# Analyzing Incidence Rates Between COVID-19 Cases and the Number of Flights from March-August of 2021

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GIS 5571

Final Project

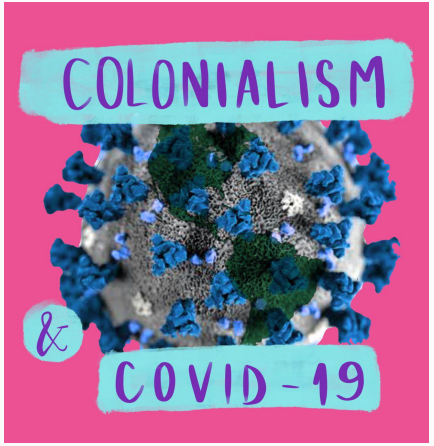
# Problem Statement

- Visualize and analyze the incidence rates between COVID-19 deaths, the number of flights and demographic variables during spring and summer of 2021 (specifically March through August of 2021)
- Included Hawaii and Puerto Rico in my analysis to attempt to make a commentary on and bring awareness to the ongoing state of settler colonialism in which Hawaii and Puerto Rico reside

# Problem Context



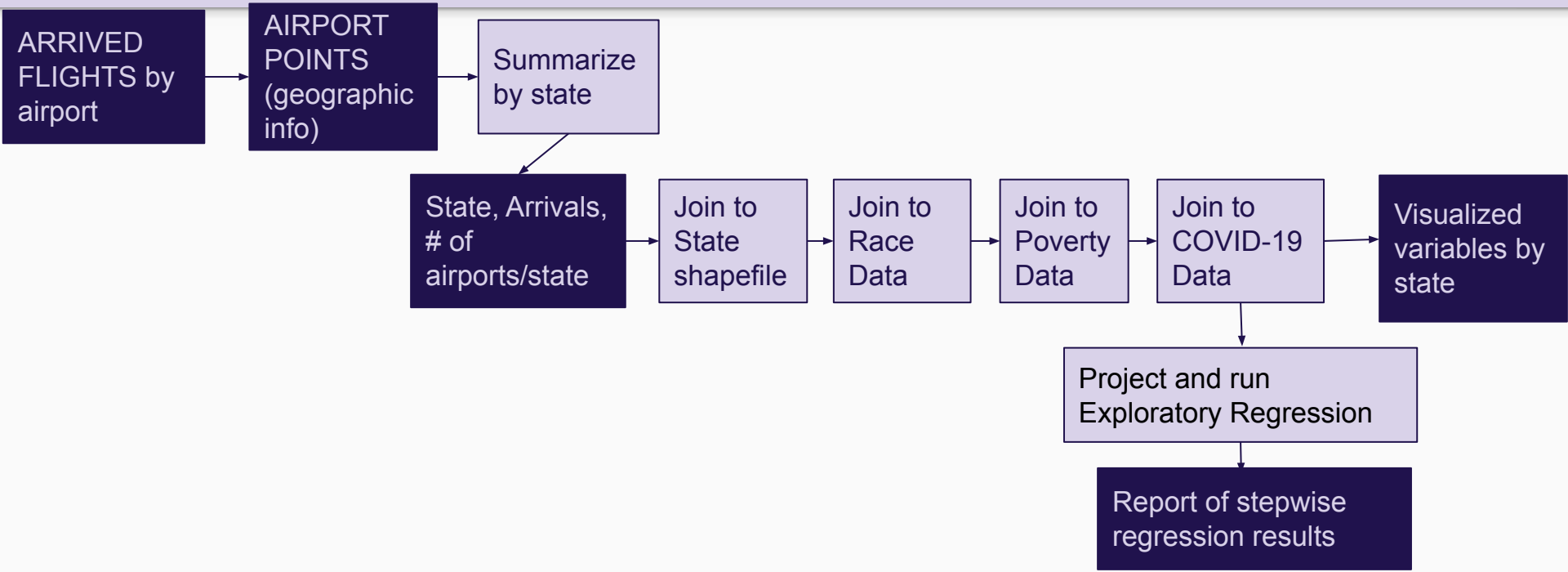
- The COVID-19 pandemic has underscored existing disparities and the impact of the pandemic has largely hit people with marginalized identities
- Study that I looked at for inspiration did not include areas outside of the continental United States
- The economies in Hawaii and Puerto Rico are reliant on tourism
- Both areas have been colonized by the United States and lack of care for spreading the virus is representative of ongoing effects of colonization



# Input Data

| # | Title | Purpose in Analysis | Link to Source |
|---|---|---|---|
| 1 | Covid new deaths and new cases and by state | Dependent Variable in Stepwise Regression | CDC COVID Data |
| 2 | Demographics<br>1. Race (white and Native)<br>2. People with income below 125% of the poverty level | Demographics have had a known impact on who is affected by the COVID-19 pandemic. It is likely they would have significant impact on deaths. | 1. 2020 Census<br>2. ACS 2019 1-Year estimate |
| 3 | Number of Arrived Flights/month | Main independent variable of interest. | Bureau of Transportation Statistics |

# Methods: Data Flow Diagram

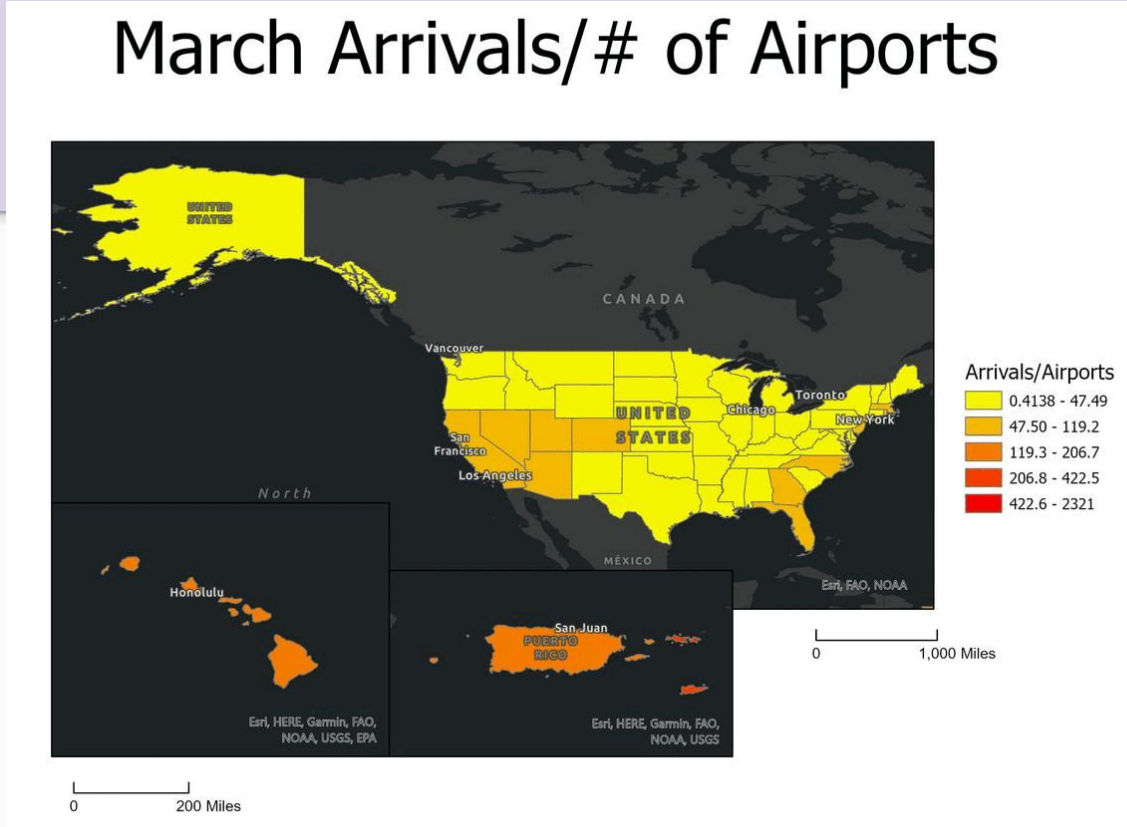


# Initial Results

Summary:

- Hawaii and Puerto Rico are in the mid to high categories most months

- Exceptions: July and August in Puerto Rico



# State Verification: Regression Analysis

(* = 0.10; ** = 0.05; *** = 0.01)

**March Dependent Variable: New Deaths**

| Model | Adj$R^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.48 |
| -ARR_FLIGHTS<br>+NATIVE<br>+BELOW_125*** | 0.79 |
| -ARR_FLIGHTS<br>+BELOW_125***<br>-WHITE<br>+NATIVE | 0.79 |

**March Dependent Variable: New Cases**

| Model | Adj$R^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.54 |
| +ARR_FLIGHTS<br>+WHITE***<br>-NATIVE** | 0.78 |
| +ARR_FLIGHTS*<br>-BELOW_125<br>+WHITE***<br>-NATIVE* | 0.78 |

**April Dependent Variable: New Deaths**

| Model | Adj$R^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.54 |
| +BELOW_125*<br>+ARR_FLIGHTS<br>+WHITE | 0.74 |
| +BELOW_125*<br>+ARR_FLIGHTS<br>+WHITE<br>+NATIVE | 0.73 |

**April Dependent Variable: New Cases**

| Model | Adj$R^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.44 |
| -BELOW_125**<br>+ARR_FLIGHTS<br>+WHITE*** | 0.68 |
| -BELOW_125*<br>+ARR_FLIGHTS<br>+WHITE***<br>-NATIVE* | 0.69 |

# State Verification: Regression Analysis

(* = 0.10; ** = 0.05; *** = 0.01)

**May Dependent Variable: New Deaths**

| Model | Adj$R^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.59 |
| +WHITE***<br>-NATIVE<br>+ARR_FLIGHTS | 0.75 |
| +WHITE***<br>-NATIVE<br>+ARR_FLIGHTS<br>-BELOW_125 | 0.74 |

**May Dependent Variable: New Cases**

| Model | Adj$R^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.72 |
| +WHITE***<br>+ARR_FLIGHTS***<br>-BELOW_125** | 0.87 |
| +WHITE***<br>-NATIVE*<br>+ARR_FLIGHTS***<br>-BELOW_125** | 0.88 |

**June Dependent Variable: New Deaths**

| Model | Adj$R^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.68 |
| +ARR_FLIGHTS<br>+WHITE***<br>+NATIVE | 0.79 |
| +ARR_FLIGHTS<br>+WHITE***<br>+NATIVE<br>+Below_125 | 0.78 |

**June Dependent Variable: New Cases**

| Model | Adj$R^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.73 |
| +ARR_FLIGHTS***<br>-NATIVE<br>+BELOW_125 | 0.74 |
| +ARR_FLIGHTS***<br>+WHITE<br>-NATIVE<br>+BELOW_125 | 0.73 |

# State Verification: Regression Analysis on Deaths

(* = 0.10; ** = 0.05; *** = 0.01)

**July Dependent Variable: New Deaths**

| Model | $AdjR^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.50 |
| +ARR_FLIGHTS<br>-NATIVE<br>+BELOW_125 | 0.49 |
| +ARR_FLIGHTS<br>-WHITE<br>-NATIVE<br>+BELOW_125 | 0.48 |

**July Dependent Variable: New Cases**

| Model | $AdjR^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.57 |
| +ARR_FLIGHTS<br>-NATIVE<br>+BELOW_125 | 0.58 |
| +ARR_FLIGHTS*<br>-WHITE<br>-NATIVE<br>+BELOW_125 | 0.58 |

**August Dependent Variable: New Deaths**

| Model | $AdjR^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.34 |
| +ARR_FLIGHTS<br>-NATIVE<br>+BELOW_125 | 0.37 |
| +ARR_FLIGHTS<br>-WHITE<br>-NATIVE<br>+BELOW_125 | 0.36 |

**August Dependent Variable: New Cases**

| Model | $AdjR^2$ value |
|---|---|
| +ARR_FLIGHTS*** | 0.68 |
| +ARR_FLIGHTS<br>-WHITE<br>+BELOW_125** | 0.73 |
| +ARR_FLIGHTS*<br>-WHITE***<br>-NATIVE*<br>+BELOW_125*** | 0.74 |

# Discussion and Future Studies

Discussion:

- State-level analysis showed that flights had more of an impact than using county-level analysis
- Flights are probably not the best predictor of COVID spread because people leave the area that an airport is located
- New cases showed more correlation with **arrivals alone** than new deaths did

Future studies:

- Adding in more demographic variables
- Having more knowledge about statistical analyses

# Questions?