Phase 3 Report

COVID-19 Vaccination, Outcomes & Hesitancy Visualization System
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GitHub Repo Link:

https://github.com/Burned357Waffles/CSC-805-Group-Visualization-Project

System Architecture:

We build our system as a modern client-side interactive data visualization dashboard using:

Frontend Framework:
- React for modular UI components
- Vite for fast build and bundling
- Tailwind CSS for responsive, utility-first styling

Visualization Library:

We used Recharts for line charts, scatterplots, choropleths, timelines, lagged comparisons, and bubble visualization.

State Management:

We built a lightweight view-level management using React's built-in useState, useMemo, and useEffect.

Data Pipeline:

We stored all the real COVID-19 data locally as CSV or JSON and loaded it through a custom parsing layer:
1. nat_week.csv: National-level weekly cases, deaths, vaccination coverage.
2. state_week.csv: State-level weekly values like vaccinations, cases, deaths, and hesitancy
3. state_week_fact.csv: State-level hesitancy and uptake relationship data.
4. state-10m.json: U.S. state boundaries for choropleth

Key Architectural Decisions:
- To avoid mock data in the final pipeline, all visual views now use the real CDC-derived dataset.
- We used memoization (i.e., useMemo) to avoid expensive recalculations and ensure smooth interactivity.
- Our system supports a complete 126-week timeline, where appropriate, for the State Profile and Hesitancy vs Uptake.
- We used a clean, complete separation between the data, logic, and presentation layers.

Dataset:

Our visualization system uses a clean CSC dataset that consists of:

Nat_week.csv:

For every 50 states
- Weekly Vaccination %
- Weekly cases per 100k
- Weekly deaths per 100k
- Weekly hesitancy percentage
- Week index from 1-126 and the ISO date

State_week_fact.csv:
- State-level hesitancy
- Vaccination coverage
- Population scaling fields

States-10m.json:

This is a GeoJSON state polygons that enables choropleth mapping

Data Cleaning:
- We ensured consistent ISO week formatting
- We filled the missing early weeks with a 0
- We normalized the state codes to a USPS two-letter format
- We validated the week numbering alignment across all the datasets
- We also smoothened the outliers for optional toggling

System Description:

We can divide our system into four analytical views, where each of them targets a specific part of the COVID-19 vaccination story.

Overview View:

National snapshot with time brush. Units: cases & deaths per 100k (weekly). "Coverage" = % with any dose. "Hesitancy" = estimated probability of saying 'probably/definitely not'.

Filters

State
All states

Outcome
Cases / 100k | Deaths / 100k

Selected week
Week 52 of 126

Apply | Clear

Vaccination (Any Dose) %
82.8% ~ +1.0%

Week ending 2021-12-08

Share of population with any vaccine dose.

Cases / 100k (weekly)
252.4 /100k ~ +70.7

Week ending 2021-12-08

Deaths / 100k (weekly)
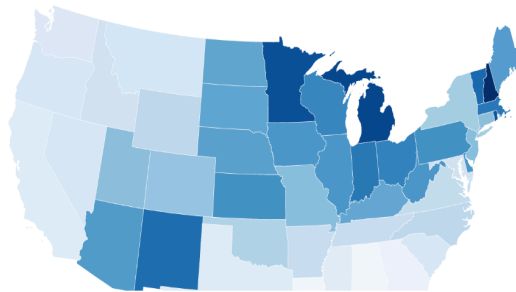**2.6** /100k ~ +0.47

Week ending 2021-12-08

Hesitancy % (CDC est.)
15.6%

Latest estimate

US by State — Cases per 100k (Week ending 2021-12-08)

Hover for values

Filters

State
All states

Outcome
Cases / 100k | Deaths / 100k
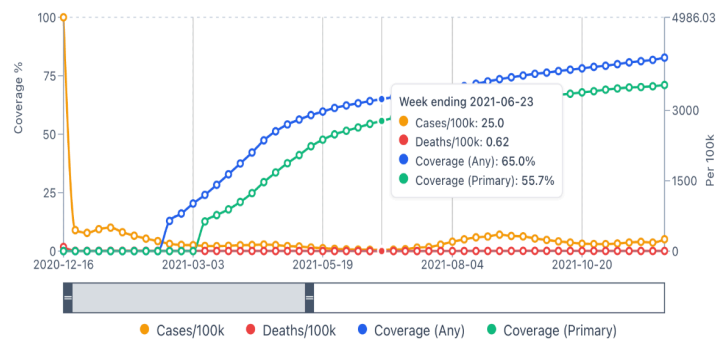
Selected week
Week 52 of 126

Apply | Clear

National Timeline — Cases, Deaths, and Vaccination Coverage

National Timeline — Cases, Deaths, and Vaccination Coverage

Week ending 2021-06-23
- Cases/100k: 25.0
- Deaths/100k: 0.62
- Coverage (Any): 65.0%
- Coverage (Primary): 55.7%

Coverage %: 100, 75, 50, 25, 0
Per 100k: 4986.03, 3000, 1500, 0
2020-12-16   2021-03-03   2021-05-19   2021-08-04   2021-10-20

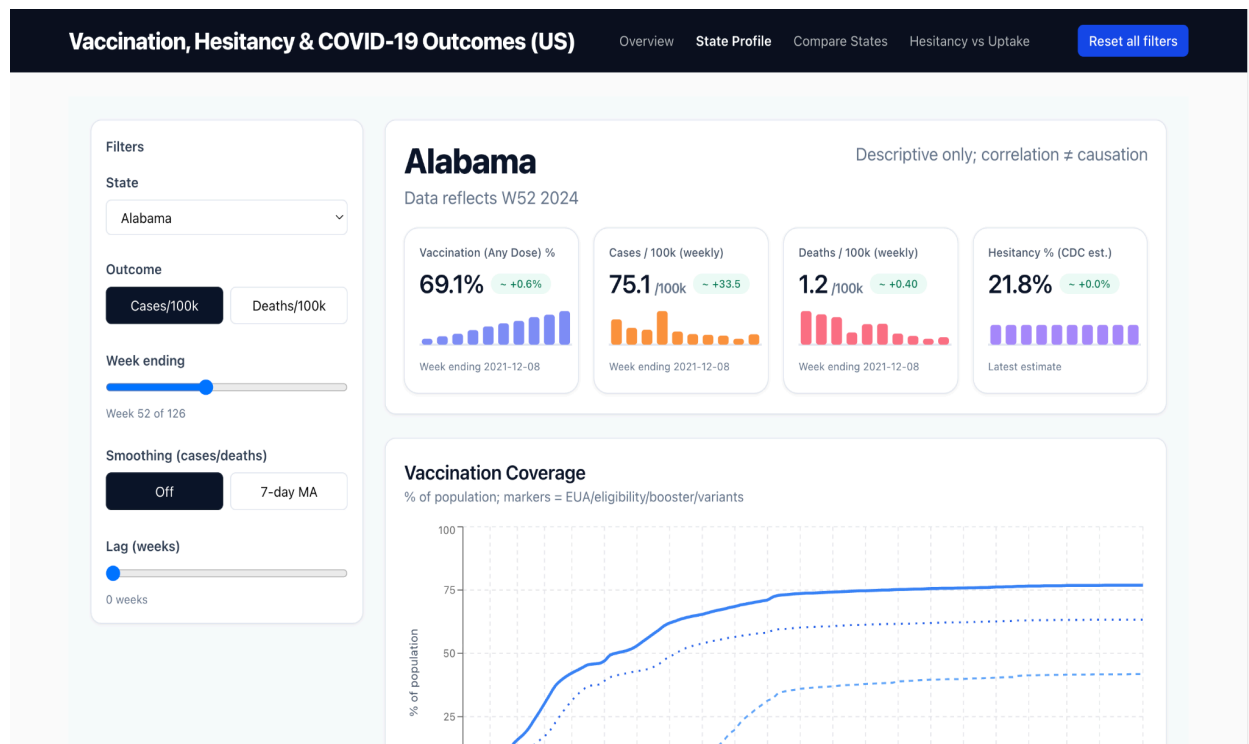Legend: Cases/100k | Deaths/100k | Coverage (Any) | Coverage (Primary)

Use the brush to adjust the timeframe shown in KPIs and map.
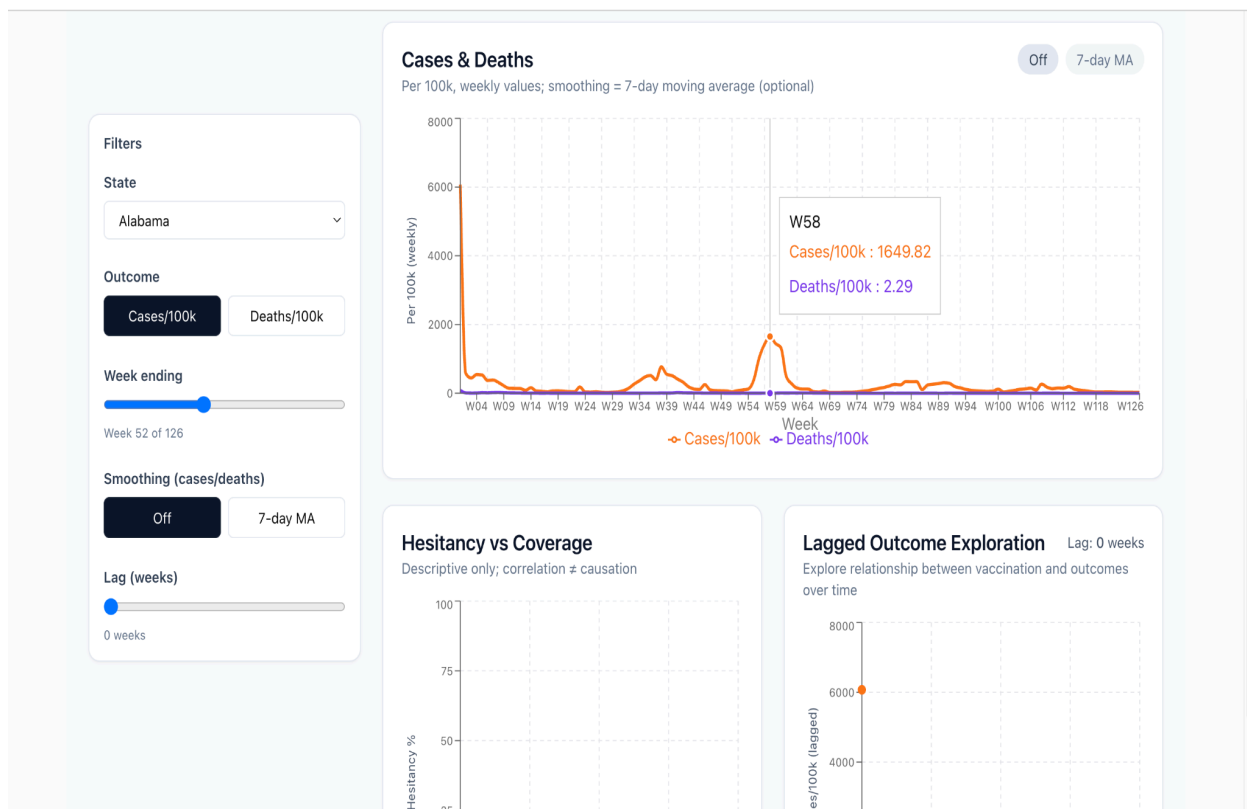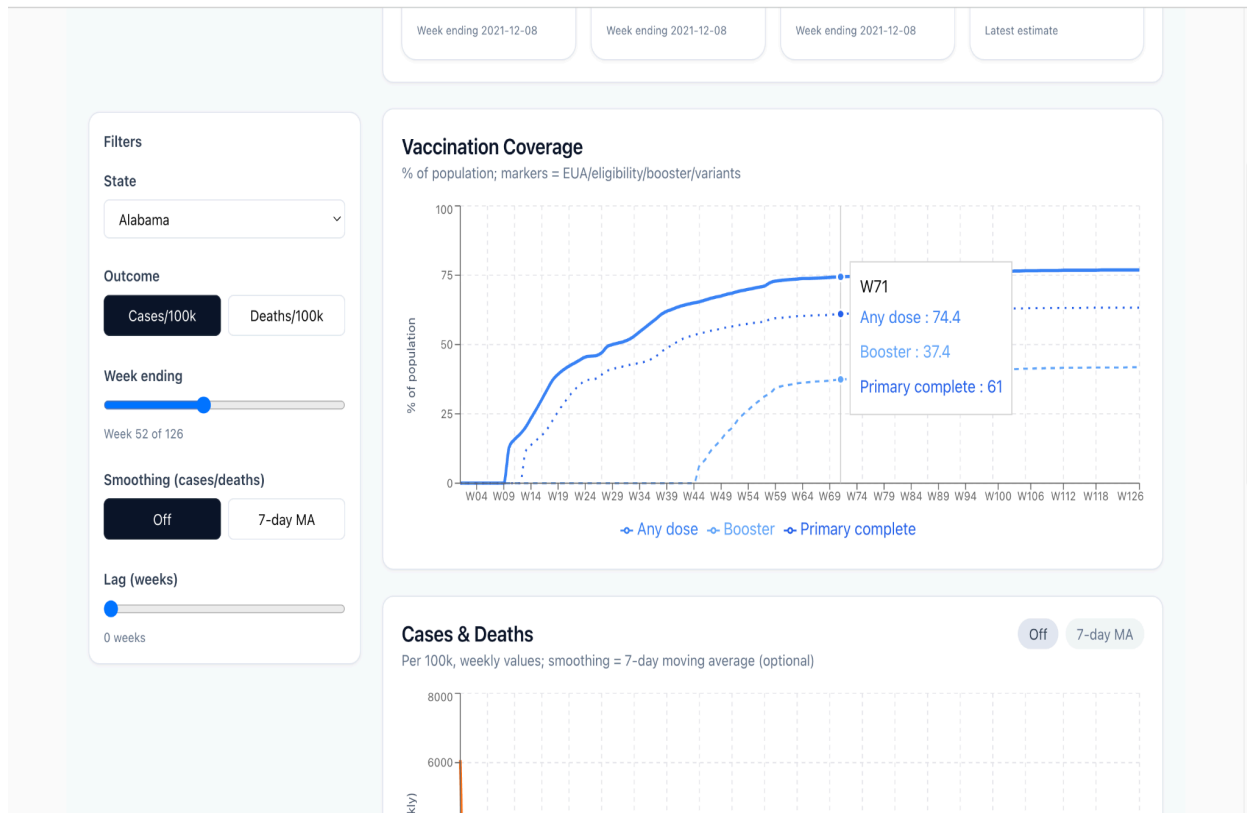
Sources: CDC COVID Data Tracker, NCHS, HHS. Accessibility: visible focus indicators; legends labeled; color-blind safe palette.

The overview state shows national KPI's and timeline trends. This enables outcome switching and brushing through time. This view helps users to understand the broad temporal patterns of COVID-19 before diving into the state data. The Overview view shows the national-level picture of the COVID-19 trends:

- Select the outcome that is Cases or Deaths per 100k
- Scrub through any of the 126 weeks of data
- View KPIs for vaccination %, cases, deaths, and hesitancy
- Explore the national timeline with an interactive brush for more control.

State Profile View:

Week ending 2021-12-08   Week ending 2021-12-08   Week ending 2021-12-08   Latest estimate

Filters

State

Alabama

Outcome

Cases/100k | Deaths/100k

Week ending

Week 52 of 126

Smoothing (cases/deaths)

Off | 7-day MA

Lag (weeks)

0 weeks

Vaccination Coverage

% of population; markers = EUA/eligibility/booster/variants

W71
Any dose : 74.4
Booster : 37.4
Primary complete : 61

↗ Any dose ↗ Booster ↗ Primary complete

Cases & Deaths

Per 100k, weekly values; smoothing = 7-day moving average (optional)

Off | 7-day MA

Cases & Deaths

Per 100k, weekly values; smoothing = 7-day moving average (optional)

Off | 7-day MA

W58
Cases/100k : 1649.82
Deaths/100k : 2.29

Week

↗ Cases/100k ↗ Deaths/100k

Filters

State

Alabama

Outcome

Cases/100k | Deaths/100k

Week ending

Week 52 of 126

Smoothing (cases/deaths)

Off | 7-day MA

Lag (weeks)

0 weeks

Hesitancy vs Coverage

Descriptive only; correlation ≠ causation

Lagged Outcome Exploration   Lag: 0 weeks

Explore relationship between vaccination and outcomes over time

The state profile view displays a detailed per-state profile that combines real weekly vaccination data, hesitancy, and outcome. This view provides detailed per-state trends across all 126 weeks, including smoothing, lag, and KPI summaries. So, it gives a comprehensive state-level account of COVID-19 vaccination and outcomes. The User can:

- Choose any U.S. state for viewing
- Navigate through the **full 126-week history of COVID-19 data**
- Compare vaccination trajectories of each state in detail
- Enable smoothing for noisy outcome curves
- Review KPIs that show week-to-week changes in the dataset

Compare States View:

Filter Options

States (2/10)

● California ✕   ● Texas ✕

Add states...   **Add**

Outcome (for charts)

Cases per 100k (weekly)

Deaths per 100k (weekly)

Lag (applies to outcomes in Bubble chart)

4 wks

Time Range (Weeks)
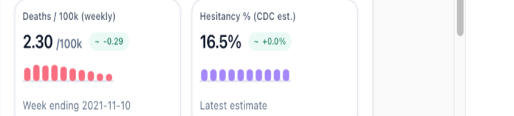
W48
W126

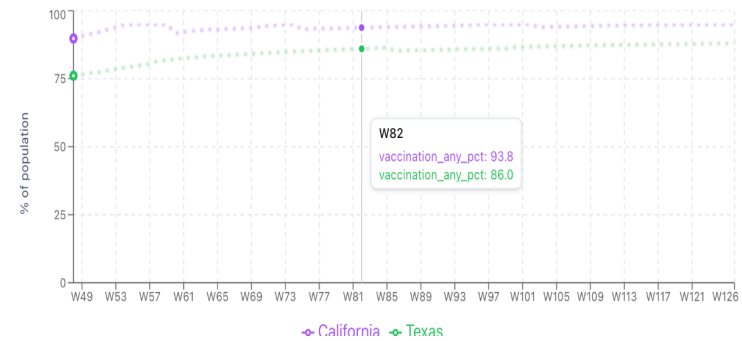**Play** Speed Normal ▾   Week W48

Apply Filters   Clear

California

Vaccination (Any Dose) %	Cases / 100k (weekly)
89.8% ~ +0.8%	**111.2** /100k ~ +1.2
Week ending 2021-11-10	Week ending 2021-11-10

Deaths / 100k (weekly)	Hesitancy % (CDC est.)
1.35 /100k ~ +0.22	**9.7%** ~ +0.0%
Week ending 2021-11-10	Latest estimate

Texas

Vaccination (Any Dose) %	Cases / 100k (weekly)
76.1% ~ +0.4%	**80.5** /100k ~ +1.6
Week ending 2021-11-10	Week ending 2021-11-10

Deaths / 100k (weekly)	Hesitancy % (CDC est.)
2.30 /100k ~ -0.29	**16.5%** ~ +0.0%
Week ending 2021-11-10	Latest estimate

Vaccination %

W82
vaccination_any_pct: 93.8
vaccination_any_pct: 86.0

% of population

W49 W53 W57 W61 W65 W69 W73 W77 W81 W85 W89 W93 W97 W101 W105 W109 W113 W117 W121 W126

─○─ California ─○─ Texas

Cases per 100k

W87
cases_per_100k: 244.5
cases_per_100k: 230.4

Weekly cases per 100k

W49 W53 W57 W61 W65 W69 W73 W77 W81 W85 W89 W93 W97 W101 W105 W109 W113 W117 W121 W126

─○─ California ─○─ Texas

Deaths per 100k

Weekly deaths per 100k

W49 W53 W57 W61 W65 W69 W73 W77 W81 W85 W89 W93 W97 W101 W105 W109 W113 W117 W121 W126

─○─ California ─○─ Texas

Filter Options

States (2/10)

● California ✕   ● Texas ✕

Add states...   **Add**

Outcome (for charts)

Cases per 100k (weekly)

Deaths per 100k (weekly)

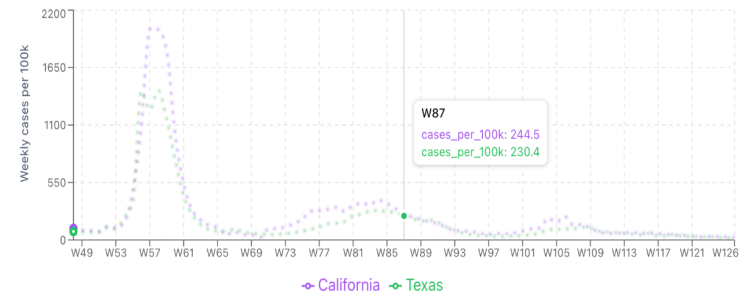Lag (applies to outcomes in Bubble chart)

4 wks

Time Range (Weeks)
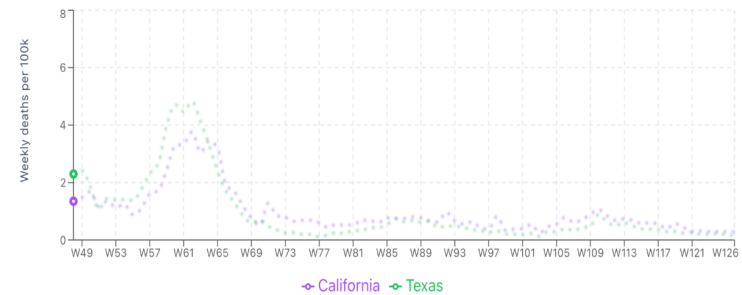
W48
W126

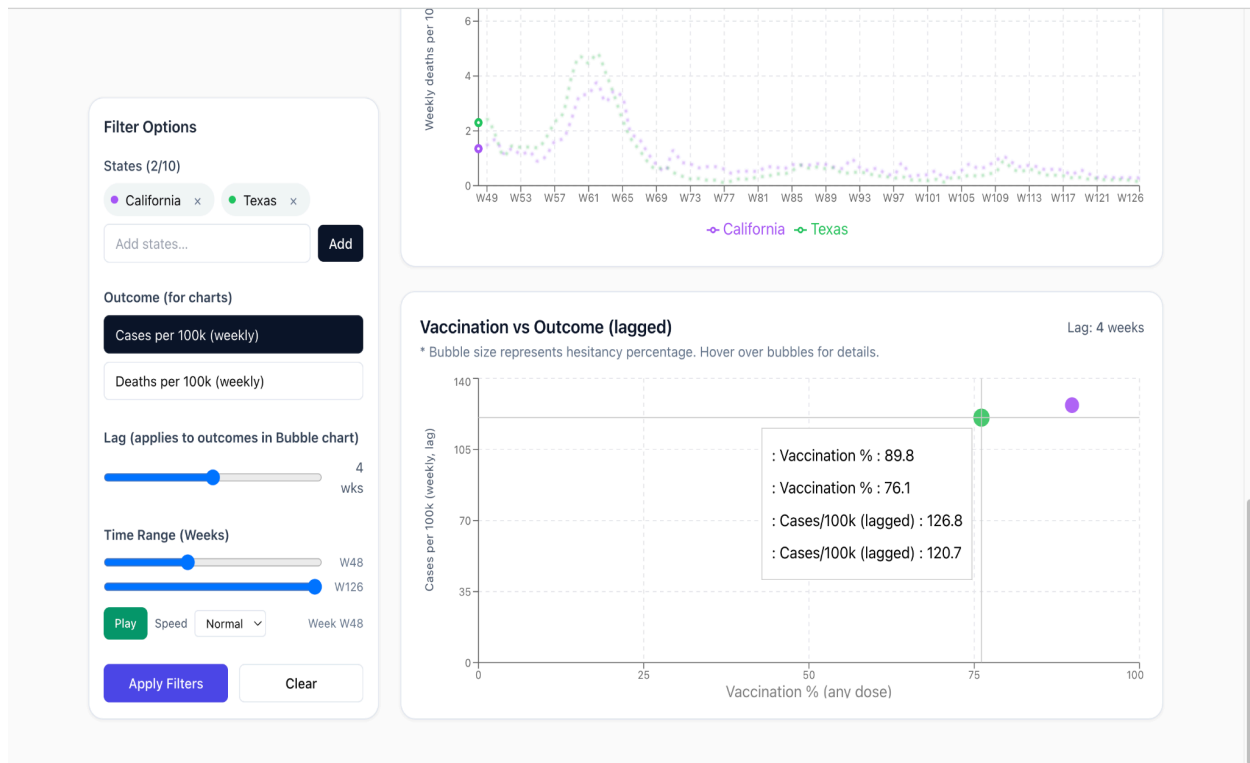**Play** Speed Normal ▾   Week W48

Apply Filters   Clear

The compare states allow users to view multiple states on the same chart. All the charts and the filter sliders in the view use real 126-week data. The compare states view allows users to:

- Select multiple states to compare or view them simultaneously
- Compare vaccination coverage, cases, and deaths
- Animates the week-by-week progression of each state
- Explore lagged relationships with a chart

Hesitancy vs Uptake View:

Filters

States (5)

- California ×
- Texas ×
- Florida ×
- New York ×
- Pennsylvania ×

Add states...   Add

Select common sets:

Top 5 by population   Pacific
Northeast   Southeast
Mountain

Clear set

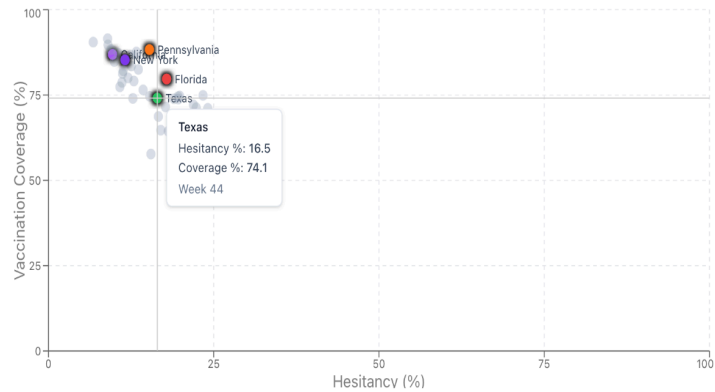### Coverage metric

Any dose

Week ending

Week 44 of 126

☐ Scale bubbles by population
☑ Label selected states

State Scatter — Hesitancy % vs Vaccination % (Week 44)   Trend line (OLS): r = -0.79, p = 0.00, n = 49

Texas
Hesitancy %: 16.5
Coverage %: 74.1
Week 44

Selected States (5)
— CA   — TX   — FL   — NY   — PA

Longitudinal Paths — Hesitancy % → Coverage % Over Time (Ends Week 44)

Selected States (5)
— CA   — TX   — FL   — NY   — PA

Filters

States (5)

- California ×
- Texas ×
- Florida ×
- New York ×
- Pennsylvania ×

Add states...   Add

Select common sets:

Top 5 by population   Pacific
Northeast   Southeast
Mountain

Clear set

Coverage metric

Any dose

Week ending

Week 44 of 126

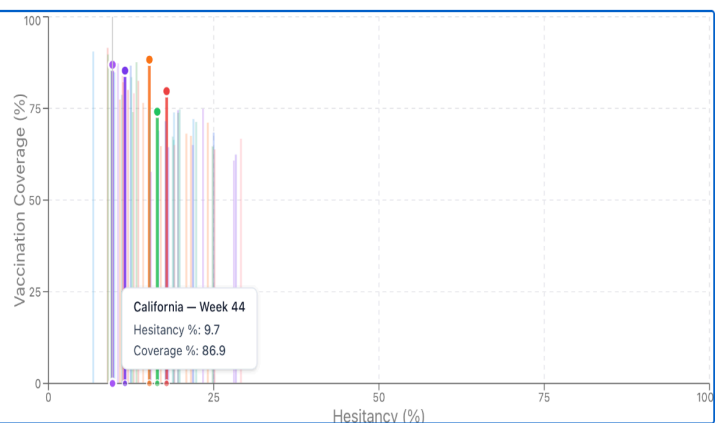☐ Scale bubbles by population
☑ Label selected states

Apply Filters   Reset

Longitudinal Paths — Hesitancy % → Coverage % Over Time (Ends Week 44)

California — Week 44
Hesitancy %: 9.7
Coverage %: 86.9

Selected States (5)
— CA   — TX   — FL   — NY   — PA

This view focuses on population-level behavioral patterns and helps users identify correlations in public response and vaccination behavior. It supports behavioral analysis and shows multiple state clusters and longitudinal trajectories. The view includes:

- Hesitancy vs vaccination uptake scatterplot
- Longitudinal hesitancy-to-uptake paths
- Optional bubble-size scaling based on state population
- Week selection across the full 126-week timeline

Video Project Demo:

https://youtu.be/WI6_ECku_mw

Individual Work Report:

- Amer Music
  - Created the 4 pages and data visualization elements (charts, kpi ribbon, filter rail.
  - Modified initial data cleaning.
  - Aided with the backend
- Preet Vithani
  - I worked on data cleaning and preprocessing, helped implement and refine the Compare States and State Profile pages, and updated both views to support the full 126-week dataset. I did some general debugging, worked on the project report, and recorded the demo video.
- Brandon Watanabe
  - I modified the data cleaning script to work with our datasets. Worked on the Hesitancy Vs Uptake page, modified the choropleth map on the Overview page for clarity, and fixed some bugs on the other pages.