Relationship between Common Health Factors & Lifestyle Choices and Drug Overdose Mortality Rates on a County Level

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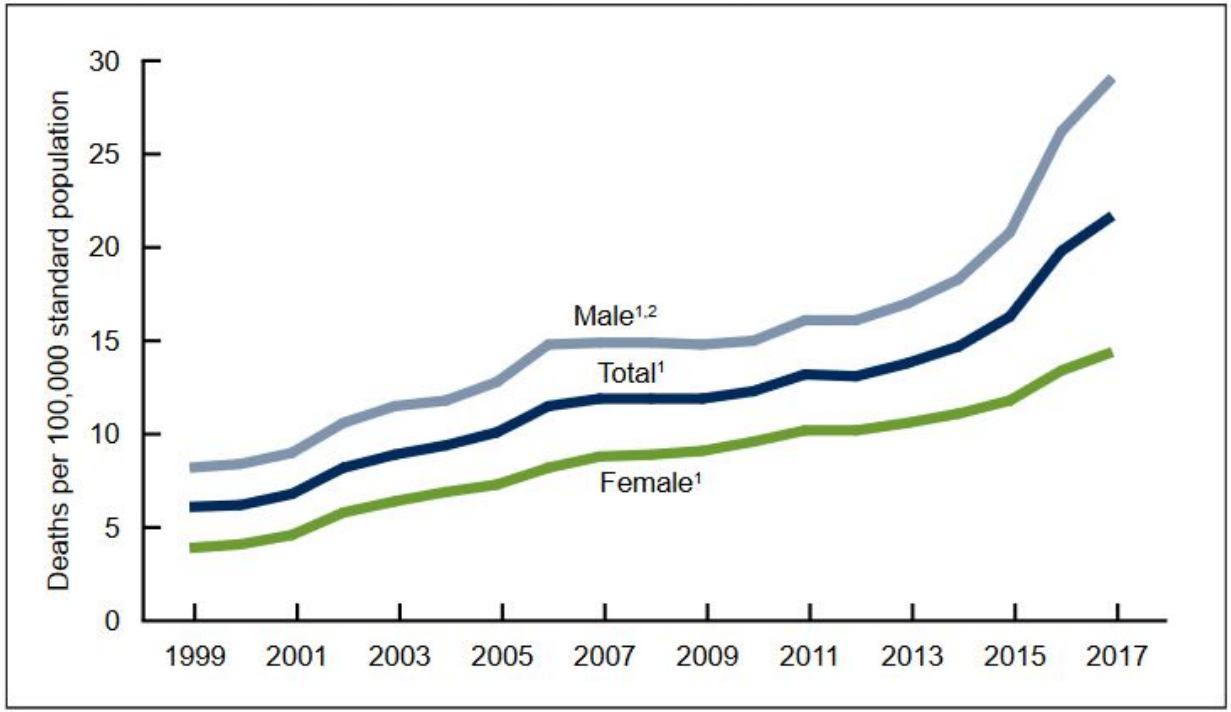
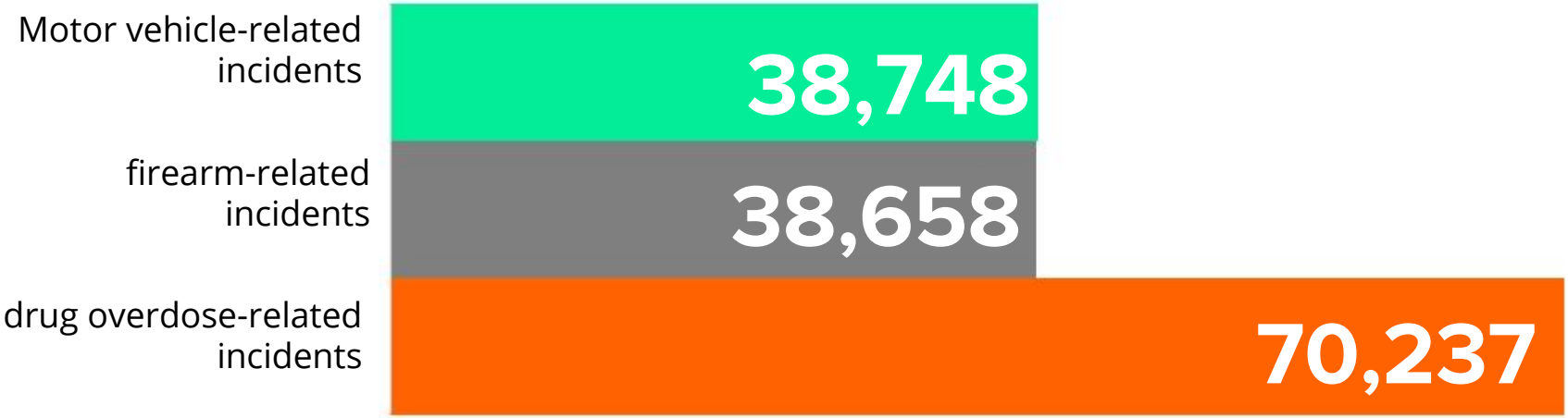
Introduction and Significance

Figure 1. Age-adjusted drug overdose death rates: United States, 1999–2017



70,237 deaths in 2017

Deaths due to



HHS RESPONSE TO THE OPIOID CRISIS

1. improving access to treatment and recovery services

2. promoting use of overdose-reversing drugs

3. strengthening our understanding of the epidemic through better public health surveillance

4. providing support for cutting-edge research on pain and addiction

5. advancing better practices for pain management

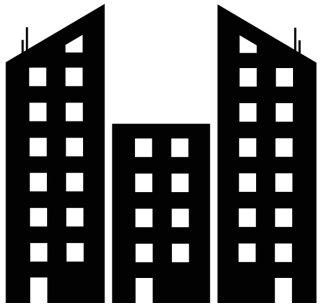
National Institute on Drug Abuse

For more information about finding treatment for yourself or a loved one, visit **drugabuse.gov/related-topics/treatment.**

Research Questions

Goal: Identify features **on a county level** that have a statistical significance in **modeling drug overdose mortality rates**.

Household Income



Rural vs Urban County

Percent Frequent Physical Distress

Where We Got Our Data

County Health Rankings & Roadmaps

Building a Culture of Health, County by County

Outcome: Drug Overdose Mortality Rate

			Frequent mental distress			Diabetes prevalence			HIV prevalence	
FIPS	State	County	% Frequent Mental Distress	95% CI - Low	95% CI - High	% Diabetic	95% CI - Low	95% CI - High	# HIV Cases	HIV Prevalence Rate
39000	Ohio		12	11	14	12			19441	201
39001	Ohio	Adams	14	14	14	11	9	15	9	38
39003	Ohio	Allen	12	12	13	13	11	15	177	202
39005	Ohio	Ashland	12	12	12	12	9	15	18	41
39007	Ohio	Ashtabula	13	13	13	13	10	17	57	68
39009	Ohio	Athens	15	14	15	11	9	14	39	68
39011	Ohio	Auglaize	11	11	11	11	9	14	15	39
39013	Ohio	Belmont	12	12	12	15	13	17	47	78
39015	Ohio	Brown	12	12	13	14	10	17	18	49
39017	Ohio	Butler	12	11	12	12	10	14	299	97
39019	Ohio	Carroll	12	12	12	13	10	17	11	46
39021	Ohio	Champaign	12	11	12	13	10	17	25	75

Data and Methods

- Select K-best:
  - Found top 20 features that are most significant and compared drug overdose mortality rates to those features to try to find correlation
- Logistic Regression
  - Binary outcome for top 25% of overdose mortality rate and bottom 25%
- 50th Percentile Calculations
  - Sorted all 20 features individually to find each features' median
  - Compared mean drug overdose mortality rate of lower and upper 50% of each feature

Chart of Logistic Regression Results

Logit Regression Results

Dep. Variable:	top_25	**No. Observations:**	828
Model:	Logit	**Df Residuals:**	802
Method:	MLE	**Df Model:**	25
Date:	Wed, 12 Dec 2018	**Pseudo R-squ.:**	0.4611
Time:	00:42:18	**Log-Likelihood:**	-309.30
converged:	True	**LL-Null:**	-573.93
		LLR p-value:	6.545e-96

	coef	std err	z	P>|z|	[0.025	0.975]
Intercept	-14.5474	3.563	-4.083	0.000	-21.531	-7.564
Age_Adjusted_Mortality	0.0135	0.005	2.490	0.013	0.003	0.024
Age_Adjusted_Mortality_Black	0.0015	0.002	0.966	0.334	-0.002	0.005
Child_Mortality_Rate	-0.0443	0.011	-4.018	0.000	-0.066	-0.023
Child_Mortality_Rate_Black	0.0262	0.006	4.077	0.000	0.014	0.039
Child_Mortality_Rate_White	0.0485	0.011	4.217	0.000	0.026	0.071
Infant_Mortality_Rate	0.2121	0.088	2.411	0.016	0.040	0.385
Percent_Frequent_Physical_Distress	-1.3801	0.501	-2.753	0.006	-2.363	-0.398
Percent_Uninsured_1	-0.1084	0.055	-1.985	0.047	-0.215	-0.001
Segregation_index	0.0321	0.008	3.919	0.000	0.016	0.048
Percent_Not_Proficient_in_English	-0.0082	0.078	-0.106	0.916	-0.161	0.144
Years_of_Potential_Life_Lost_Rate	0.0008	0.000	3.418	0.001	0.000	0.001
Years_of_Potential_Life_Lost_Rate_Black	-0.0002	7.39e-05	-2.632	0.008	-0.000	-4.97e-05
Physically_Unhealthy_Days	2.6282	1.377	1.909	0.056	-0.070	5.326
Mentally_Unhealthy_Days	4.5303	1.032	4.391	0.000	2.508	6.552
Percent_Smokers	0.0024	0.062	0.038	0.970	-0.119	0.124
Teen_Birth_Rate_White	-0.0850	0.016	-5.289	0.000	-0.117	-0.054
Percent_Some_College	-0.0558	0.021	-2.624	0.009	-0.097	-0.014
Percentile_Income_20th	-6.938e-05	5.89e-05	-1.178	0.239	-0.000	4.61e-05
Percent_Unemployed	0.0449	0.099	0.453	0.651	-0.149	0.239
Household_Income	8.332e-05	2.91e-05	2.861	0.004	2.62e-05	0.000
Graduation_Rate	0.0094	0.016	0.576	0.565	-0.023	0.041
Percent_Rural	-0.0306	0.007	-4.320	0.000	-0.045	-0.017
HIV_Prevalence_Rate	-0.0014	0.001	-2.204	0.028	-0.003	-0.000
Percent_Frequent_Mental_Distress	-0.8984	0.440	-2.042	0.041	-1.761	-0.036
Percent_Excessive_Drinking	0.0408	0.050	0.823	0.411	-0.056	0.138

significant but negative!

significant but slight change

Physical Distress: **decreases likelihood** by a factor of 4

Household income: odds approximately 1

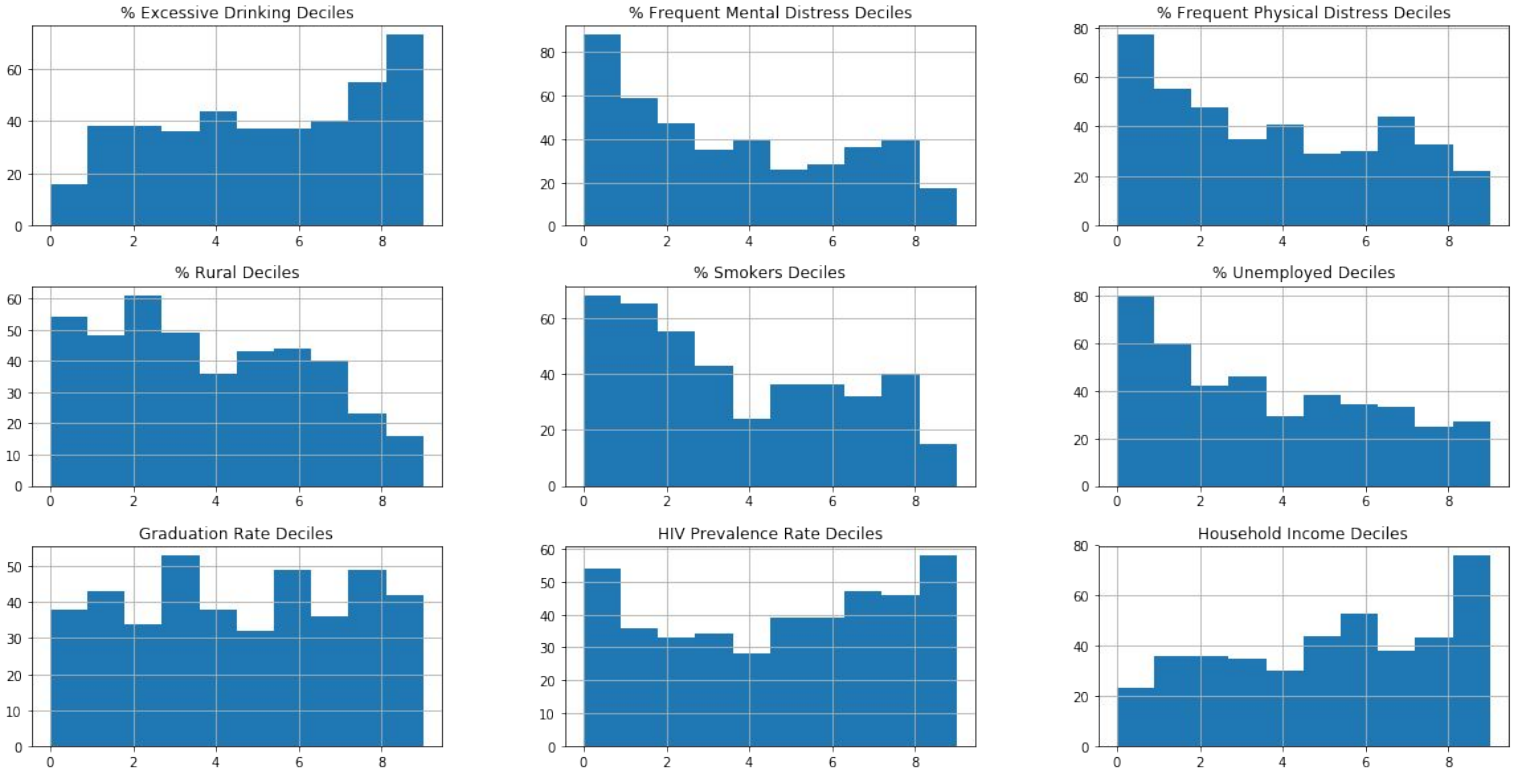
Percent Rural: odds **slightly less than** 1

Chart of 50th Percentile Results

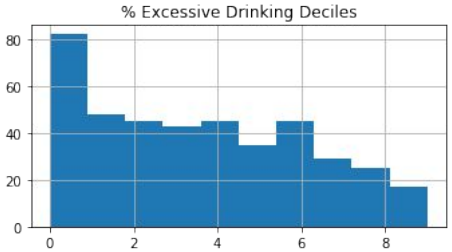
	State	Age Adjusted Mortality	Age Adjusted Mortality Black	Child Mortality Rate	Child Mortality Rate Black
Lower 50%	19.24	16.44	17.15	17.69	17.68
Upper 50%	20.52	23.32	22.61	22.07	22.08
	Child Mortality Rate White	Infant Mortality Rate	Percent Frequent Physical Distress	Percent Uninsured 1	Segregation Index
Lower 50%	17.74	17.33	17.69	20.13	19.12
Upper 50%	22.02	22.43	22.07	19.63	20.64
	Percent Not Proficient in English	State Ranked	Years of Potential Life Lost Rate	Years of Potential Life Lost Rate Black	Physically Unhealthy Days
Lower 50%	21.89	19.24	16.35	17.39	17.55
Upper 50%	17.87	20.52	23.41	22.37	22.21
	Mentally Unhealthy Days	Percent Smokers	Teen Birth Rate White	20th Percentile Income	
Lower 50%	16.89	17.46	17.73	22.03	
Upper 50%	22.87	22.29	22.02	17.73	

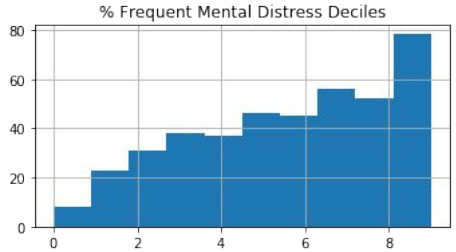
- Most features have a rate 4-7/100,000 lower for lower 50% than upper 50%
- Surprising: almost no difference between lower 50% and upper 50% of percent uninsured

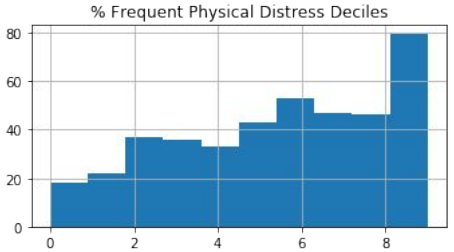
Bottom Quartile of Drug OD Mortality Rate

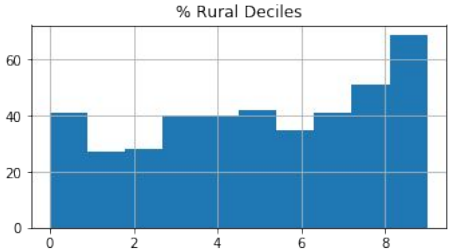


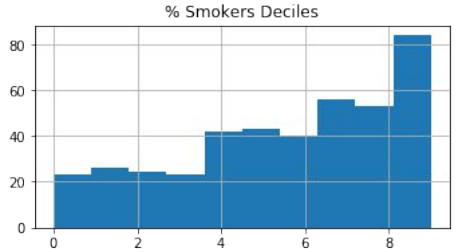
Top Quartile of Drug OD Mortality Rate

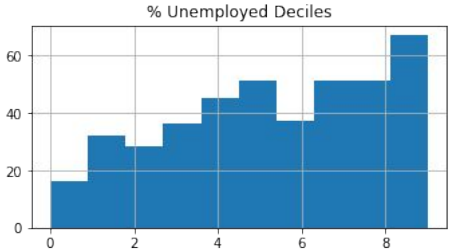


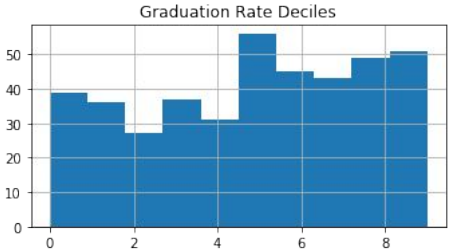


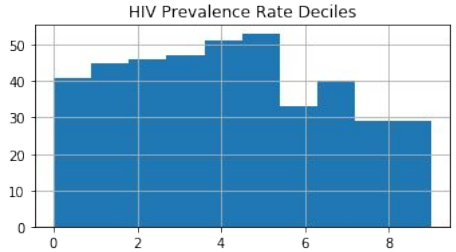


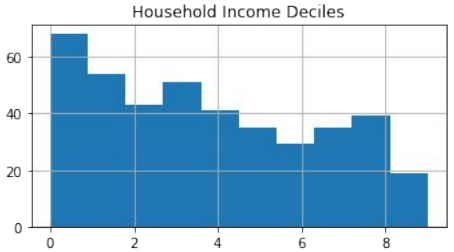








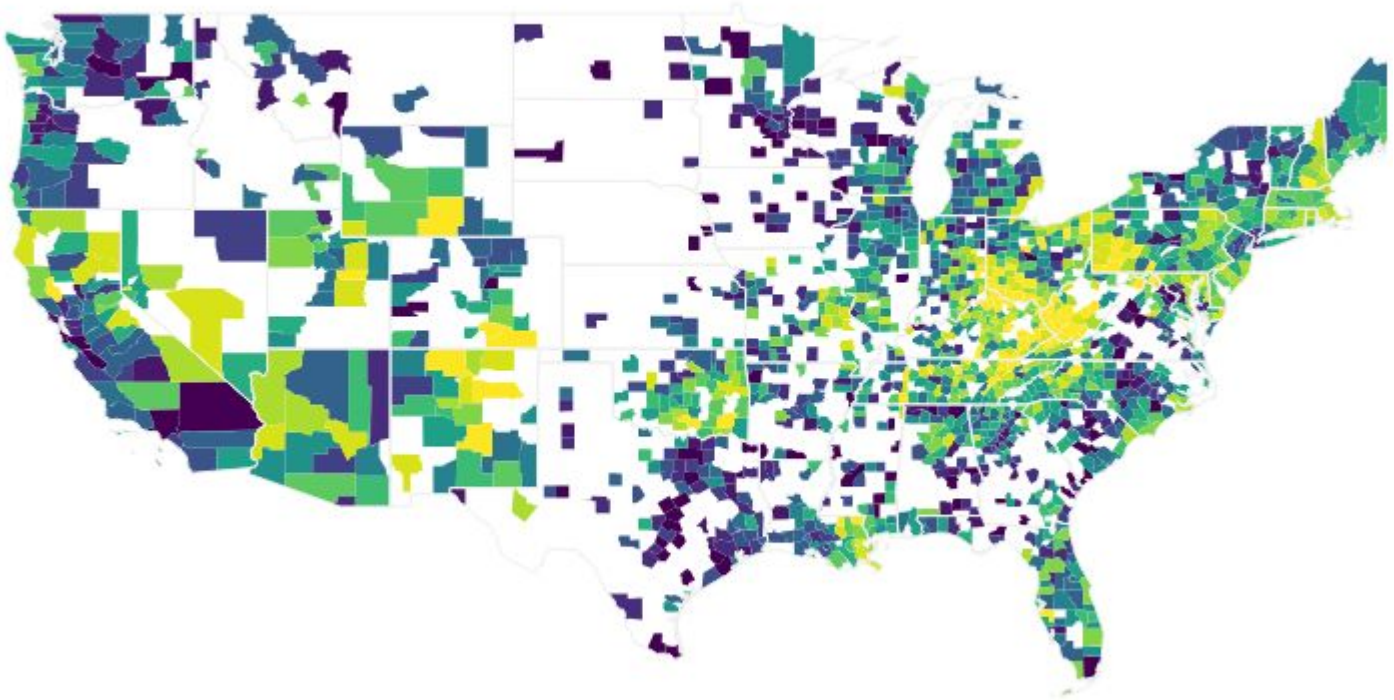




Results and Conclusions

- Originally, we had thought certain features would be relevant
  - ['% Unemployed', 'Household Income', 'Graduation Rate', '% Rural', 'HIV Prevalence Rate', '% Frequent Mental Distress', '% Excessive Drinking', '% Frequent Physical Distress', '% Smokers']
- However, we found many of those to be statistically insignificant in our models
  - Instead, other features which we had not considered were significant, such as ‘% Not Proficient in English’
- OLS Regression Model Results
  - Our subjectively chosen features: R-squared = 0.169
  - 20 k-Best features chosen by f_regression metric: R-squared = 0.574

Drug Overdose Mortality Rate



Drug Overdose Mortality Rate Modeled