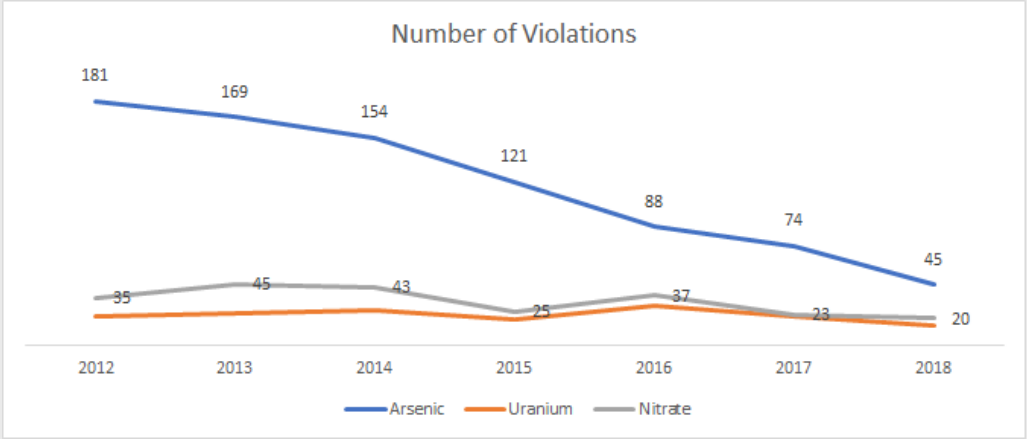


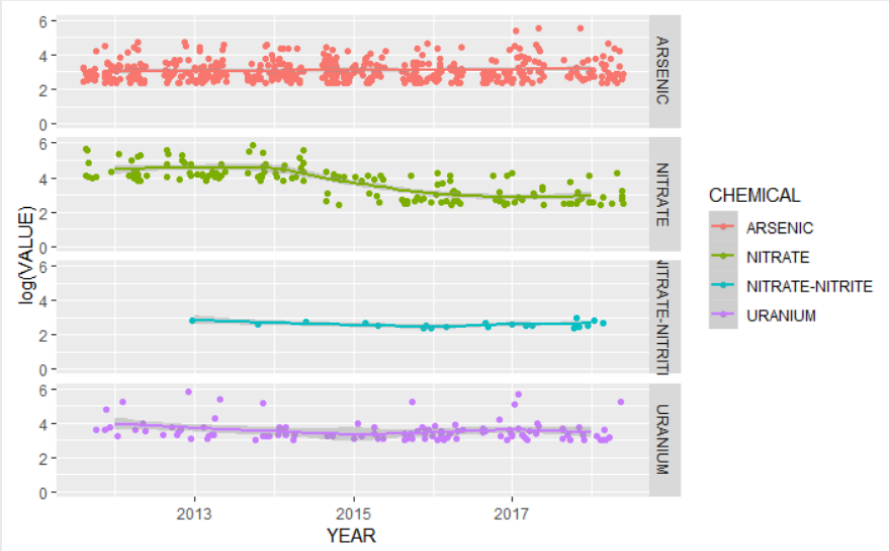

```
> summary(gam.model.2)

Call: gam(formula = Y ~ ., data = data.gam.2)
Deviance Residuals:
    Min      1Q  Median      3Q     Max
-4.7548 -1.1298 -0.2409  0.9448  5.3181

(Dispersion Parameter for gaussian family taken to be 4.6018)

    Null Deviance: 876.6923 on 51 degrees of freedom
Residual Deviance: 211.6848 on 46 degrees of freedom
AIC: 234.57

Number of Local Scoring Iterations: 2

Anova for Parametric Effects
            Df  Sum Sq Mean Sq F value    Pr(>F)
Arsenic      1 164.246 164.246 35.6913 3.165e-07 ***
Nitrates     1  92.201  92.201 20.0356 4.976e-05 ***
Uranium      1   8.820   8.820  1.9166    0.1729
earnings     1 273.645 273.645 59.4642 7.905e-10 ***
pct.over.65  1 126.096 126.096 27.4013 3.984e-06 ***
Residuals   46 211.685   4.602
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Insights

```
> summary(gam.model.ints)

Call: gam(formula = Y ~ Arsenic + Nitrates + Uranium + earnings + pct.over.65 +
    Arsenic:Uranium + Nitrates:Uranium + Nitrates:Arsenic, data = data.ggplot)
Deviance Residuals:
     Min       1Q   Median       3Q      Max
-1.00520 -0.21820 -0.05127  0.22399  1.43992

(Dispersion Parameter for gaussian family taken to be 0.2373)

    Null Deviance: 51 on 51 degrees of freedom
Residual Deviance: 10.2028 on 43 degrees of freedom
AIC: 82.8833

Number of Local Scoring Iterations: 2

Anova for Parametric Effects
                Df  Sum Sq Mean Sq F value    Pr(>F)
Arsenic          1  9.5547  9.5547 40.2687 1.148e-07 ***
Nitrates         1  5.3636  5.3636 22.6051 2.252e-05 ***
Uranium          1  0.5131  0.5131  2.1624   0.14871
earnings         1 15.9188 15.9188 67.0903 2.548e-10 ***
pct.over.65      1  7.3354  7.3354 30.9154 1.589e-06 ***
Arsenic:Uranium  1  0.2796  0.2796  1.1785   0.28371
Nitrates:Uranium 1  1.1004  1.1004  4.6376   0.03693 *
Arsenic:Nitrates 1  0.7316  0.7316  3.0832   0.08622 .
Residuals       43 10.2028  0.2373
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Number of Violations due to Pollutants in Water





Future

- Nitrate, Arsenic and other metal tend to affect infants
- Research for poisoning effects on gender required

THANKS!

Any questions?

APPENDIX

FOR MORE DETAILS OF OUR PRESENTATION & VISUALIZATIONS:

https://gregoryfaletto.com/2019/05/19/our-entry-in-the-ocrug-hackathon-2019/

https://public.tableau.com/profile/shruhi5343#!/vizhome/HealthconditionsinCalifornia2010-2018/Dashboard1

https://public.tableau.com/profile/javier.orraca#!/vizhome/CaliforniaPopulationExploration/HealthDashboard

REFERENCES:

[1] https://www.sciencedirect.com/science/article/pii/S0013935102943380

[2] Gender and age differences in mixed metal exposure and urinary excretion. https://www.ncbi.nlm.nih.gov/pubmed/21962832

[3] Nitrate/Nitrite Toxicity https://www.atsdr.cdc.gov/csem/nitrate_2013/docs/nitrite.pdf