

Climate Solutions

An analysis of US efforts to prevent a climate crisis



Our Climate Progress Questions: Our Data Sources:

- 1) Is the US successfully transitioning to clean energy?
- 2) Have electric car sales made an impact on air quality in the US?
- 3) Does increased educational attainment lead to stabilization of population in the US?
- 4) Have COVID-19 lockdowns affected air quality in the US?

- Energy
 - U.S. Energy Information Administration
- Covid
 - Google COVID mobility data
- Electric vehicles and air quality
 - US Department of Energy
 - Alternative Fuels Data Center
 - Energy Efficiency and Renewable Energy
 - EPA
- Population and education
 - U.S. Department of Agriculture
 - Economic Research Service
 - U.S. Census

Exploratory Data Analysis And Cleanup Process

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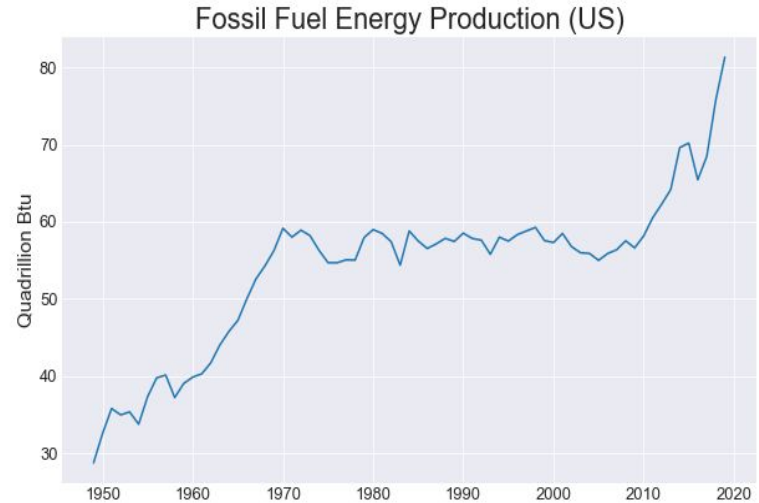
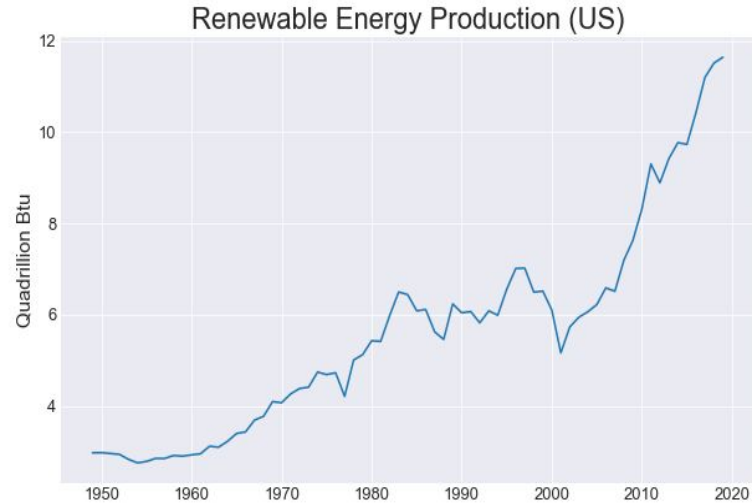
A lesson on complicated data sources and the disparity in record keeping among governmental organizations.

Is America Successfully Transitioning To Clean Energy?

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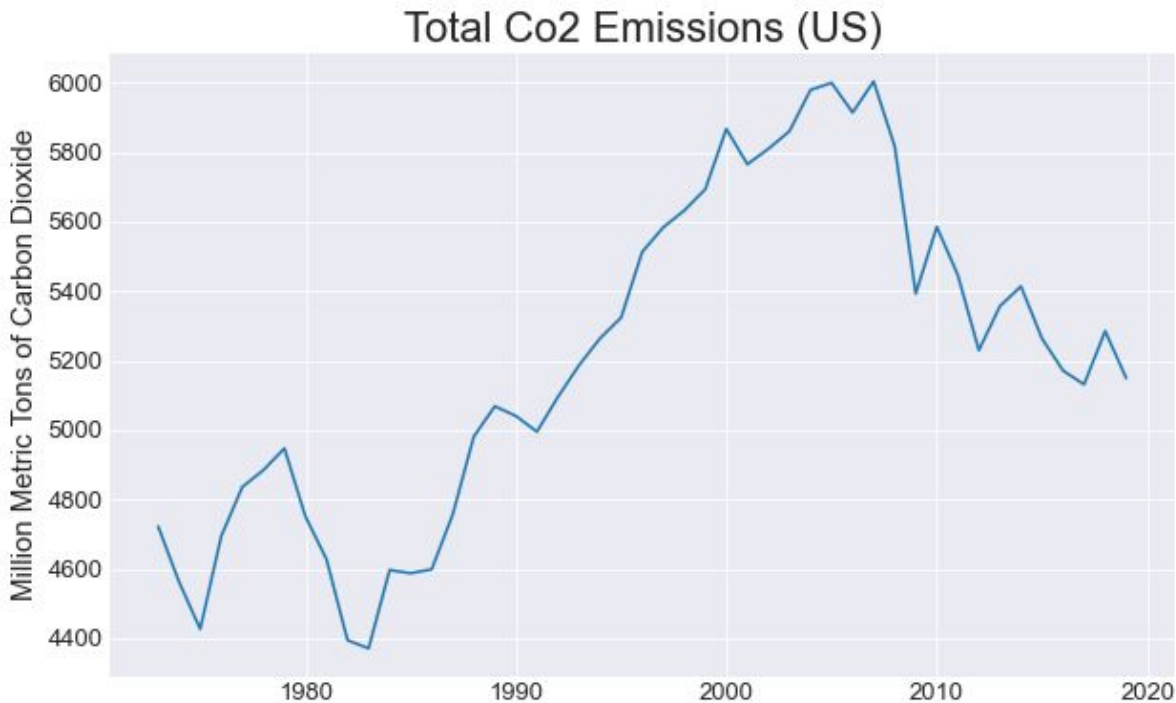
An analysis of energy production and Co2 emissions in the
United States.

Energy Production



- Renewable energy production has more than doubled since 2001.
 - Adding around 6.5 Quadrillion Btu.
- However, fossil fuel production has outpaced that growth.
 - Growing by over 20 Quadrillion Btu since 2010

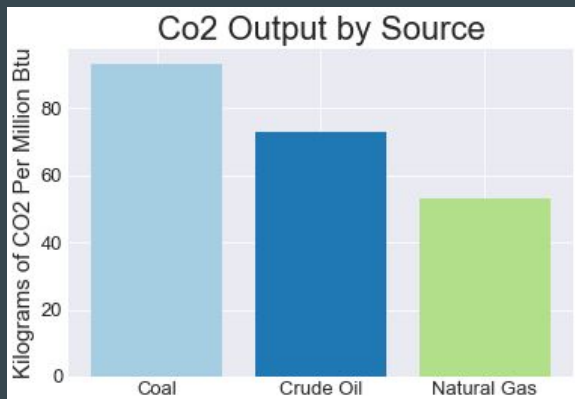
Some Good News



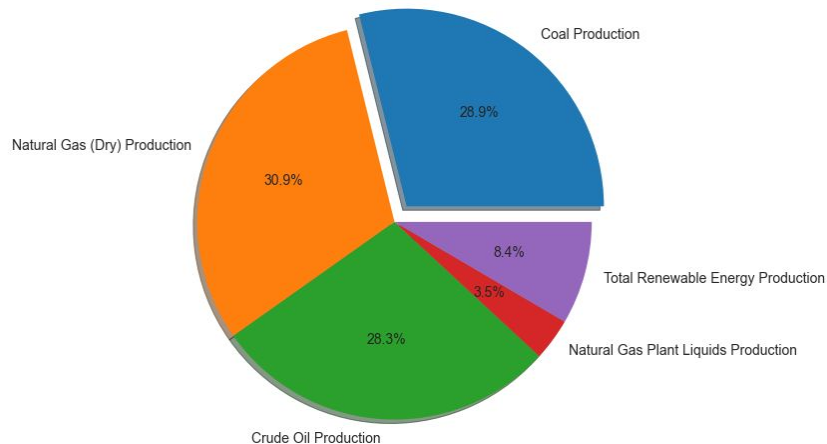
- Overall Co2 emissions have been dropping since around 2005

Analysis

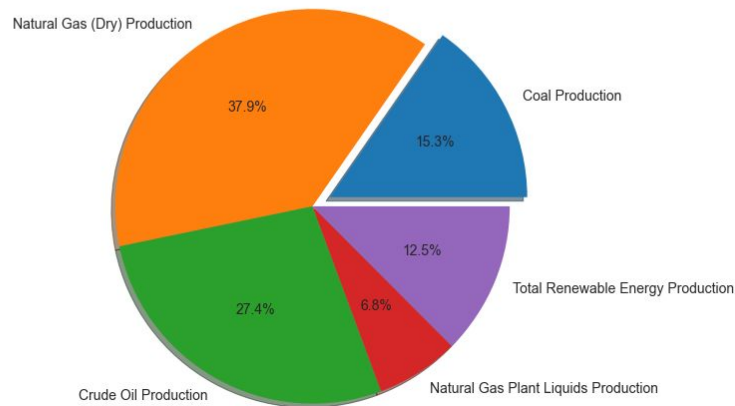
- The US remains a power hungry nation.
- Fossil fuel still accounts for the lion's share of our energy production.
 - However, we are transitioning away from coal to cleaner fossil alternatives
- Renewable energy has grown quickly over the last decade but needs to accelerate if it is to outpace fossil fuel growth.



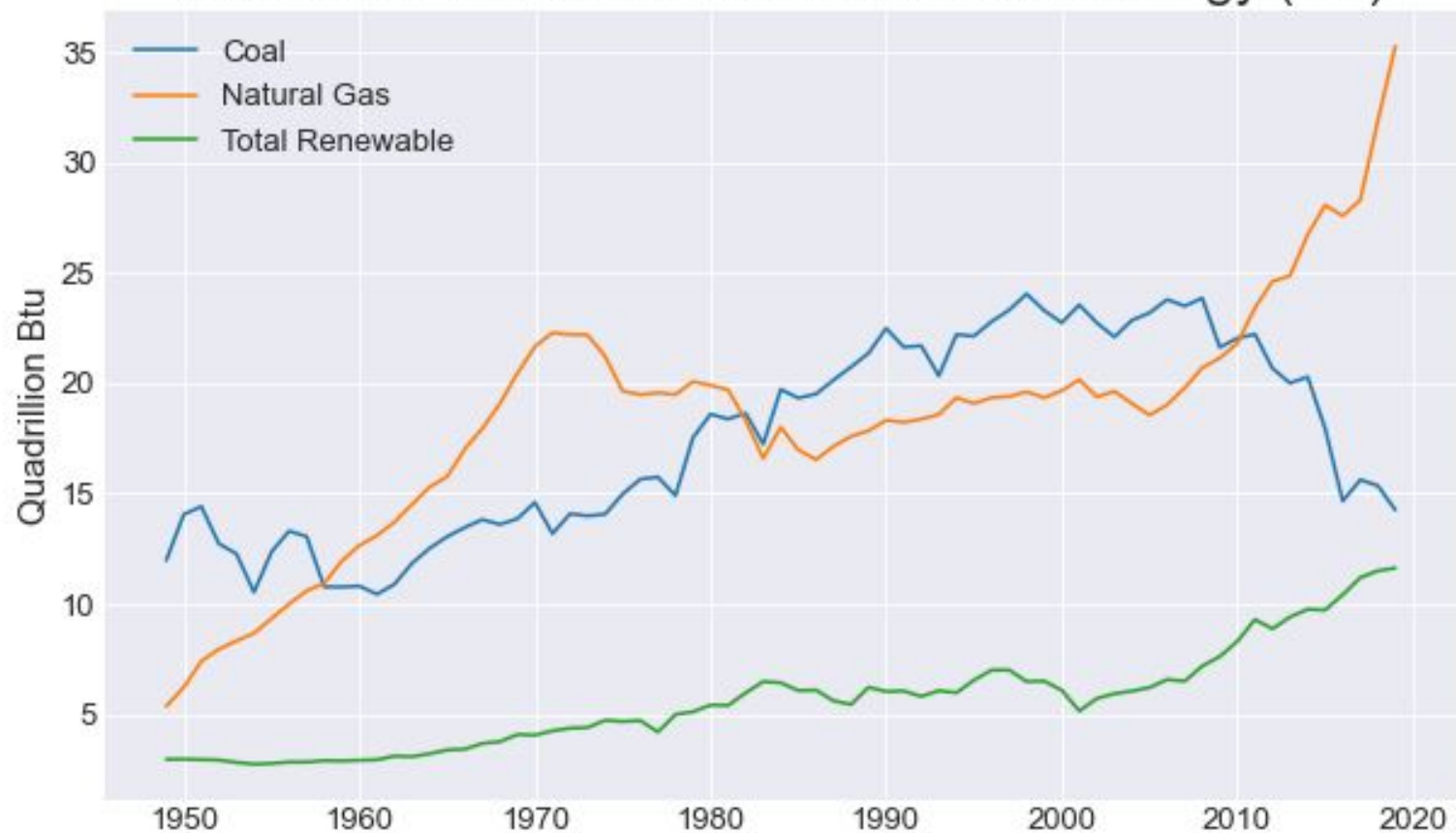
Total US Energy Production by Source (1970)



Total US Energy Production by Source (2019)



Dominant Fossils Fuels vs Renewable Energy (US)



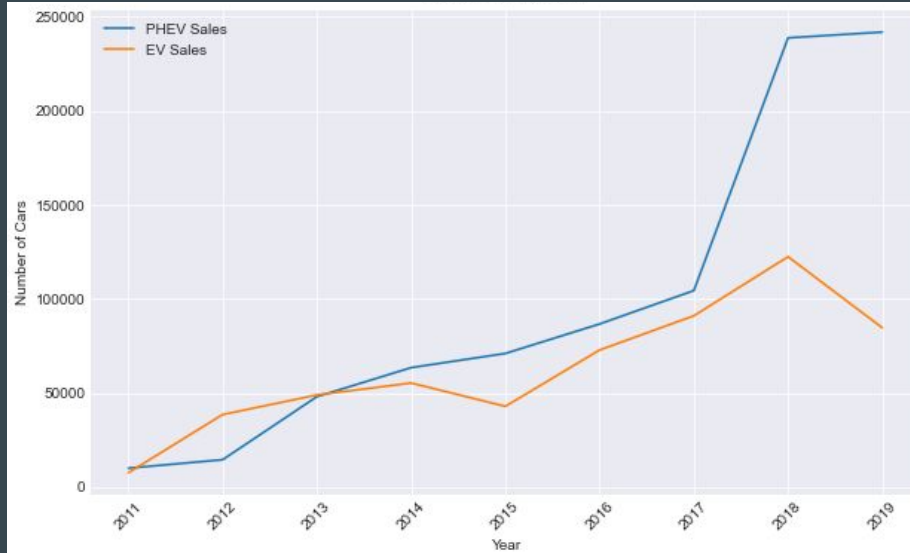
Has Electric Car Sales Made an Impact on Air Quality in the United States?

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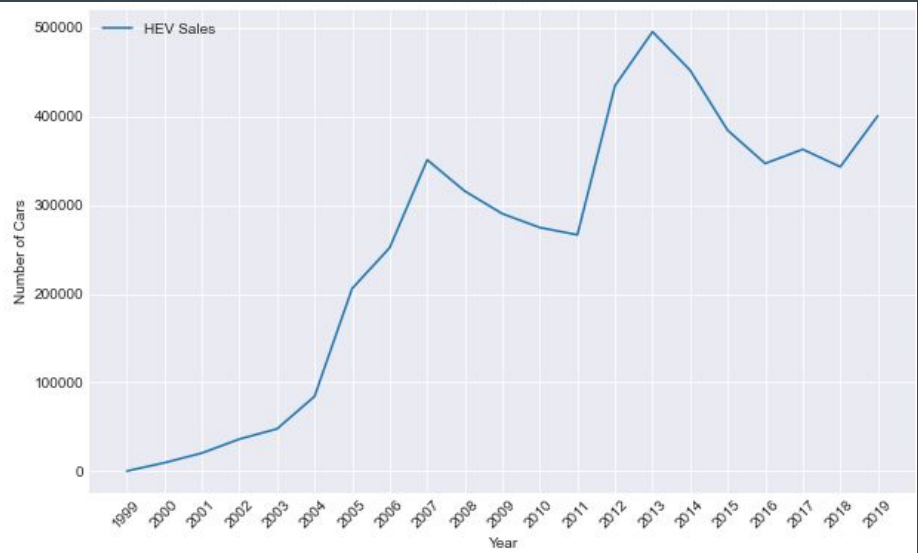
An analysis of PHEV, EV and HEV Sales and Air Quality in the
United States.

PHEV, HEV and EV Car Sale Data (U.S.)

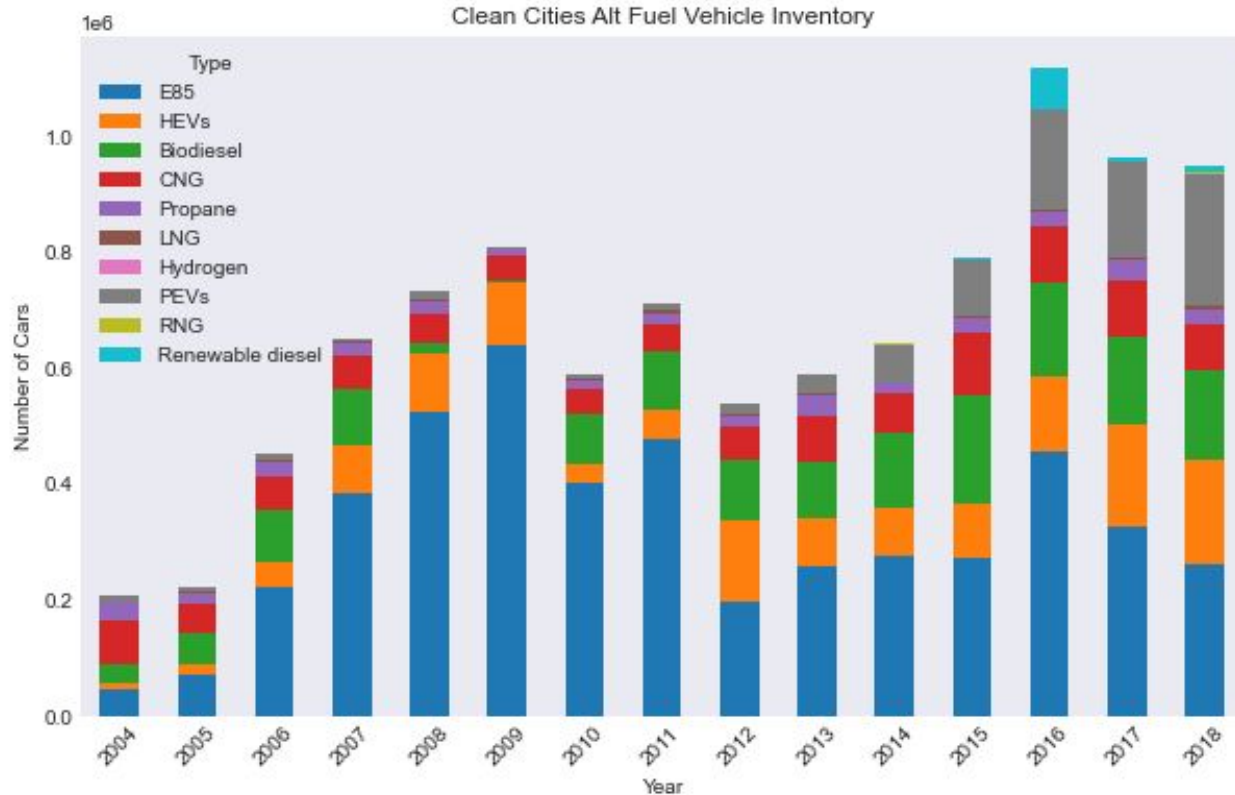
PHEV and EV Sales



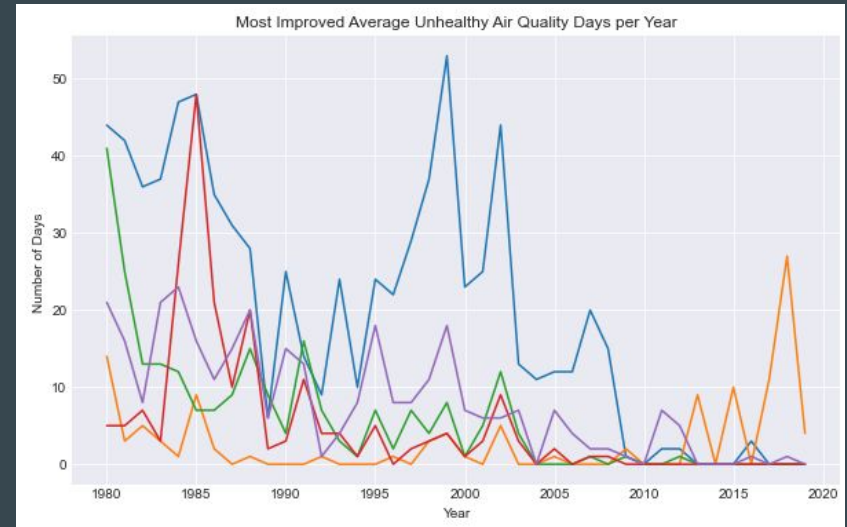
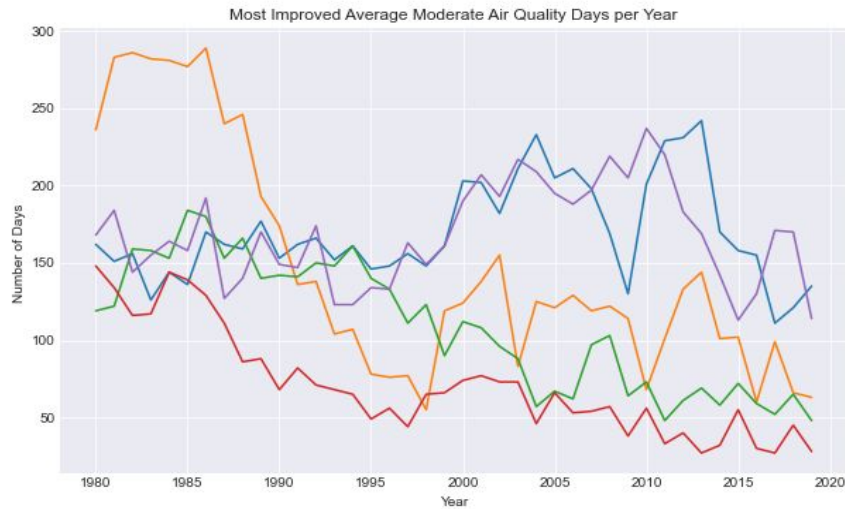
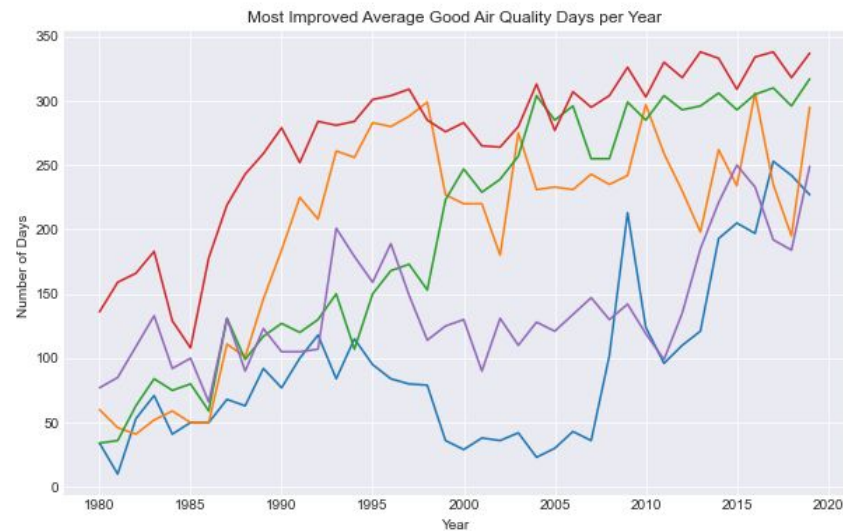
HEV Sales



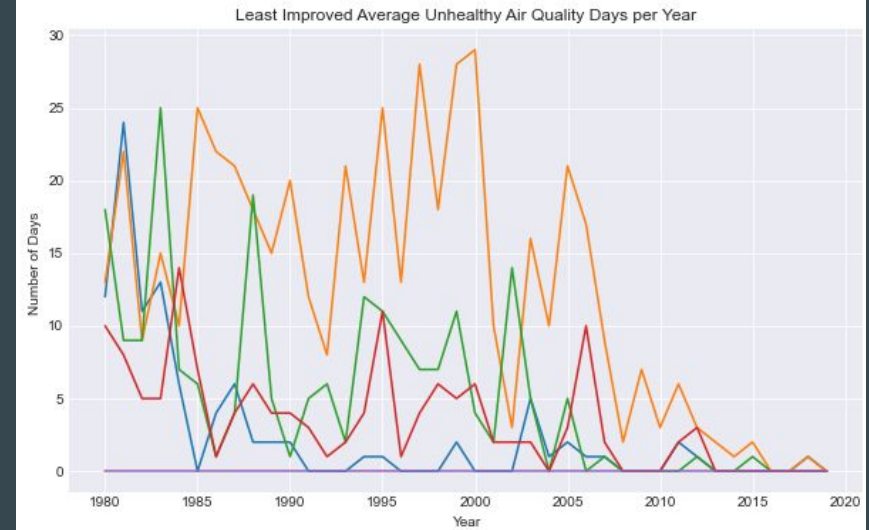
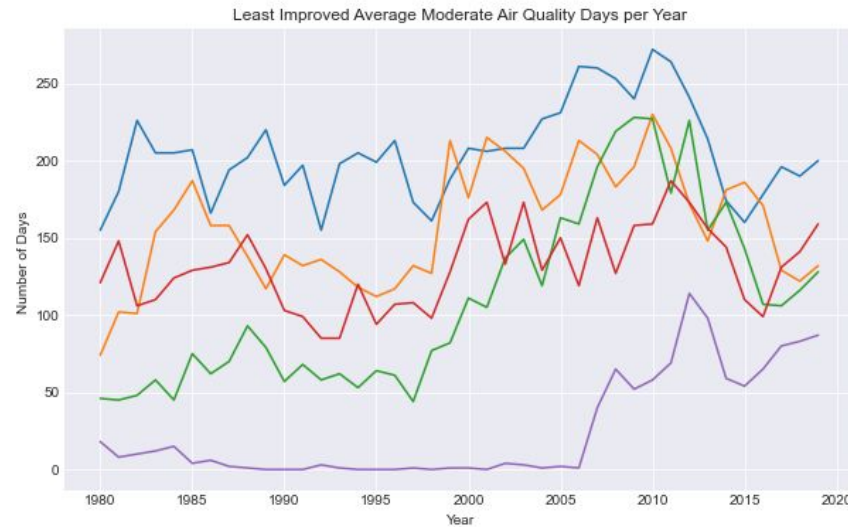
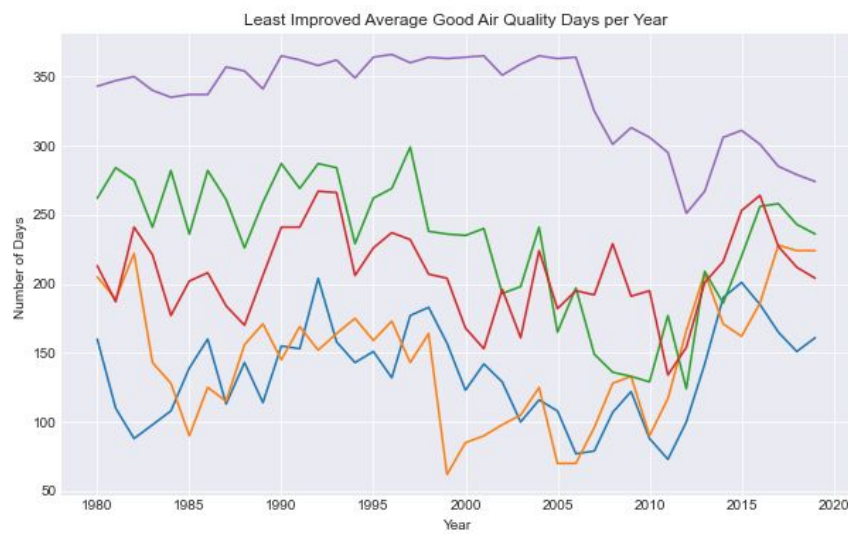
Cars with Alternative Fuel in Clean Cities Data



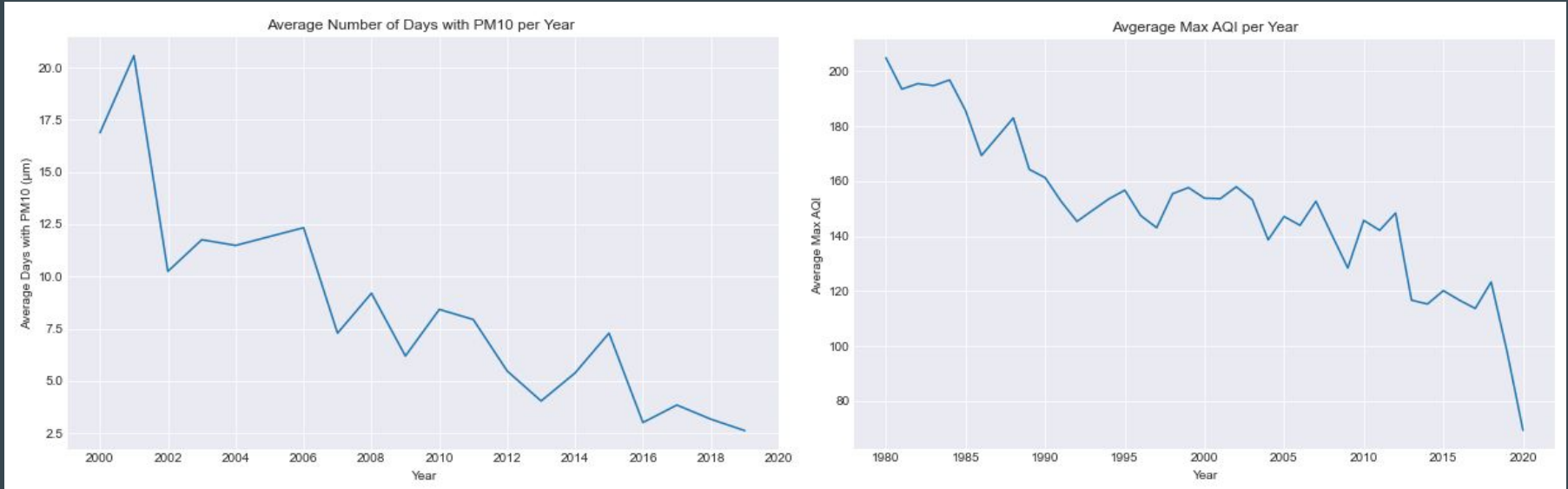
5 Most Improved Average Number of Days of Good, Moderate and Unhealthy Air Quality



5 Least Improved Average Number of Days of Good, Moderate and Unhealthy Air Quality



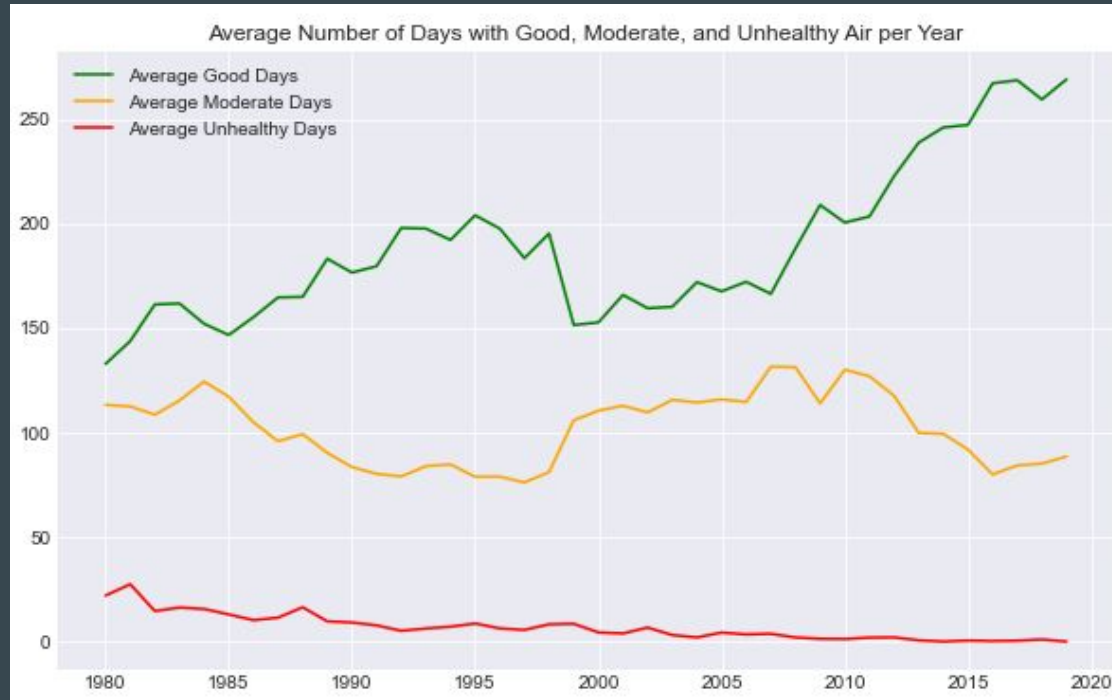
Air Quality Yearly Averages



*note, 2020 data is incomplete

Electric Vehicle and Air Quality Analysis

- Overall, air quality from has improved.
- EV and other vehicles using alternative, renewable sources for fuel have increased in popularity since initial introduction.
- Although the average number of good air quality days has an increasing trendline, the average number of unhealthy air quality days remains relatively consistent.

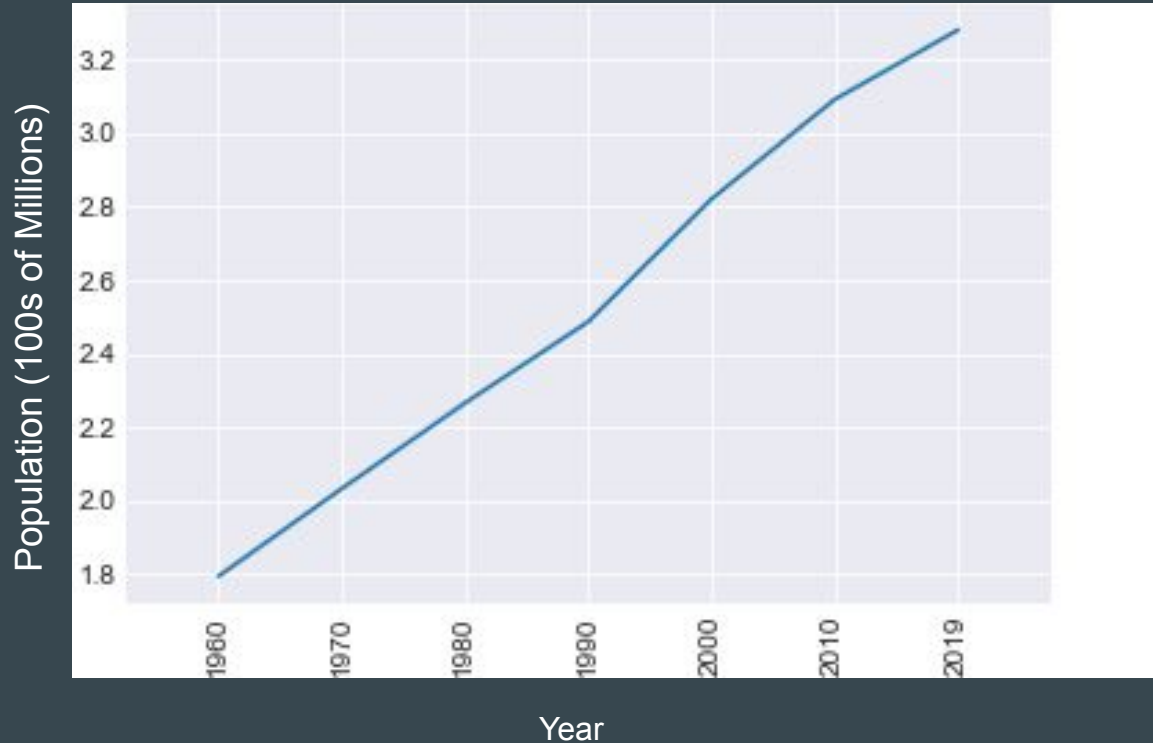


Do Education Rates have an effect Population Stabilization?

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An analysis of Education Rates in US Counties and
Population.

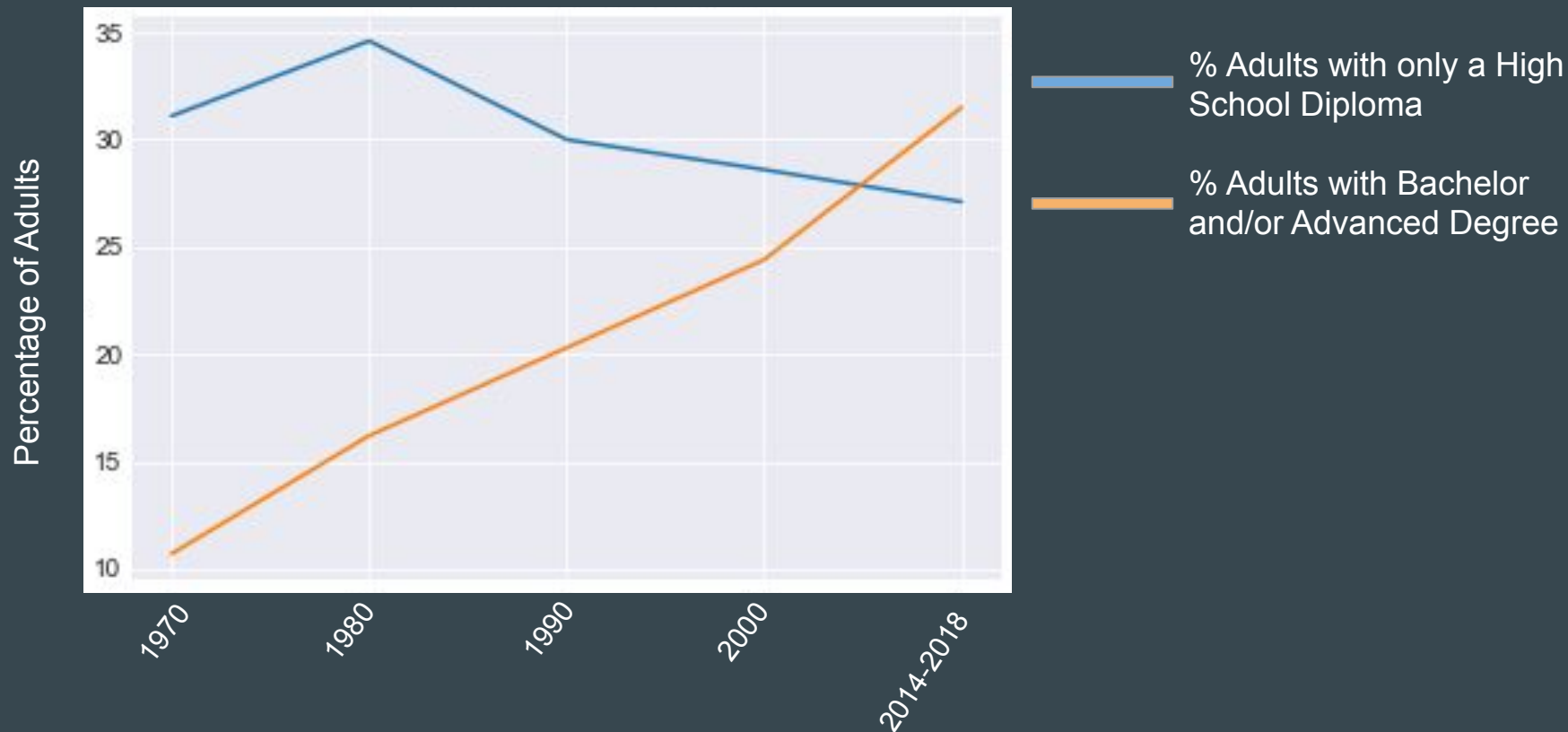
U.S. Population Trend (100s of Millions)



Since 2010 the rate of Population Growth in United States has started to decrease.

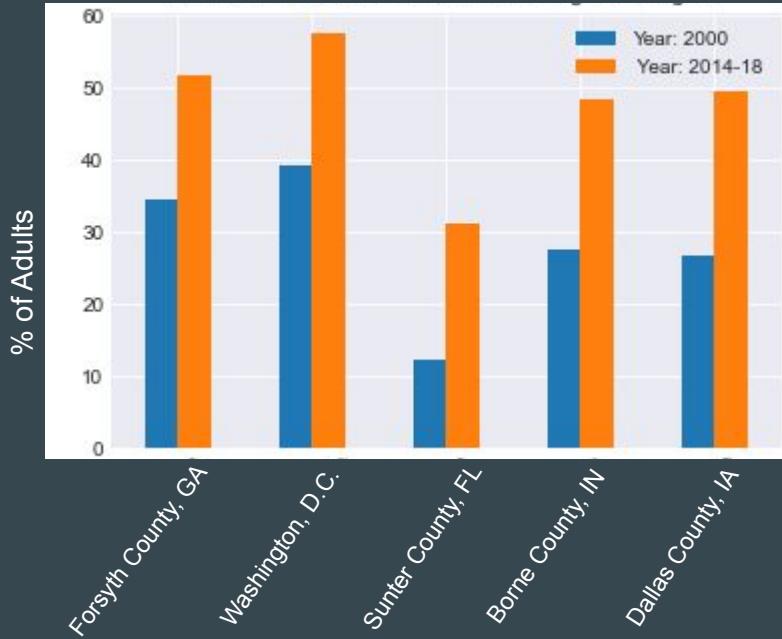
Is that attributed to the increase in education attainment?

U.S. High School Diploma, Bachelor and Advanced Degree Data

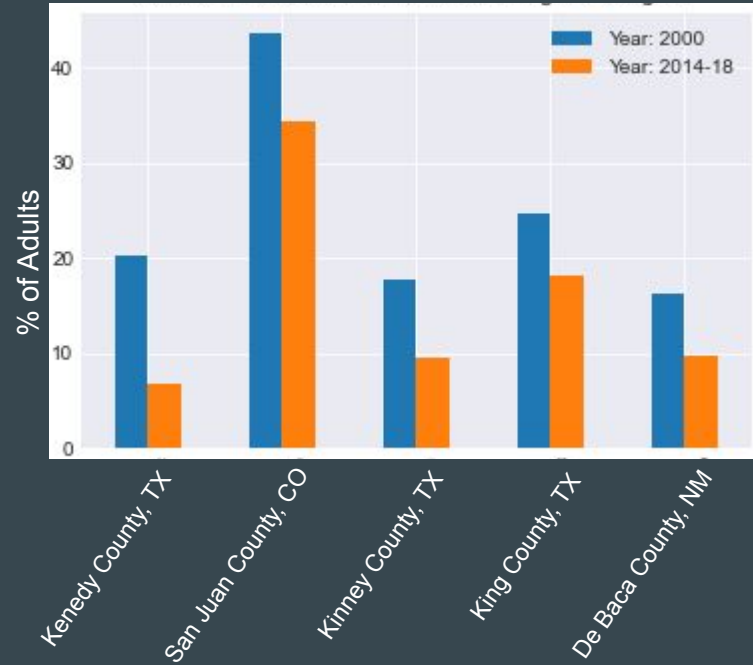


U.S. Bachelor and Advanced Degree Data

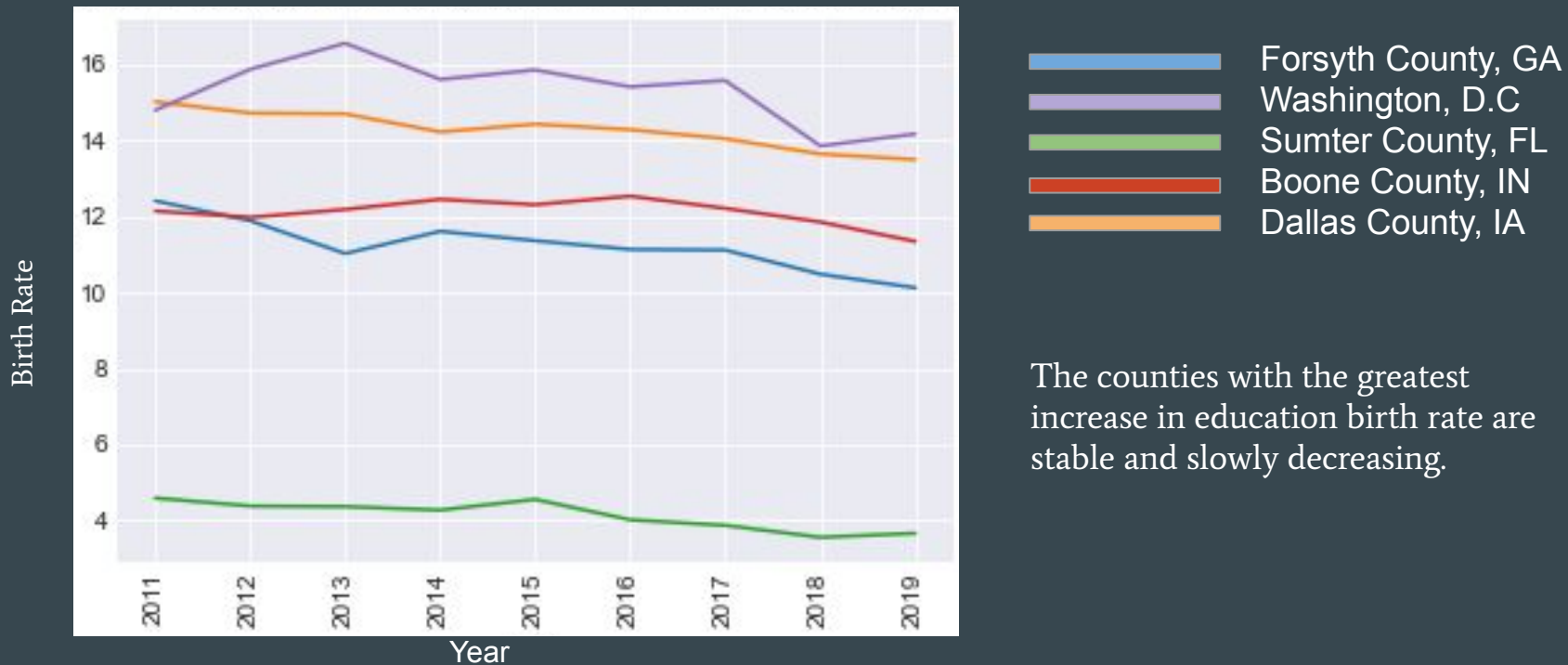
Top 5 Most Improved Counties



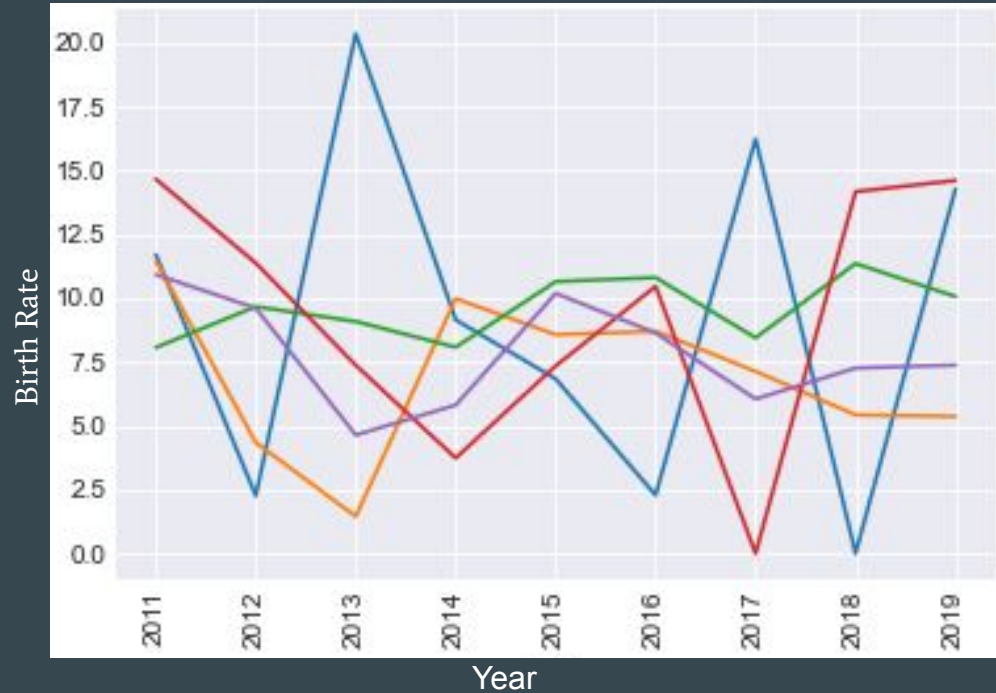
Top 5 Most Least Improved Counties



County Birth Rate with Greatest Increase in Education Degree Attainment



County Birth Rate with Greatest Decrease in Education Degree Attainment



- Kenedy County, TX
- San Juan County, CO
- Kinney County, TX
- King County, TX
- De Baca County, NM

The counties with the greatest decrease in education data does not show a consistent trend..

So does education have an effect on Population Stabilization?



Have COVID-19 Lockdowns affected Air and/or Water Quality?

...

An analysis of COVID-19 Lockdown Activity and Monthly
Air/Water Quality

Low U.S. Traffic Levels 'Unprecedented' Amid Coronavirus

As states issue stay-at-home orders and more employees work remotely during the coronavirus outbreak, the U.S. is seeing a major drop in traffic, data shows.

By Elliott Davis, Staff Writer April 15, 2020, at 4:52 p.m.

f t y e

Social Distancing? You Might Be Fighting Climate Change Too

Isolation and other shifts in behavior during the coronavirus outbreak could also alter our greenhouse gas emissions. Will the changes stick?



Los Angeles Times

CALIFORNIA

Eerily empty freeways: A symbol of how the coronavirus has hurt Los Angeles



The 115 freeway through downtown Los Angeles had noticeably lighter traffic on Wednesday afternoon. (Gustavo Morin / Los Angeles Times)

By LAURA J. NELSON | STAFF WRITER
MARCH 28, 2020 | 6:38

The 'Unprecedented Natural Experiment:' Stay-At-Home Order Reduces Air Pollution, Offers Clues in Climate Change Fight

By Ezra David Romero
Tuesday, April 14, 2020 | Sacramento, CA

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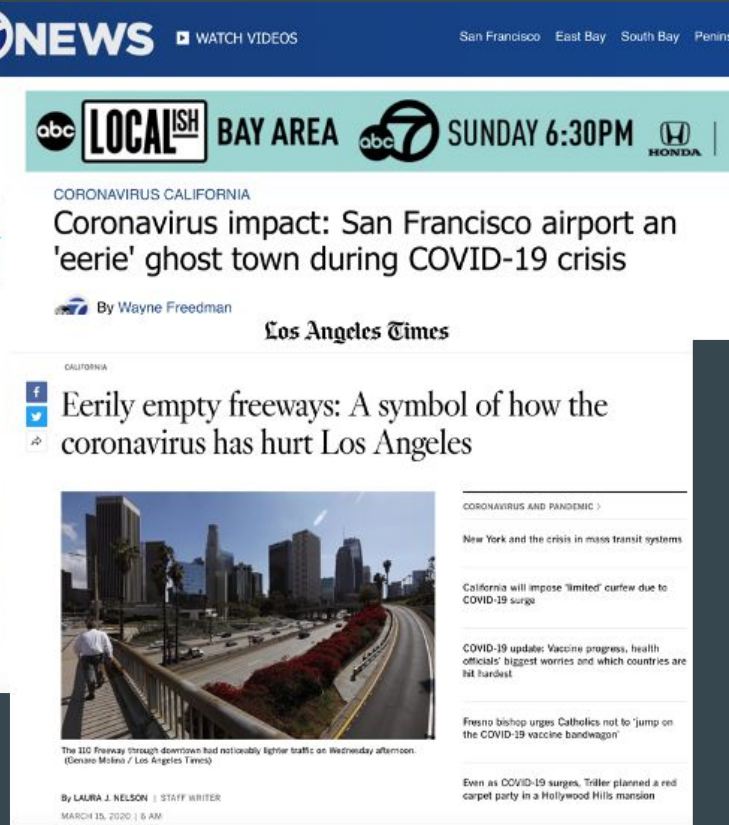
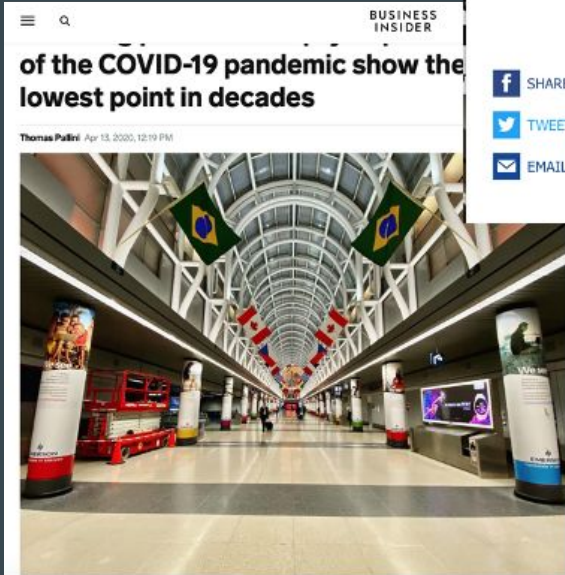


LISTEN

4:00



When lockdowns were still in place, it was noted frequently in the news about the lack of traffic in normally heavily traveled areas like the ones shown here



Same with airports

Our Diets Are Changing Because of the Coronavirus Pandemic. Is It for the Better?



If you are trans or non-binary, let's update your credit

A market place-making, nonprofit, nonpartisan news organization dedicated to covering climate change, energy and the environment.

inside climate news

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HOT TOPICS: Election 2020: The Path Forward Coronavirus Environmental Justice The Burning West Super Pollutants

HOME

Think Covid-19 Disrupted the Food Chain? Wait and See What Climate Change Will Do

The pandemic has revealed deep flaws in the world's food system and food leaders are calling for global coordination and climate resilient agriculture.

By Georgina Gustin
JUL 7, 2020

A 'mass experiment' for the climate



(Image credit: Emily Kassir)



And even effects on the food chain and how we eat.

Forbes

It Turns Out COVID Isn't Helping The Climate

 **Dave Keating** Contributor @
Energy

f
t
in



State of **the Planet**
EARTH INSTITUTE | COLUMBIA UNIVERSITY

AGRICULTURE CLIMATE EARTH SCIENCES ECOLOGY ENERGY HEALTH SUSTAINABILITY

 Trending Topic
Coronavirus Coverage

CLIMATE

Coronavirus is Not Helping to Slow Down Climate Change

UN report: Covid crisis does little to slow climate change

By Matt McGrath
Environment correspondent

9 September

COP26



GETTY IMAGES

Wildfires are being linked to climate change in many parts of the world

Now, we are seeing a different story.

Covid-19 lockdown will have 'negligible' impact on climate crisis - study

Drop in emissions was a blip, say scientists, and a green recovery is vital to halt global heating



▲ The study found economy-wide changes are needed for a transformation to reach the zero-emissions goal.
Photograph: Peter Byrne/PA

We focused on this article from The Guardian.

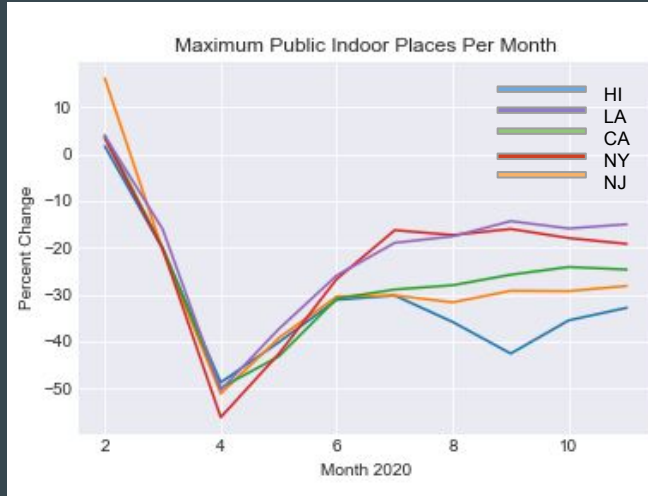
Six Categories

Out[30]:

		Retail/Rec	Grocery/Pharmacy	Parks	Transit Stations	Workplaces	Residential
State	month						
Alabama	2	3.368932	-1.266667	17.166667	1.533333	0.244898	0.237288
	3	-7.720379	6.518868	36.483871	-15.806452	-12.117073	5.500000
	4	-30.007463	-2.162393	21.516667	-38.700000	-33.252475	16.219512
	5	-10.453901	4.225806	54.145455	-26.387097	-24.892683	10.890244
	6	-5.625850	1.778571	56.960784	-20.833333	-20.487437	8.152941
...
Wyoming	7	43.419355	75.900000	NaN	27.645161	-24.000000	3.472222
	8	46.854167	76.625000	NaN	34.000000	-20.051724	2.342105
	9	29.350000	49.785714	NaN	24.200000	-18.506667	2.439024
	10	-0.698925	25.130435	53.846154	7.403226	-20.069565	4.659091
	11	-20.700000	11.500000	-26.666667	-15.050000	-22.108108	6.214286

390 rows × 6 columns

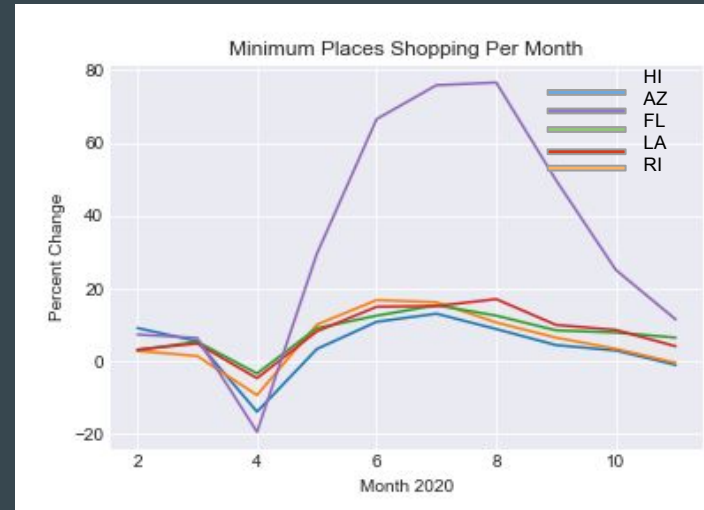
Percentages of People Going to Public Indoor Places During Pandemic



Severe drops in April, with spiking back during summer and then leveling off. Minimum movement stayed at approximately same average. Maximum movement stayed lower than original starting data.

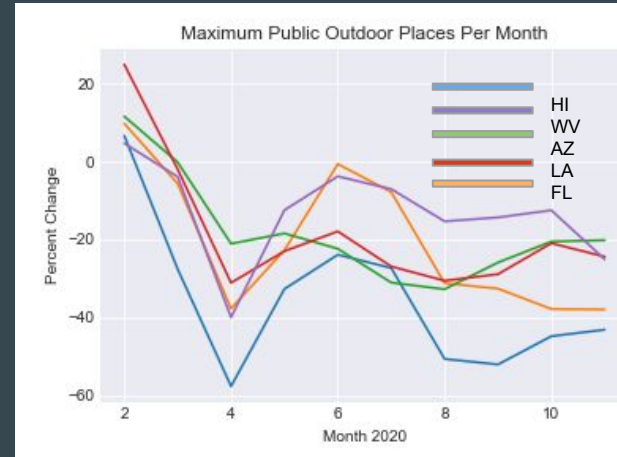
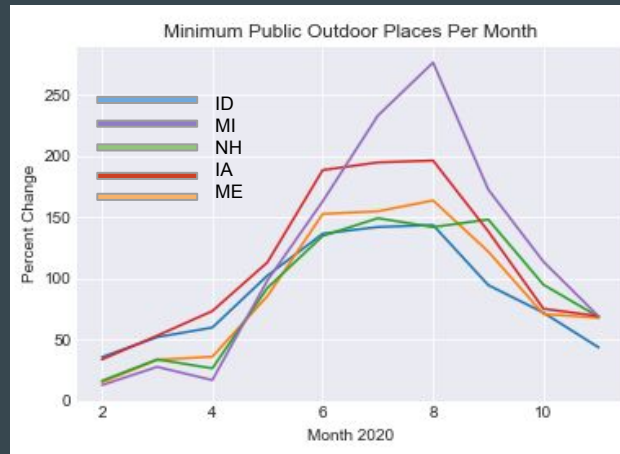
Wyoming had a very large increase in average movement within indoor public places in the summer.

Percentages of People In-Person Shopping During Pandemic



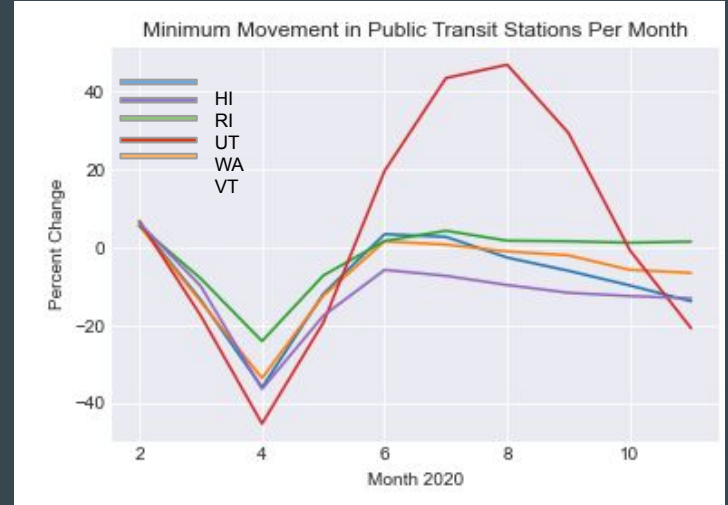
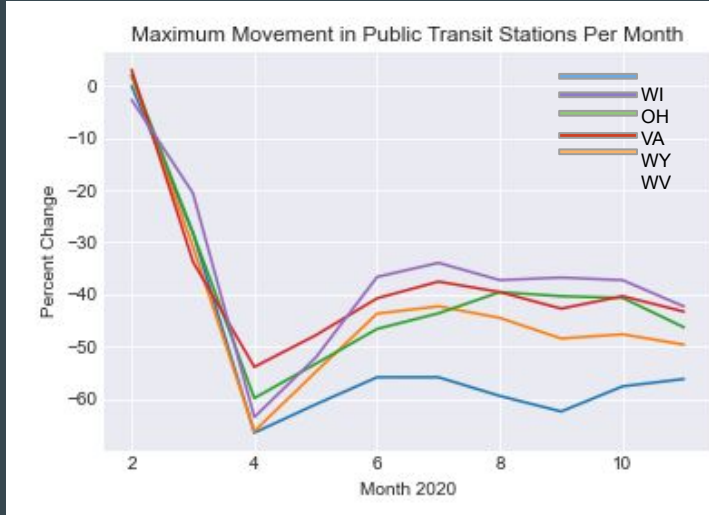
Severe drops in April, with increases and then leveling off. Minimum movement was already fairly low, and was slower to increase, and lowering again toward the end of the year. Wyoming was the outlier.

Percentages of People In Outdoor Spaces During Pandemic



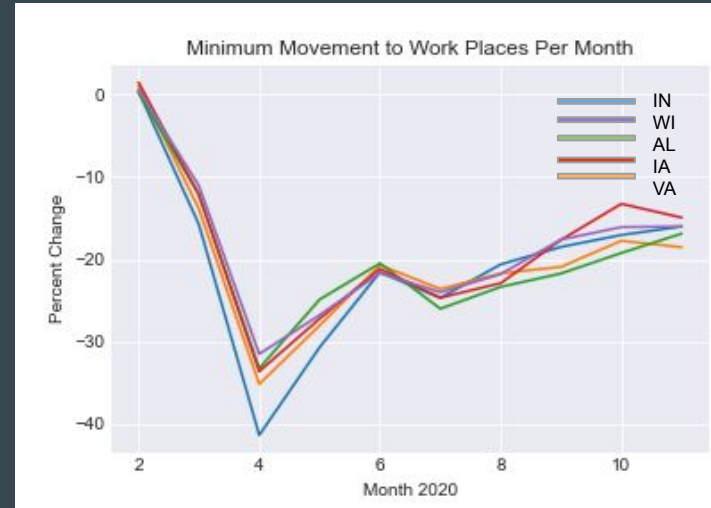
Less dropping in April in the states with maximum movement, no clear trend, with drops in the winter months. Minimum movement spiked very high during summer and trended downward in the colder months.

Percentages of People Using Public Transit During Pandemic



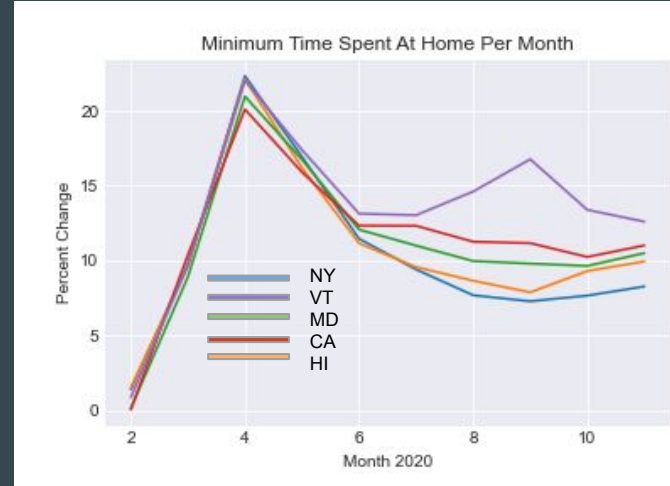
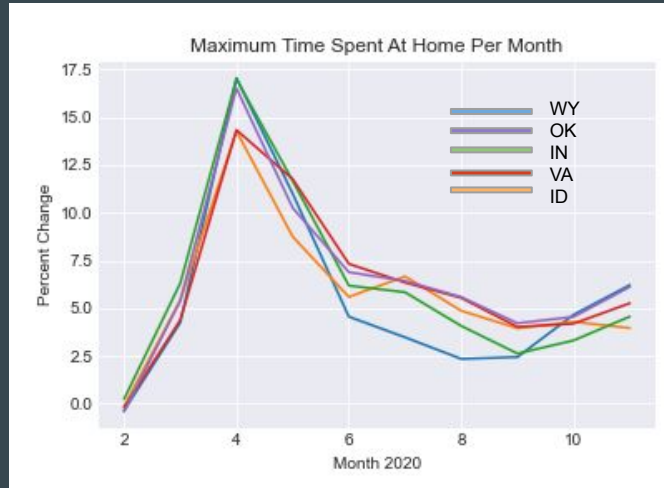
Once again, severe drops in April, with slow increase during summer and then leveling off. Minimum movement showed a similar trend, but not as severe. Wyoming was an outlier here again.

Percentages of People Going to Work Facilities During Pandemic



Severe drops in April, with slow trending upward in maximum movement states. Minimum movement dropped as well, but not as sharply. These states slowly trended back up at a quicker rate than the maximum states. Note that the minimum movement states did not increase to a higher level than the maximum movement states.

Percentages of People Staying At Home During Pandemic



Major increases in April, with spiking back down during summer with a gradual increase for maximum movement states. Minimum movement states had a similar increase in staying at home, with a slightly higher average. The trend to movement out of homes was somewhat slower and has remained at a higher percentage.

COVID-19 Activity Analysis

- Overall, people stayed indoors at the beginning of COVID-19 lockdowns, and in March, people began going back to public indoor and outdoor spaces, to work, and using public transit.
- These indications show that people did not follow CDC or State guidelines, policies, and recommendations; or mandates were difficult to enforce.

*Note: Hawaii was most frequently repeated as a maximum movement state

*Note: Wyoming frequently was an outlier in the minimum movement states

*We did not have Apple iOS device data

Conclusions & Implications



Some good trends, but sluggish response lacks desired effect.
Local government leadership can drive change, but lockdowns show
there is a limit to the impact individual citizens can have.