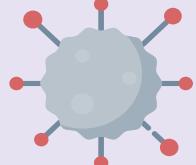


COVID-19 AND PRISONS



Team 7

Emily Allendorf, Luis Ceja Abrica,
Tiffany Feng, Amarissa Mases,
Newton Peng, Lizbeth Ureno,
Kienna Qin, Varchasvi Vedula



ABSTRACT

01

INTRODUCING THE PROBLEM

Statement of the problem
Research goals

02

DATA & EXPLORATION

Datasets
Relevant variables
Exploratory analysis

03

STATISTICAL METHODS & ANALYSIS

Hierarchical Regression
Bayesian GLM
Findings

04

DISCUSSION

Relation to student life
Challenges / limitations
Next steps

Abstract

RESEARCH QUESTION

How do prison-related factors and county COVID-19 rates influence resident and staff case rates in California prisons?

FINDINGS

Factors that significantly influence prison case rates are: staffed capacity, percent occupied, admission rates of female and male residents, and county-level cases and death rates.

Date significantly influences resident case rates.

STATISTICAL METHODS

Hierarchical regression modeling and Bayesian generalized mixed effects linear models

CHALLENGES & NEXT STEPS

Challenge: Finding sufficient datasets for research questions, limited analysis capabilities

Next steps: Expand project beyond scope of CA prisons, find more updated and robust datasets for future analysis

01

INTRODUCING THE PROBLEM



Statement of the Problem

- Rapid spread of COVID-19 in prisons
- The severity of COVID-19 in confined and overcrowded areas

RESEARCH GOALS



GOAL 1

Investigate criminal justice outcomes reflected through COVID-19



GOAL 2

Use prisons as a proxy to dorm rooms to understand how COVID behaves in shared living spaces

02

DATA & EXPLORATION



DATASETS

- 1) **Prison COVID-19 Data:** UCLA Law COVID-19 Behind Bars Data Project
 - Daily counts of COVID-19 across more than 1,700 state, federal, county, and immigration correctional facilities in the U.S.
- 2) **Prison Population Data:** California Department of Corrections and Rehabilitation (CDCR)
 - Weekly population and capacity counts for prisons in California
- 3) **Prison Demographic Data:** Vera Institute of Justice
 - Annual county-level data on incarceration trends
- 4) **County-Wide COVID-19 Data:** California Department of Public Health (CDPH)
 - Daily county-wide COVID-19 statistics across the U.S.

Our final dataset consisted of over 9500 observations with 16 variables, containing data on 33 prison facilities in California.

KEY VARIABLES

Prison COVID-19 Data: UCLA Law - Facility-level COVID data

Dataset Origin	VARIABLE	TYPE	How it's measured
UCLA Law	Facility name	Categorical	--
UCLA Law	Date of case counts	Date	--
UCLA Law	COVID case count (Residents)	Numerical	cumulative resident cases
UCLA Law	COVID case rate (Residents)	Numerical	(cumulative resident cases) / (# of residents)
UCLA Law	COVID case count (Staff)	Numerical	cumulative staff cases
UCLA Law	COVID case rate (Staff)	Numerical	(cumulative staff cases) / (# of staff)

KEY VARIABLES

Prison Population Data: California Department of Corrections and Rehabilitation (CDCR)

Dataset Origin	VARIABLE	TYPE	How It's Measured
CDCR	Total Population	Numerical	--
CDCR	Staffed Capacity	Numerical	--
CDCR	Design Capacity	Numerical	--
CDCR	Percent Occupied	Numerical	$(\text{Total Population}) / (\text{Design Capacity})$
CDCR	Gender	Categorical	--

KEY VARIABLES

Prison Demographic Data: Vera Institute of Justice, 2018

Dataset Origin	VARIABLE	Type	How It's Measured
Vera Institute	Prison Admissions Rate (Female)	Numerical	--
Vera Institute	Prison Admissions Rate (Male)	Numerical	--
Vera Institute	Prison Admissions Rate (White)	Numerical	--

KEY VARIABLES

County-Wide COVID-19 Data: California Department of Public Health (CDPH)

DATASET ORIGIN	VARIABLE	TYPE	HOW IT'S MEASURED
CDPH	County COVID case rate	Numerical	(Cumulative # of COVID cases in a county) / (County population)
CDPH	County death rate	Numerical	(Cumulative # of COVID deaths in a county) / (County population)

	Time-Independent Variables										
Time-Dependent Variables	3/31/20	4/1/20	4/2/20	...	4/21/21	4/23/21	4/25/21	Capacity	...	Gender	
Avenal State Prison								2920	...	Male	
California Healthcare Facility	Resident Case Count	0	0	0	...	621	621	621	2951	...	Male
	Staff Case Count	1	1	1	...	661	661	663			
	Percent Occupied	96	96	96	...	82.7	82.7	82.7			
	Staffed Capacity	2951	2951	2951	...	3051	3051	3051			
...								
Pelican Bay State Prison								2380	...	Male	
Substance Abuse Treatment Facility								3424	...	Male	

DATA SCHEMATIC

Time-Dependent Variables

3/31/20

4/1/20

4/2/20

...

4/21/21

4/23/21

4/25/21

Capacity

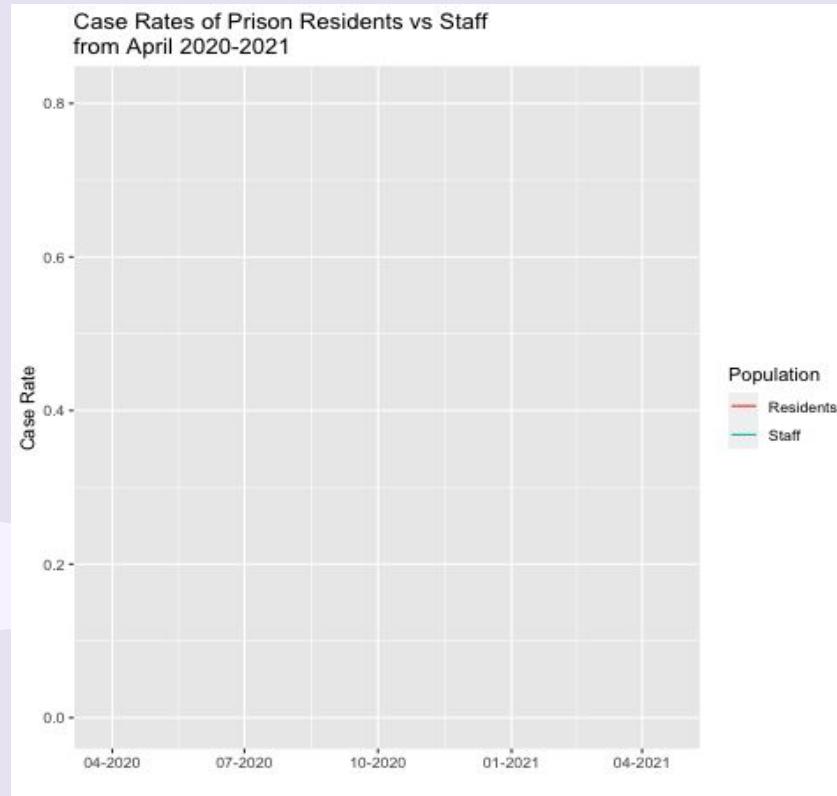
...

Gender

Avenal State Prison									2920		...	Male
California Healthcare Facility	Resident Case Count	0	0	0	...	621	621	621	2951		...	Male
	Staff Case Count	1	1	1	...	661	661	663				
	Percent Occupied	96	96	96	...	82.7	82.7	82.7				
	Staffed Capacity	2951	2951	2951	...	3051	3051	3051				
...								
Pelican Bay State Prison									2380		...	Male
Substance Abuse Treatment Facility									3424		...	Male

EXPLORATORY DATA ANALYSIS

Graph of Prison Residents vs. Staff Case Rates



EXPLORATORY DATA ANALYSIS

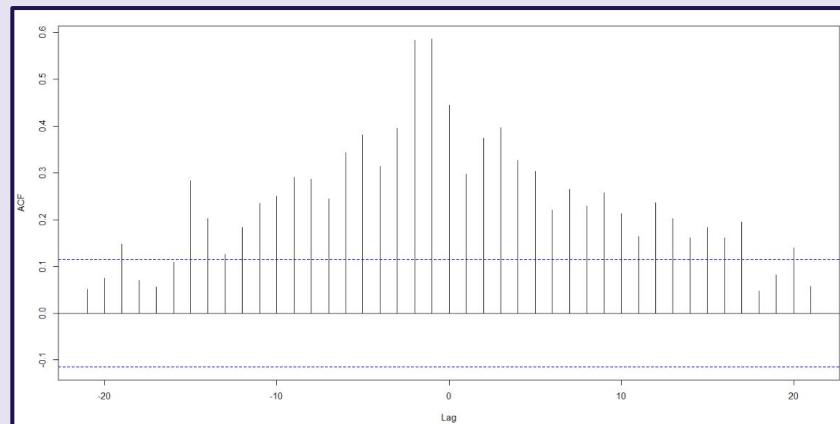
Cross-Correlation Analysis

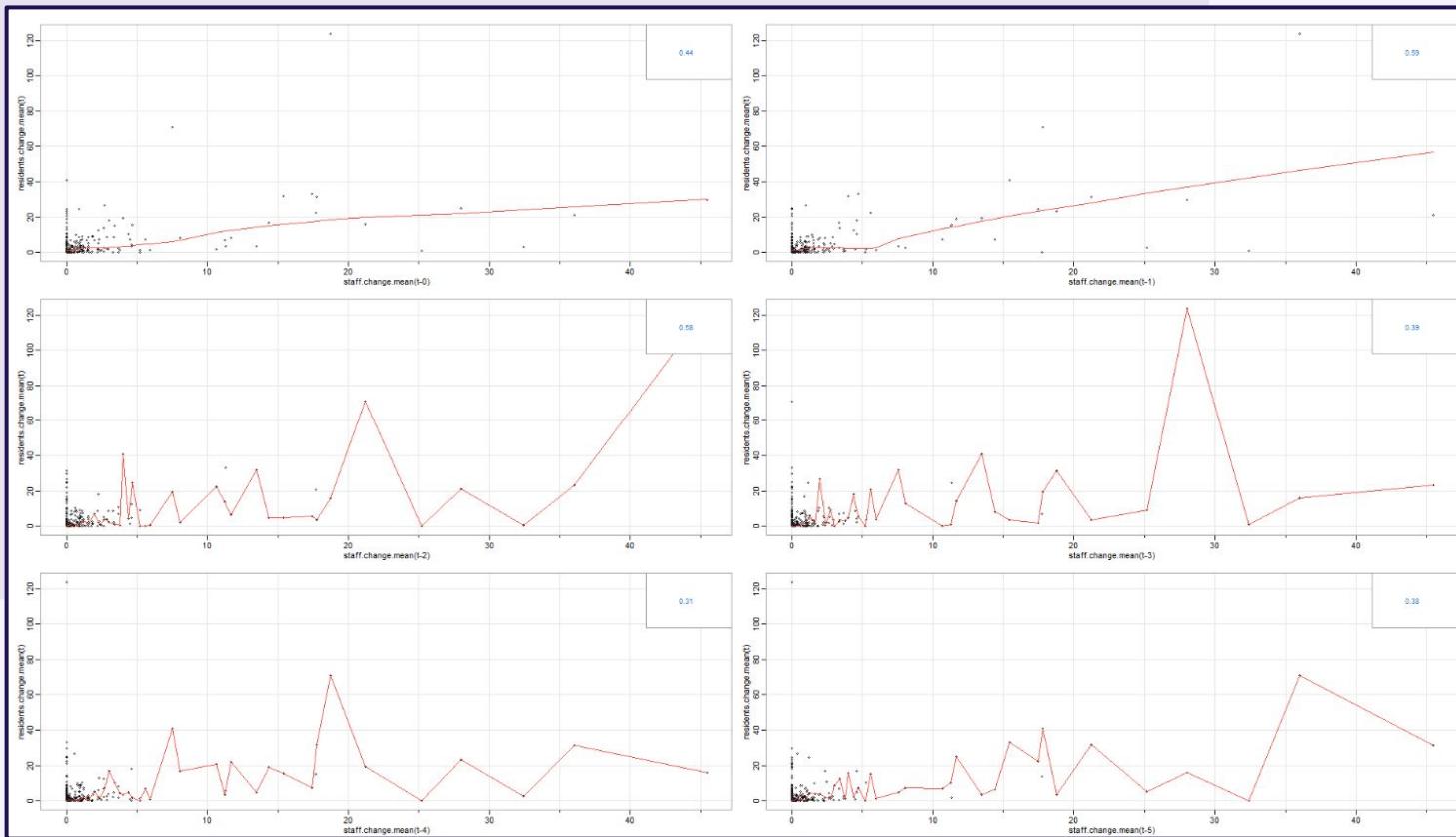
Correlation Table: Lagging staff and correlating with residents.

Lags:	-5	-4	-3	-2	-1	0	1	2	3	4	5
Corr.	0.38	0.31	0.39	0.58	0.58	0.45	0.30	0.37	0.40	0.33	0.30

The highest lags are at -2 and -1.

An above average value of staff cases
is likely to lead to an above average
value of residents later on.





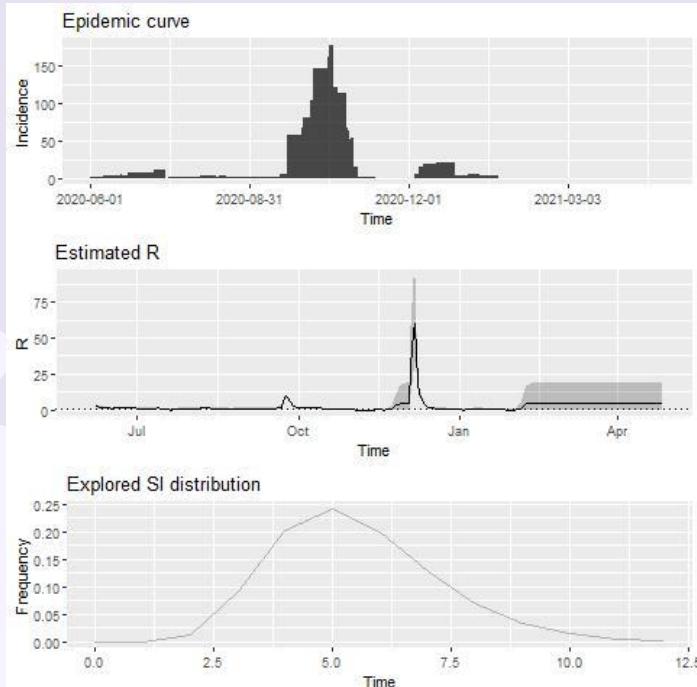
EXPLORATORY DATA ANALYSIS

R0 Analysis

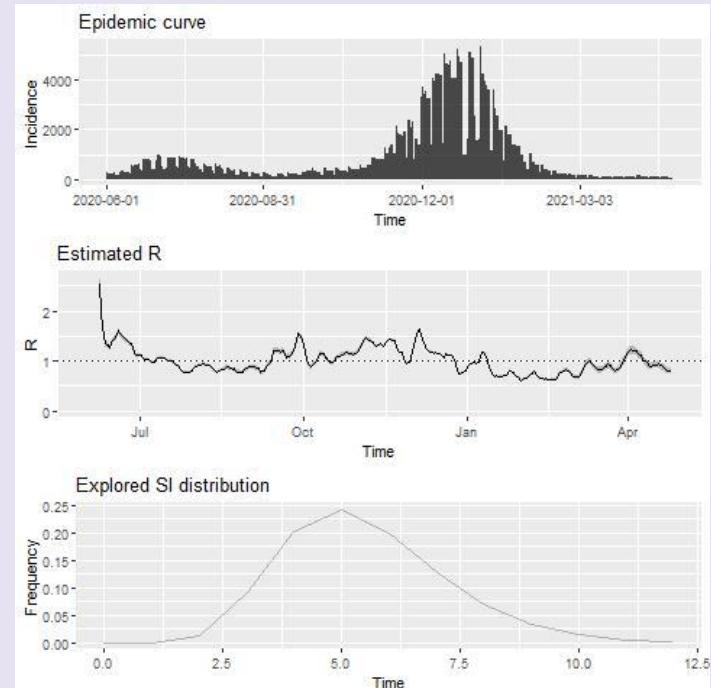
- **R0:** Average number of secondary cases of disease caused by a single infected individual over their infectious period
- Software used: EpiEstim in R
(<https://www.researchgate.net/publication/256666227>)
- We use data of the number of active cases on each day between 2020-06-01 to 2021-04-25 to model the R0 at each time step
- We used additional information about the Serial Interval of COVID-19 from Rai et al. (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7448781/>)
- **Serial Interval** is the time interval between the onset of symptoms in the primary and secondary case.
- We compared R0 for Adelanto ICE Processing Center with that of the San Bernardino County

EXPLORATORY DATA ANALYSIS

R₀ Analysis



Adelanto ICE Processing Center



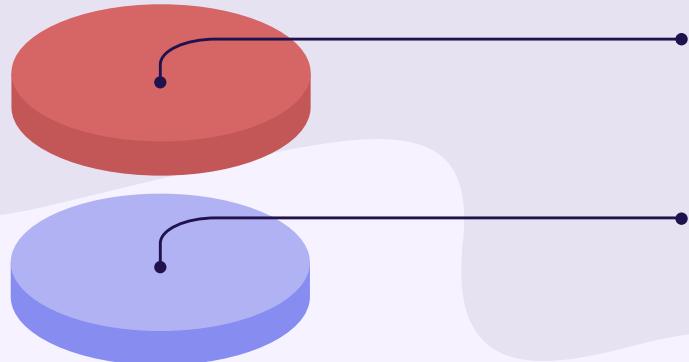
San Bernardino County

03

STATISTICAL METHODS & ANALYSIS



STATISTICAL METHODS



1

**Hierarchical multiple
linear regression models**

2

**Bayesian generalized
linear mixed effects
models**

HIERARCHICAL REGRESSION SCHEMATIC

Demographic Models

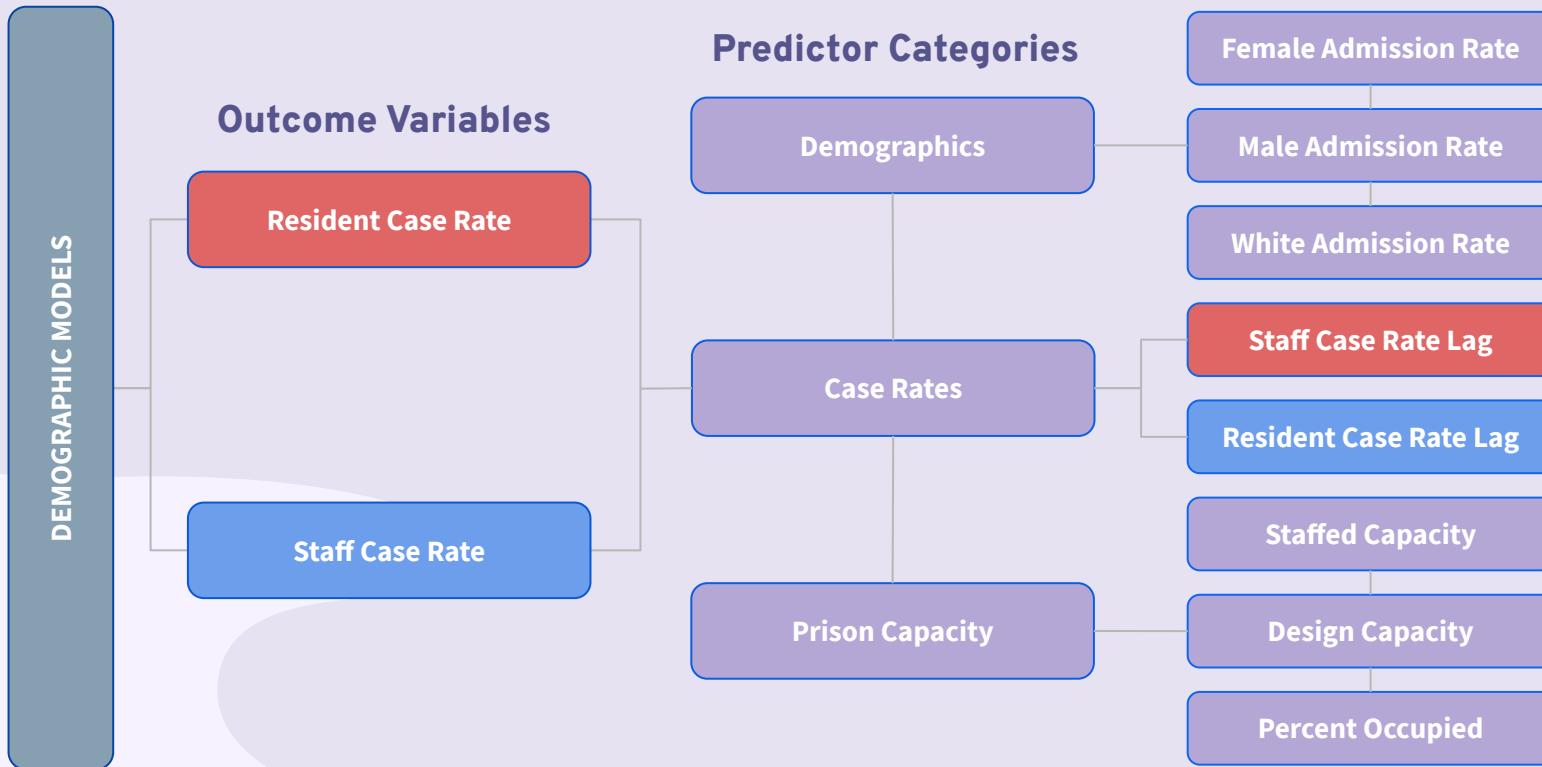


Table 1. Hierarchical Regression Analysis of Demographic Predictors of Resident / Staff Case Rates

Category	Predictor Variables	Regression 1		Regression 2	
		Resident Case Rates	Staff Case Rates	Resident Case Rates	Staff Case Rates
Demographics	Female prison admission rate	0.007	0.007	0.03***	-0.04***
	Male prison admission rate	-0.03***	-0.03***	-0.03***	0.01**
	White prison admission rate	0.001	0.006	-0.01***	0.03***
Prison Capacity	Staffed capacity	0.25***	0.24***	0.11***	0.05***
	Design capacity	-0.23***	-0.26***	-0.09***	-0.07***
	Percent occupied	-0.13***	-0.15***	-0.04***	-0.04***
Case Rate	Staff case rate lag			0.19***	
	Resident case rate lag				0.21***
R^2		0.277	0.235	0.629	0.632
R^2 Change				0.352	0.397
F				8469.1	9866.2
ANOVA p-value				< 2.2e-16***	< 2.2e-16***

*p < 0.05; **p < 0.01; ***p < 0.001

HIERARCHICAL REGRESSION SCHEMATIC

County-Level COVID-19 Models

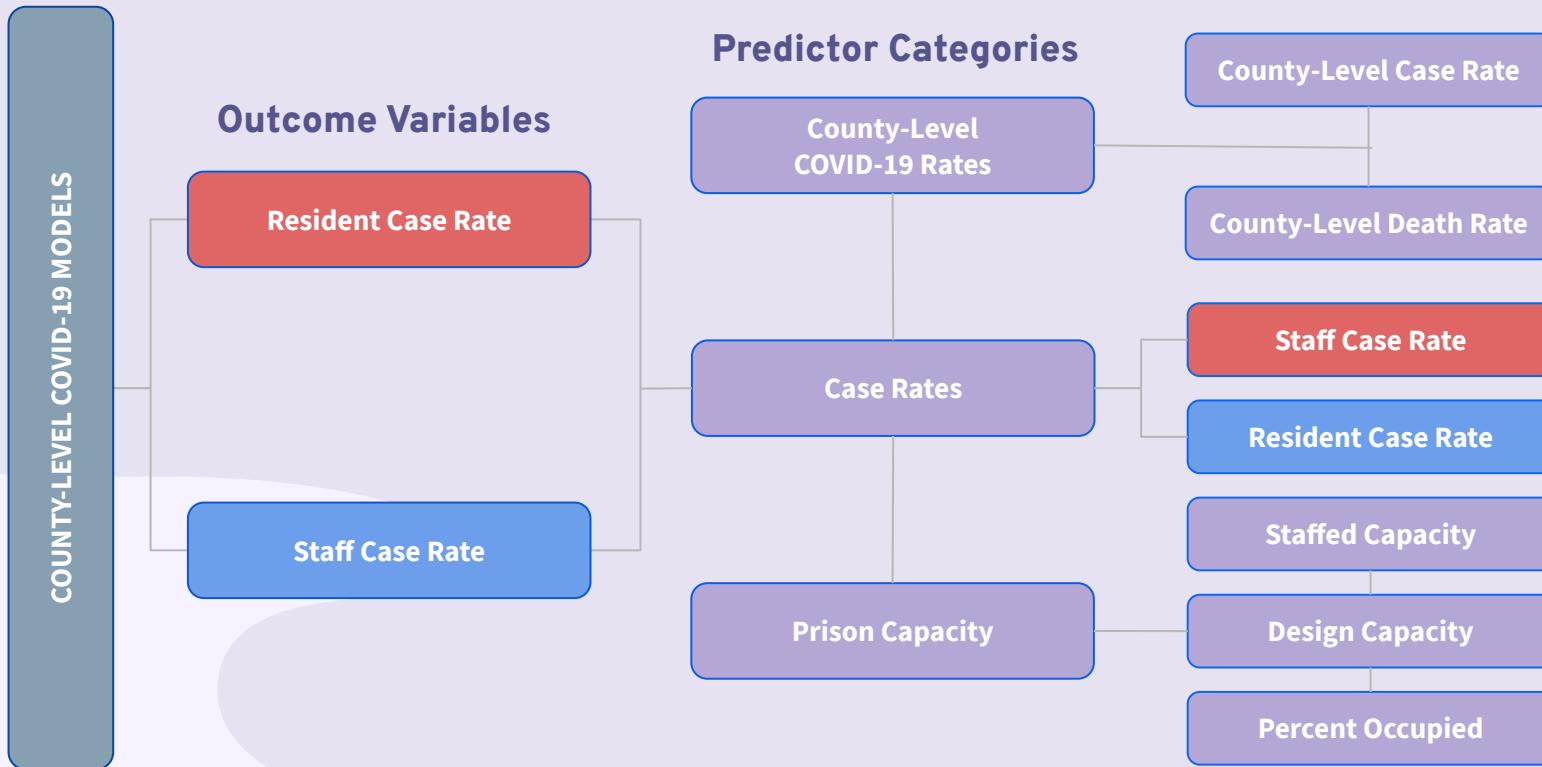


Table 2. Hierarchical Regression Analysis of County-Wide COVID-19 Predictors of Resident / Staff Case Rates

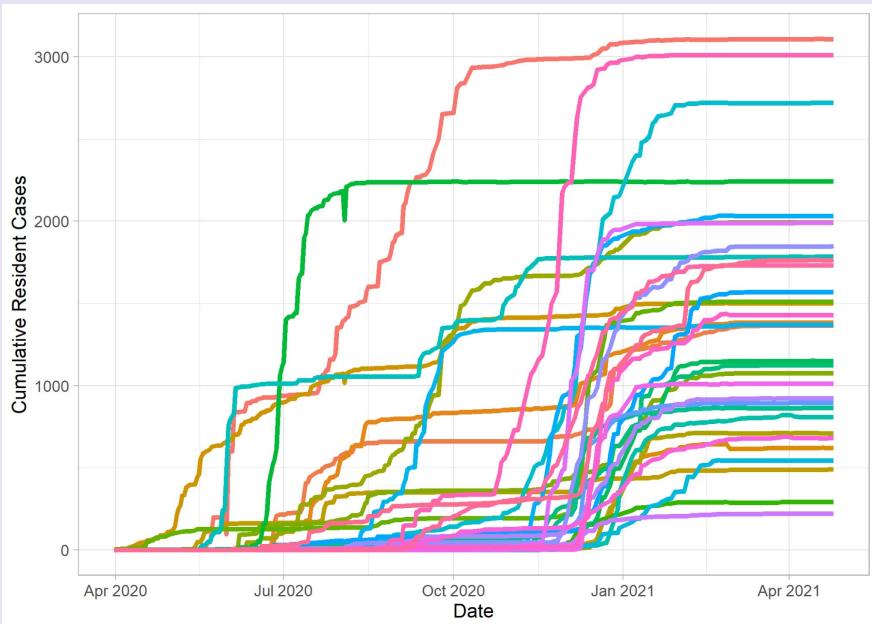
<i>Category</i>	<i>Predictor Variables</i>	<i>Regression 1</i>		<i>Regression 2</i>	
		<i>Resident Case Rates</i>	<i>Staff Case Rates</i>	<i>Resident Case Rates</i>	<i>Staff Case Rates</i>
County-Wide COVID-19 Data	County case rate	0.17***	0.25***	0.11***	0.22***
	County death rate	-0.02***	0.02***	-0.03***	0.02***
Prison Capacity	Staffed capacity	0.11***	0.03***	0.10***	0.01*
	Design capacity	-0.10***	-0.05***	-0.08***	-0.03***
	Percent occupied	-0.07***	-0.08***	-0.04***	-0.07***
Case Rate	Staff case rate lag			0.09***	
	Resident case rate lag				0.05***
R^2		0.628	0.820	0.660	0.833
R^2 Change				0.032	0.013
F				820.0	716.41
ANOVA p-value				< 2.2e-16***	< 2.2e-16***

*p < 0.05; **p < 0.01; ***p < 0.001

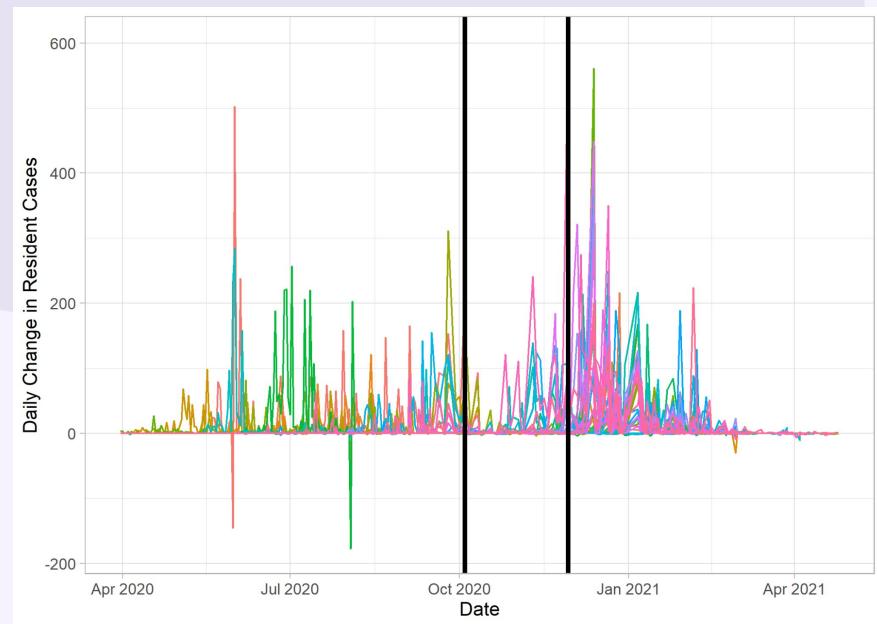
BAYESIAN MODELS

Refining the data

Cumulative Resident Cases by Facility



Daily Change in Resident Cases



BAYESIAN MODELS

Facility-Level Mixed Effects Predictor Variables

BAYESIAN MIXED EFFECTS COVID-19 MODELS

Outcome Variables

Resident Cumulative Case Count

Predictor Categories

Demographics

Prison Capacity

Predictor Variables

Female Admission Rate

Male Admission Rate

White Admission Rate

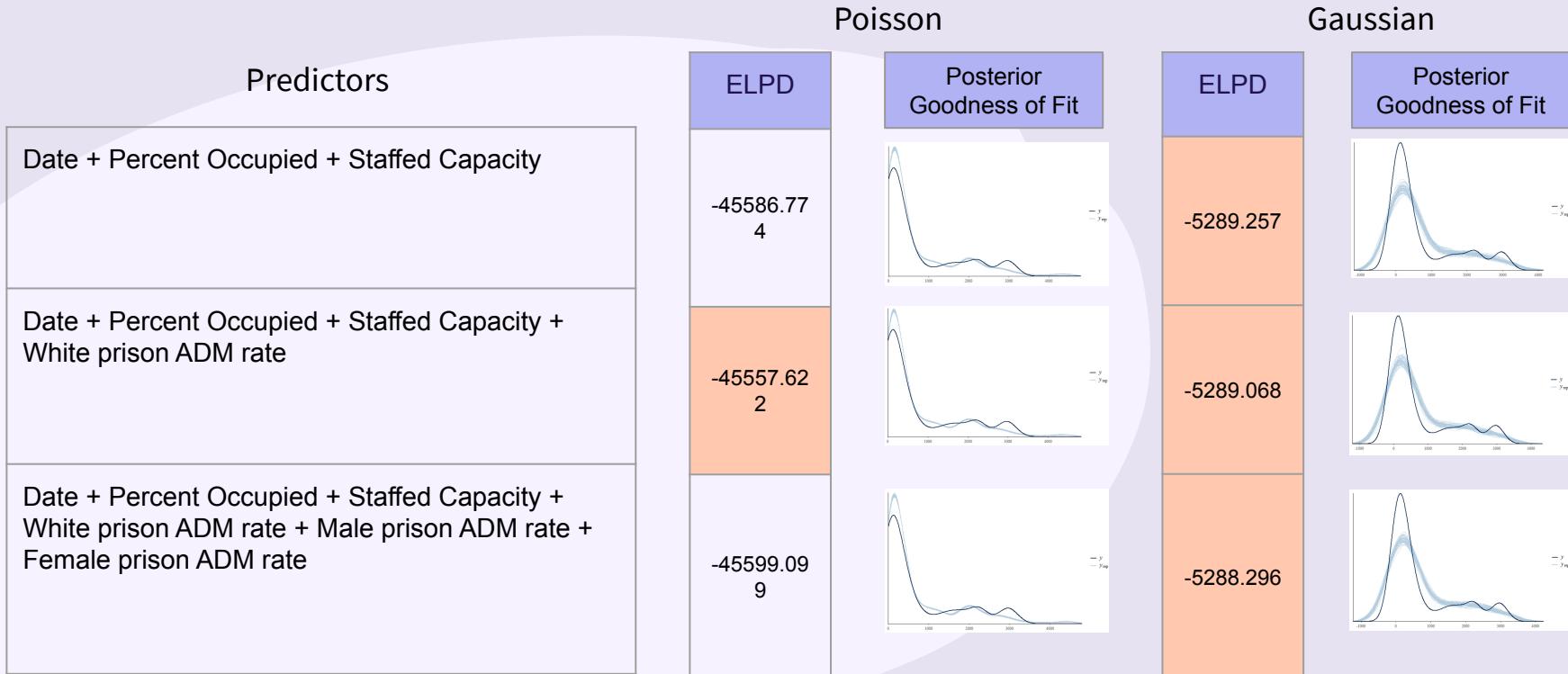
Staffed Capacity

Design Capacity

Percent Occupied

BAYESIAN MODELS

Summary of models predicting Cumulative Resident Cases



Note: all models include random effects of each facility

Table 3. Bayesian Mixed Effects Regression Analysis of Resident Case Count

Category	Predictor Variables	Poisson			Gaussian		
		Partial Model 1	Partial Model 2	Full Model	Partial Model 1	Partial Model 2	Full Model
Prison Capacity	Date	0.01636 *	0.0163627 *	0.016361 *	8.33144 *	8.3134448 *	8.331639 *
	Staffed capacity	0.00130 *	0.0012986 *	0.001299 *	1.841175 *	1.8620119 *	1.9171007 *
	Percent occupied	0.06418 *	0.0641654 *	0.064162 *	-5.329827 *	-5.375001 *	-5.2910228 *
Demographics	Female prison admission rate			-0.635003			-885.735711 *
	Male prison admission rate			0.627919			349.43010
	White prison admission rate		0.04954	0.034408		-55.27126	439.38452
Prison Random Effects	Avenal State Prison	0.59078	0.51767	0.962474	279.76273	346.62974	1,083.65713
	California Health Care Facility	1.043456 *	1.05990 *	0.524404	149.64156	150.44564	-374.56551
	California Institution for Women	4.69458 *	4.67370 *	4.273346 *	2748.8232 *	2814.4588 *	2372.17107 *
	California State Prison, Los Angeles	0.22779	0.31070	0.392924	162.41430	81.32917	496.10532
	California State Prison, San Quentin	2.64049 *	2.7547 *	3.210861 *	164.29206	28.90636	538.71932
	California State Prison, Solano	-2.46627 *	-2.40459*	-2.495324 *	-1308.3575*	-1375.9121 *	-1413.8501 *
	Calipatria State Prison	-1.15227 *	-1.12709 *	-0.980430	-109.50192	-124.31734	-396.92207
	Centinela State Prison	-1.27378 *	-1.24896 *	-1.101757	3.21836	-11.33818	-285.65136
	Chuckawalla Valley State Prison	3.32485 *	3.35240 *	3.233606	2,828.30704	2827.0909 *	2680.978 *
	Correctional Training Facility	-2.02044 *	-1.9596 *	-1.972524 *	-2404.5598 *	-2,491.72796	-2459.8033 *
	Deuel Vocational Institution	0.79194 *	0.80819	0.272350	1390.6831 *	1404.67018 *	917.75587 *
	Ironwood State Prison	-1.01896 *	-0.99113*	-1.109663 *	171.92850	157.91938	-28.69573
	North Kern State Prsion	0.23183	0.19099	-0.174219	-1,382.36322	-1337.61339 *	-1968.71968 *
	Pelican Bay State Prison	-0.33394	-0.32653	0.367219	-274.84905	-269.43109	252.11600
	Substance Abuse Treatment Facility	-1.51645 *	-1.58921*	-1.144587	-2,116.22975	-2,058.69597	-1,351.75279
ELPD		-45,587.00	-45,558.00	-45,599.00	-5,289.00	-5,289.00	-5,288.00

Note: Significance (*) determined as having 90% intervals which do not cross 0

Note: poisson coefficients are presented in units of log counts

BAYESIAN MODELS

Post Hoc Analysis

MOST SIGNIFICANT PRISON EFFECTS

High	Low
<ul style="list-style-type: none">• Avenal State Prison• CA Institution for Women• CA State Prison, San Quentin• Chuckawalla Valley State Prison	<ul style="list-style-type: none">• Deuel Vocational Institution• Pelican Bay State Prison• Correctional Training Facility• CA State Prison, Solano

SUMMARY OF FINDINGS

1. How are criminal justice outcomes reflected through COVID-19?

1

Demographics, county-wide COVID-19 statistics, and prison capacity are significantly correlated with case rates in prisons.

2

Spread rates of COVID-19 are higher in prisons than at the county-level.

3

Prison-to-prison differences are significant and suggest the need for more in-depth investigation into the characteristics of federal prisons.

SUMMARY OF FINDINGS

2. How are prisons similar to universities in the context of COVID-19?

1

More crowded facilities are not necessarily connected with higher COVID-19 case counts.

2

Prison staff seem to be infecting residents.

04

Discussion



RELATION TO STUDENT LIFE

- Understanding how COVID-19 spreads in small spaces
- Similarities between prisons and dorm rooms

LIMITATIONS

- Scarcity of jail data
- Limited information on staff deaths
- No recent demographic data
- Ongoing COVID -19 data
- Restricted to California facilities

FUTURE RESEARCH

- Dashboard recommendations
- Other research questions
 - Analyzing resident and staff deaths
 - Changes in death and infection rates due to location
 - Widening the scope of R0 modeling geographically
 - Including informative priors in all Bayesian models
 - Extending state level analysis to a national level analysis

FINAL THOUGHTS

- Evidently, resident and staff interaction contributes to the exceeding spread of COVID-19 in prison facilities. To diminish the spread, institutions should assign separate lavatories and living quarters for individuals with COVID -19, staff members should communicate virtually, disinfectant supplies should be provided in common areas, and sick individuals should have designated household supplies.

RESOURCES



 SCAN ME



OUR COMPANY

The planet's name has nothing to do with the liquid metal, since it was named after the Roman messenger god, Mercury

UNDERSTANDING THE PROBLEM



MARS

Mars is actually a cold place. It's full of iron oxide dust, which gives the planet its reddish cast



VENUS

It has a beautiful name and is the second planet from the Sun. It's even hotter than Mercury



SATURN

This is the ringed one. Saturn it's a gas giant, composed mostly of hydrogen and helium

A PICTURE ALWAYS REINFORCES THE CONCEPT

Images reveal large amounts of data, so remember: use an image instead of long texts



OUR SOLUTIONS

MERCURY



Mercury is the closest planet to the Sun

VENUS



Venus has a beautiful name, but terribly hot

JUPITER



It's the biggest planet in the Solar System

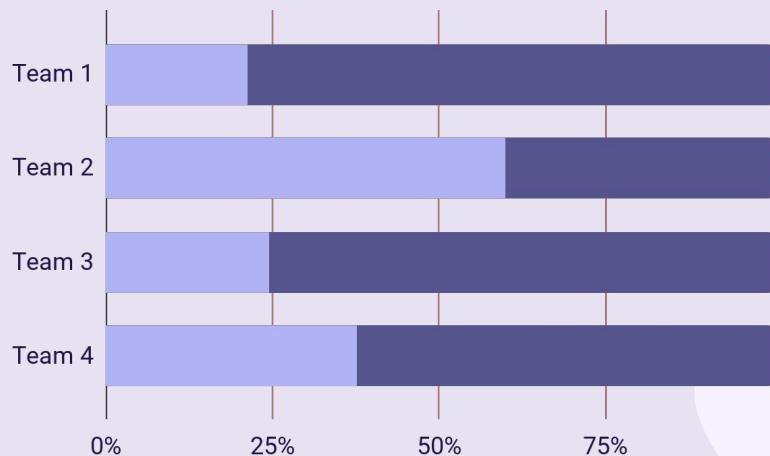
SATURN



Saturn is the ringed one and a gas giant

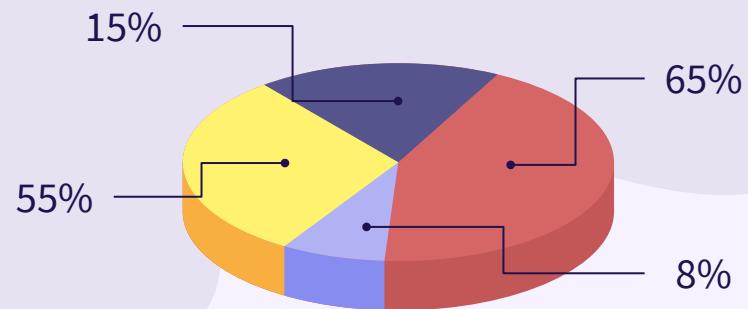
MARKET RESEARCH

EVOLUTION



To modify this graph, click on it, follow the link, change the data and paste the new graph here

SHARE



1 MERCURY

3 SATURN

2 JUPITER

4 NEPTUNE

THIS IS A MAP

MERCURY

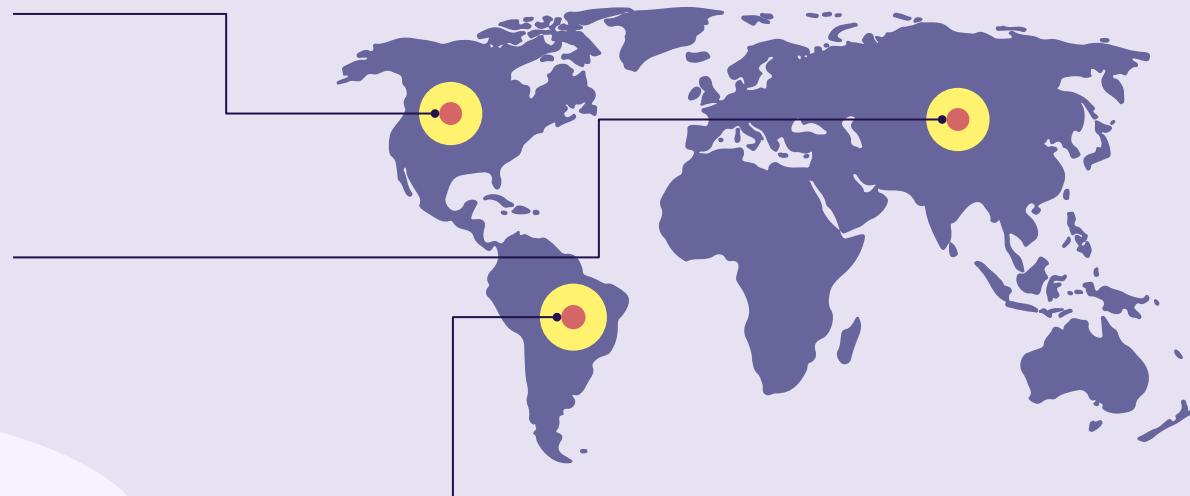
Mercury is the closest planet to the Sun

VENUS

Venus is the second planet from the Sun

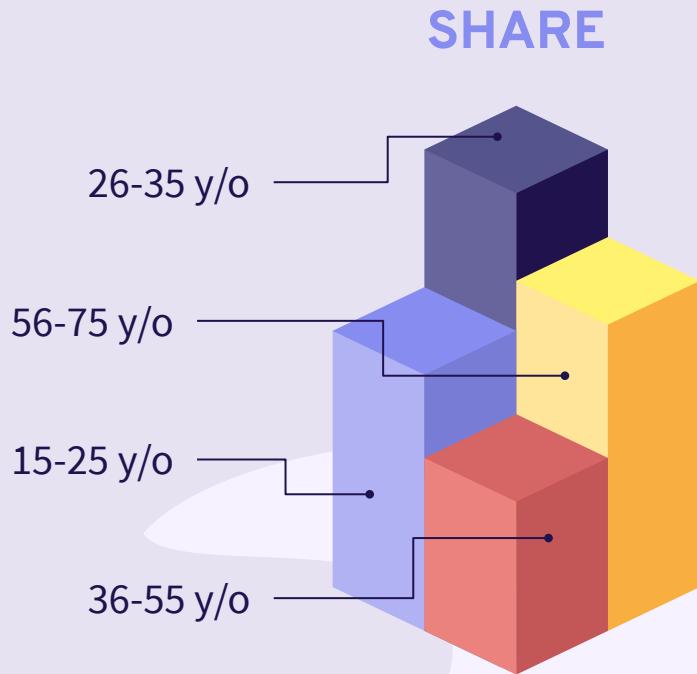
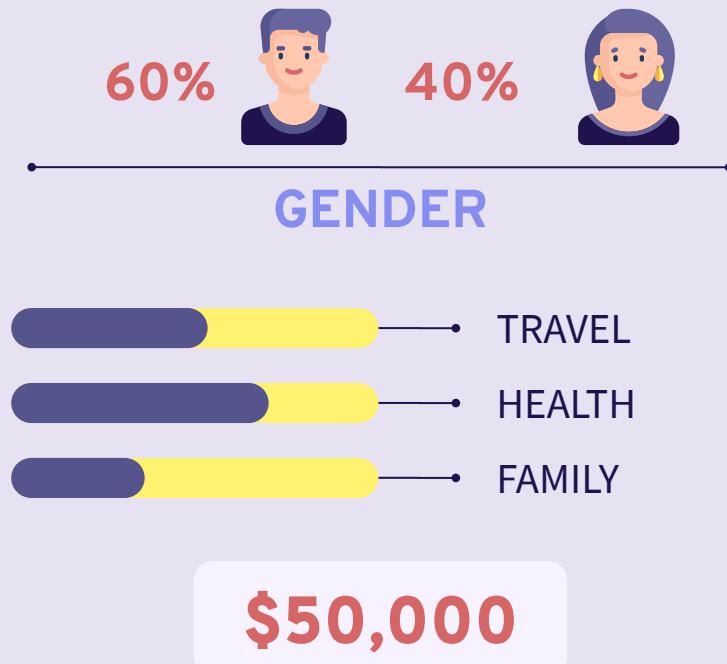
JUPITER

It's the biggest planet in the Solar System



15,000,000

TARGET



A PICTURE IS
WORTH A
THOUSAND
WORDS

OUR CONSULTANTS

The planet's name has nothing to do with the liquid metal since it was named after the Roman messenger god, Mercury



OUR PARTNERS



JUPITER

It's the biggest planet in the Solar System



MARS

Despite being red, Mars is a cold place



MERCURY

Mercury is the closest planet to the Sun

TESTIMONIALS



HELENA JAMES

“Mercury is the closest planet to the Sun”



SAMUEL NELL

“It’s the biggest planet in the Solar System”



JENNA DOE

“Venus is the second planet from the Sun”



PENNY HENRY

“Saturn is the ringed one and a gas giant”



JOHN SMITH

“Despite being red, Mars is a cold place”



EVAN LEE

“Neptune is the farthest planet from the Sun”

AWARDS

MERCURY

Mercury is the closest planet to the Sun

VENUS

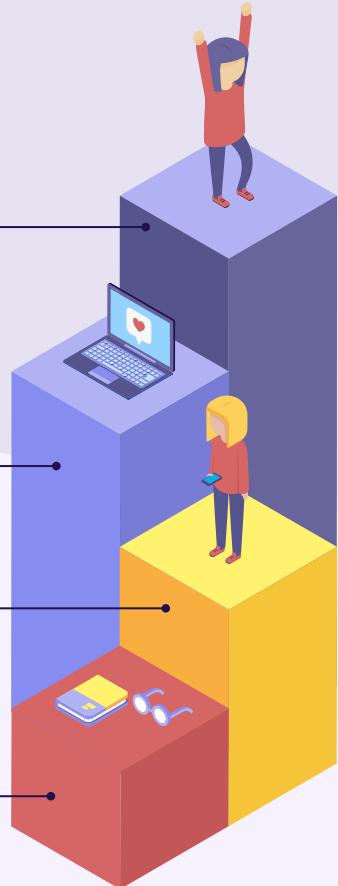
Venus is the second planet from the Sun

JUPITER

It's the biggest planet in the Solar System

SATURN

Saturn is the ringed one and a gas giant



333,000.00

earths is the Sun's mass

24h 37m 23s

is Jupiter's rotation period

386,000 km

is the distance between Earth and the Moon



AWESOME WORDS

Because key words are great for catching your audience's attention



MOCKUP

You can replace the images on these screens with your own work. Just delete these ones, add yours and center them properly



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ALTERNATIVE RESOURCES

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- Isometric programming landing page template

RESOURCES

VECTOR

- Isometric teamwork landing page template
- Isometric business landing page template
- Isometric teamwork landing page template
- Isometric infographic collection concept
- Flat design christmas town background
- Isometric infographic steps concept
- Isometric math concept background
- Isometric teamwork landing page template
- Colorful isometric infographic
- Isometric teamwork landing page template

PHOTO

- Lawyer and his client shaking hands together over the desk
- Arrangement of desk elements with copy space on orange background

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Overpass

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#e7e2f2

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#d66565

How it Works.



Pana



Amico



Bro

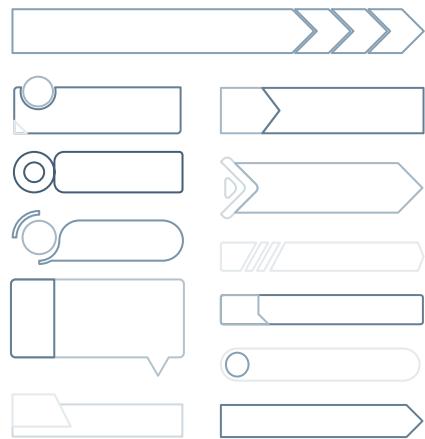


Rafiki

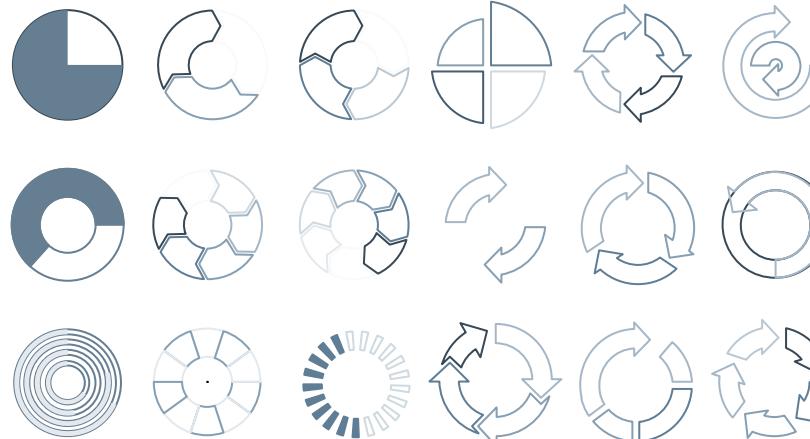


Cuate

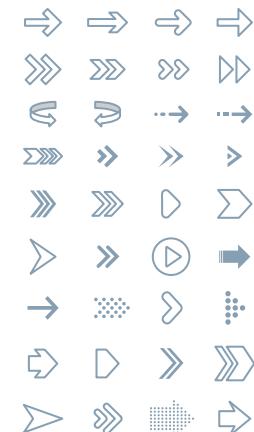
resize



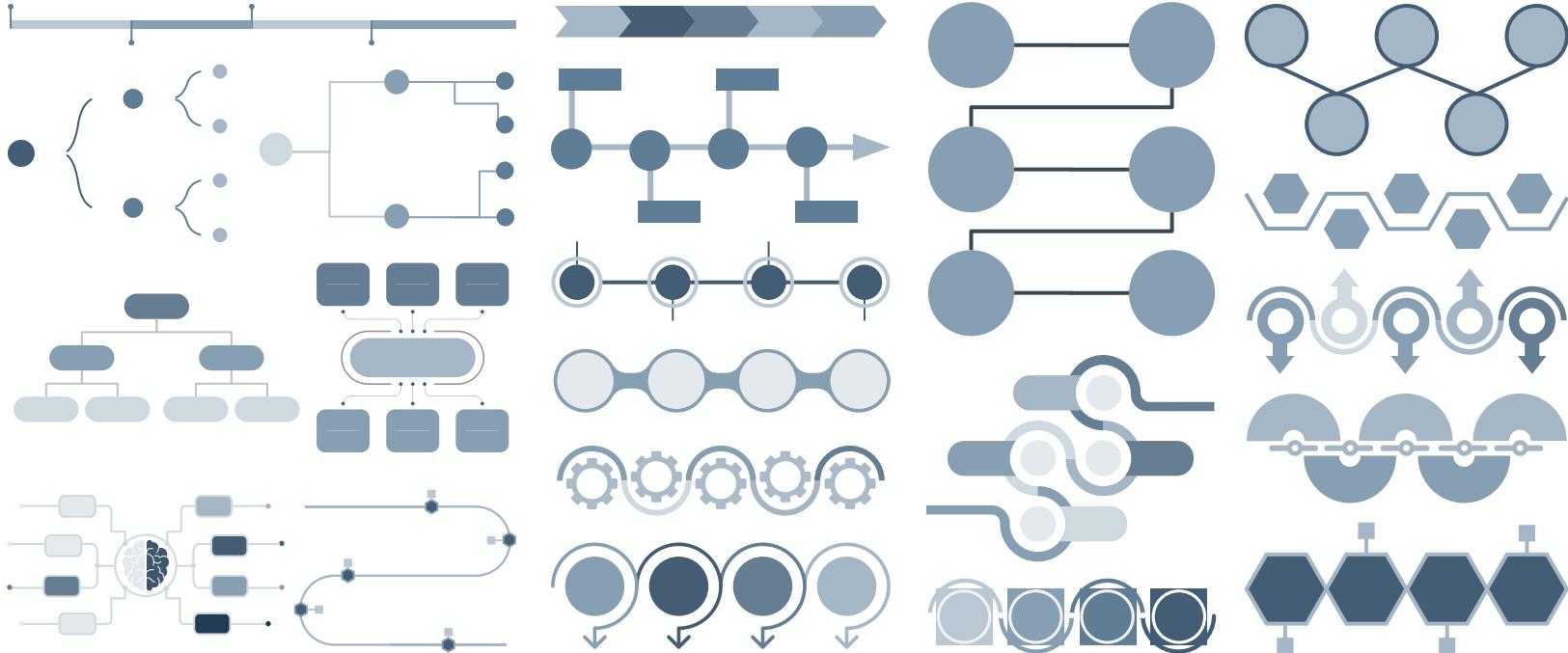
change the color

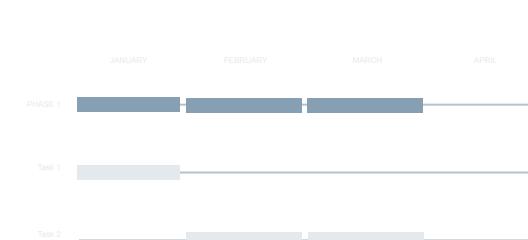
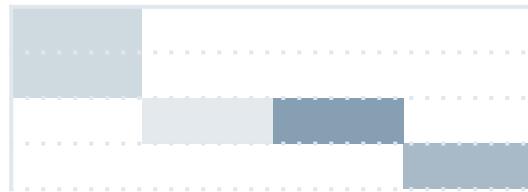
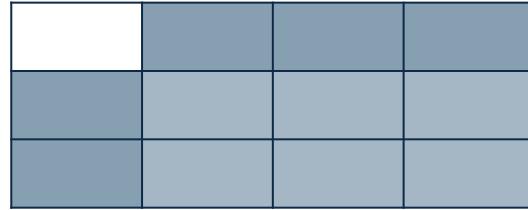
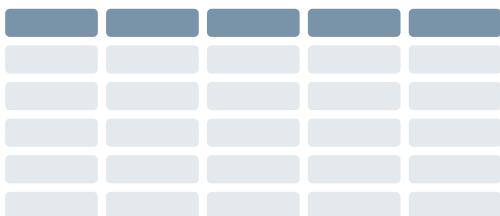
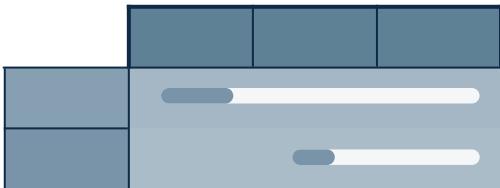
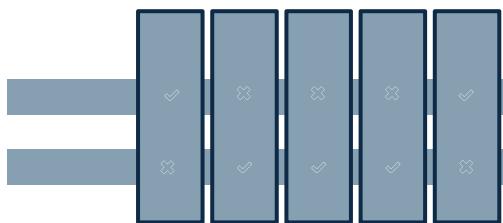
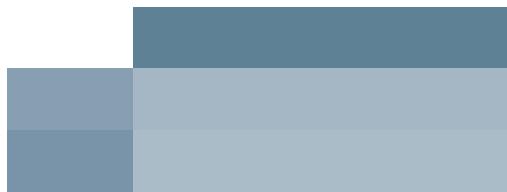
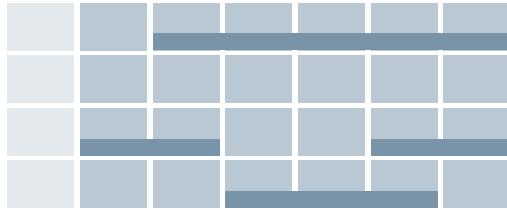


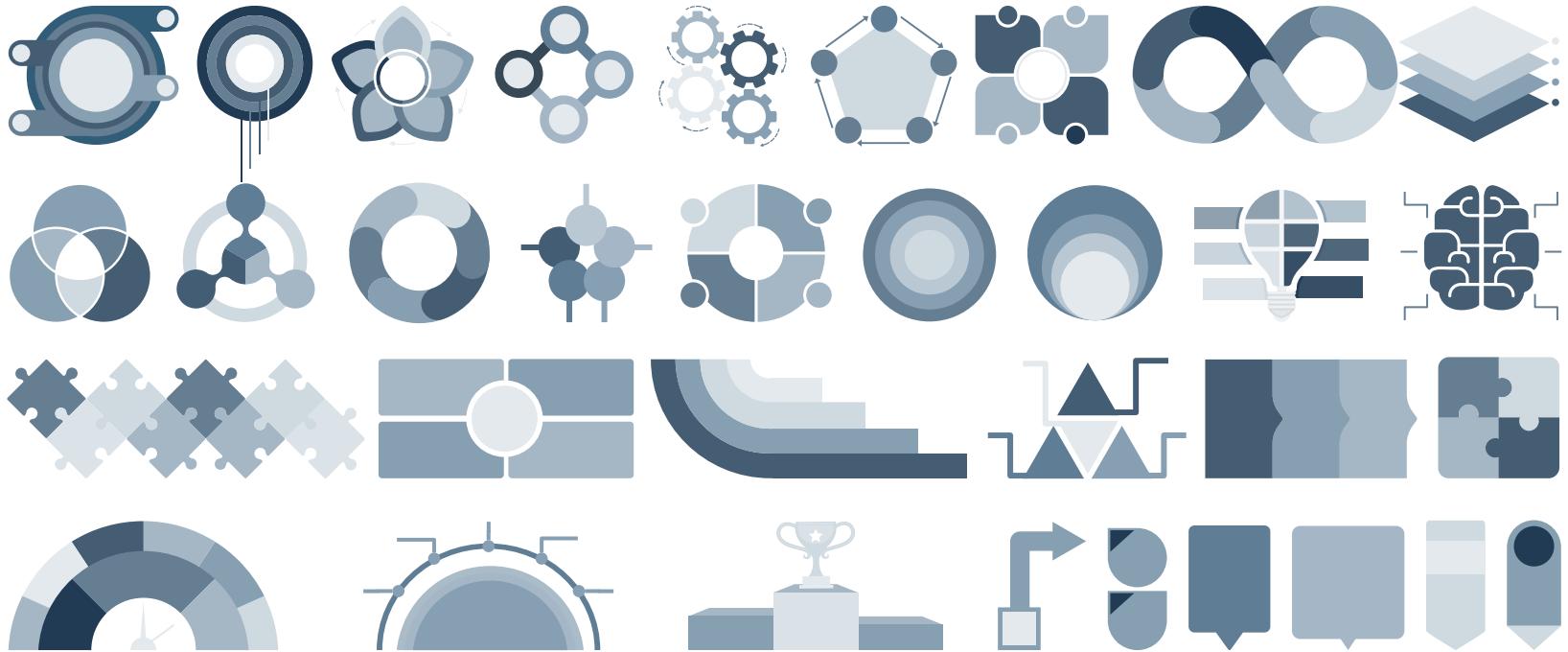
infographics

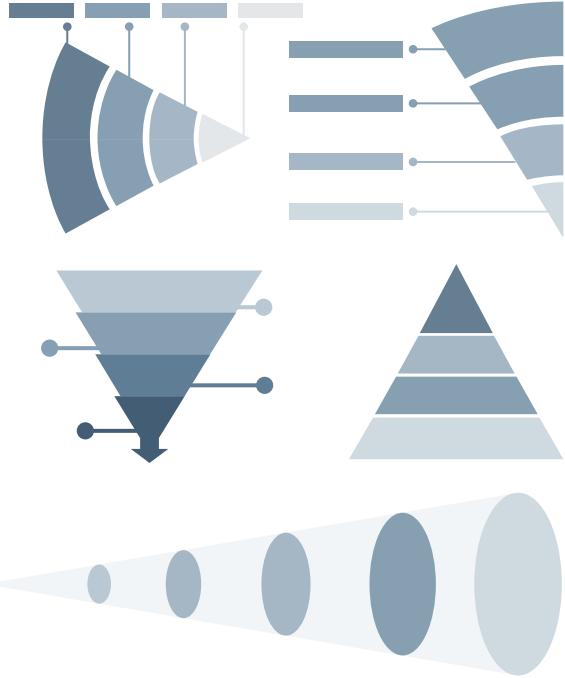
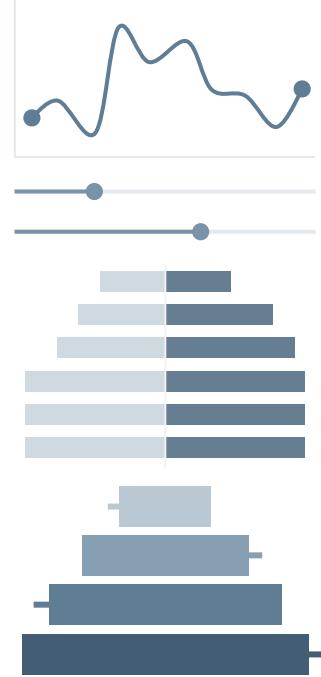
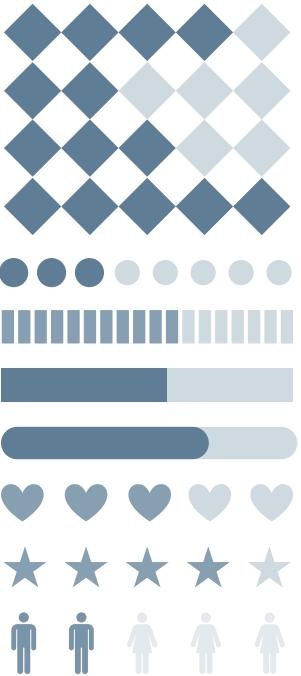
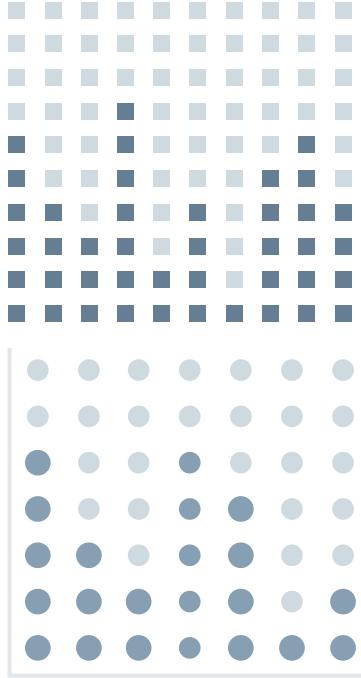












resize
change the stroke and fill color
Flaticon's extension

paint bucket/pen



