Using Novel, Hyperlocal Data to Increase Adult Vaccine Uptake Across the US

Background and Objectives

Despite the availability of safe and effective vaccines to help protect against serious outcomes from respiratory diseases, US adult vaccination rates remain below national goals. Traditional outreach efforts often fail to address localized barriers to vaccine acceptance, access, and uptake.

To address this issue, the National Foundation for Infectious Diseases (NFID) and Fraym partnered on a pilot project to deliver novel, hyperlocal insights to public health stakeholders working to increase vaccine uptake across the US. The pilot project focused on mapping US adult intent to get vaccinated against **COVID-19**, **influenza (flu)**, **respiratory syncytial virus (RSV)**, and **pneumococcal disease** using data produced through a nationally representative survey of US adults. The data were made available for every state, county, and ZIP code in the US through a user-friendly **US Vaccine Uptake Dashboard**.

The pilot project was developed with a steering committee including representatives from NFID partner organizations, the Association of Immunization Managers (AIM) and the National Association of County and City Health Officials (NACCHO). The goal of the project is to assist those on the frontlines in allocating resources to deploy effective approaches to public health outreach and service delivery.

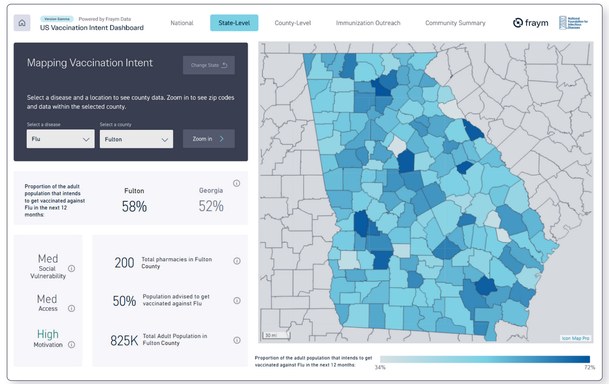
Dashboard Overview

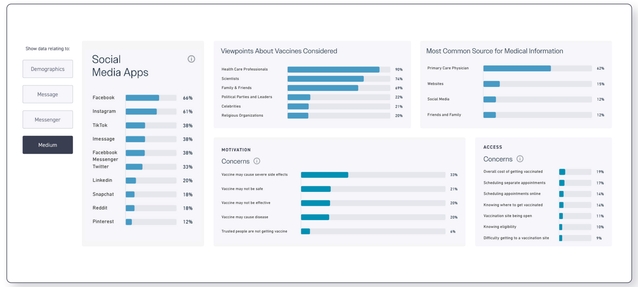
KEY FEATURES

- Compare intent among US adults to get vaccinated against 4 respiratory diseases
- Track community vulnerability and overall access and motivation barriers
- View data specific to the geography of interest at the state, county, and ZIP code levels:

  Demographics: Household income, educational attainment, age groups, poverty status, race/ethnicity, language spoken
  Message: Concerns related to access and motivation, beliefs and worries around infectious diseases, access to medical care
  Messenger: Viewpoints about vaccines considered, most trusted source for vaccine-related information, location of most recent vaccinations, most common source for medical information
  Medium: Most common source for information about local or national issues, news channels visited, social media applications used, streaming services used

- High-level community summary page displays the most relevant information for the geographic area and subpopulation specified





Methodology

DATA PRODUCTION

Data was produced through a large, nationally representative survey of 16,737 respondents age 18 years and older during September–October of 2024.

Demographic Breakdown of Survey Respondents	
National-Level Statistics	Proportion of Adults (18+)
AGE	
Ages 18-34	30%
Ages 35-54	49%
Ages 65+	21%
GENDER	
Male	49%
Female	51%
RACE/ETHNICITY	
White	67%
Black	14%
EDUCATION	
High school or less	37%
Some college	21%
College degree or higher	42%
HOUSEHOLD INCOME (ANNUAL)	
Less than $50,000	40%
Between $50,000 and $100,000	30%
Over $100,000	30%

To ensure representation, a stratified sampling approach was used, dividing the US into more than 80 strata—each representing distinct population groupings. Adults age 18 years and older were then surveyed across approximately 3,000 ZIP codes. The survey design included interlocking quotas across key dimensions—geography, age/gender, education, income, and race/ethnicity—to ensure representation at geographic, socioeconomic, and demographic levels.

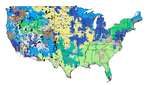
The survey responses serve as training data for Fraym machine learning models, which use hundreds of covariates to generate ZIP code-level estimates for each indicator. These can then be aggregated to any higher geographic level such as state and county.

Data Collection:
Initial Covariates: 683
Sampling Units: 32,931
Sampling Unit: ZIP code
Data Sources: US Census Bureau

Covariate Types:
- 2020 Decennial Census
- Land Area/Water Area
- Educational Attainment
- Income
- Urban/Rural Land use

STRATIFICATION

Fraym uses a novel approach to subdivide the country into near homogeneous groups at the ZIP code level.



RANDOM SAMPLING

Within each stratum, random sampling occurred twice at two different hierarchical levels.

Zip Code Selection

Level 1: Within each stratum, ZIP codes are randomly selected.

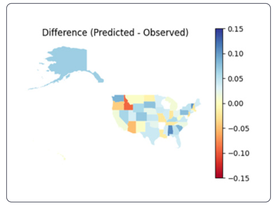
Respondent Selection

Level 2: Within each ZIP code, respondents are randomly selected.

Training Data Evaluation: Rigorous assessment of training data sample sizes ensured sufficient coverage and representativeness across strata and demographic groups.

Model Performance Monitoring: Standard metrics, including Root Mean Squared Error (RMSE), were tracked to evaluate model accuracy. Spatial validation is also performed by comparing modeled values to observed values at both the strata and state levels.

External Benchmarking: Model outputs have been compared to external sources, including US Census data and the most recent Centers for Disease Control and Prevention (CDC) National Immunization Surveys. For demographic variables, quotas were calibrated to closely match Census benchmarks (e.g., age, race, and educational attainment). Vaccination indicators were aligned closely with external datasets in terms of timing and question wording, acknowledging the inherent challenges in matching immunization data across sources.

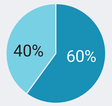


Stakeholder Feedback

As of April 2025, there have been 564 requests for access, 255 users have logged in, and 65 users have logged in more than once.
User comments include:

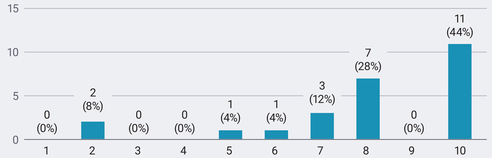
- Useful for public health officials in filling gaps left by incomplete state immunization records, especially where reporting is not mandated
- Value in identifying motivators and barriers to vaccination—data often unavailable through other means or typically anecdotal
- Used to craft data-informed community health messaging and promotional strategies. Examples include filming local provider videos, organizing educational events, and shaping policy conversations around vaccine access and trust
- Health departments and advocacy groups have relied on the dashboard to support focus group development, inform grant work, and build public health case studies
- Data factsheets for use in legislative advocacy and community outreach

How would you rate the overall usability of the US Vaccine Uptake Dashboard?



How has the US Vaccine Uptake Dashboard impacted your work?

On a scale of 0 to 10, how likely are you to recommend the US Vaccine Uptake Dashboard to a colleague?



ACKNOWLEDGMENTS

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National Foundation for Infectious Diseases

Scan to Request Access

www.nfid.org/us-vaccine-uptake-dashboard