FAQs

COVID-19 Vaccine Equity Planner

Ariadne Labs and Boston Children's Hospital

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About the Vaccine Equity Planner

What is the purpose of this tool?

In the national COVID-19 vaccination effort, state and county planners are seeking to reduce barriers to vaccination, such as geographic distance, vaccine hesitancy, historical injustice, language barriers, lack of paid time off work, and other factors. The over 50,000 active vaccination sites across the country are concentrated in population centers, leaving people in more sparsely populated areas without close geographic access. In addition, for those without access to a car, the travel time by walking or public transportation continues to be an access barrier. These rural and exurban “vaccine deserts” cannot be left behind if we are to reach the goal of 70% national vaccination.

The purpose of the Vaccine Equity Planner is to support local officials by identifying potential vaccination sites within vaccine deserts. For any given state, county, or local area, the tool shades the vaccine deserts according to travel time by car, public transit, or on foot, as selected by the user. The location and size of deserts varies based on the target age-group, as selected by the user. Within those deserts, the tool shows the location -- and specific address -- of potential sites for vaccine distribution, such as primary health care centers, Federally Qualified Health Centers, and pharmacies not already vaccinating. The user can also choose to see schools, retail sites, and places of worship as potential distribution points.

What is a vaccine desert?

This tool defines vaccine deserts as areas where people have limited geographic access to COVID-19 vaccinations. The user can define a desert as any area where travel time to the closest active vaccination site exceeds 15 or 30 minutes by car, 30 minutes by public transport, or 15 or 30 minutes walking.

Access can also be limited by other factors such as vaccine hesitancy, historical injustice, language barriers, or lack of paid time off work. This tool does not calculate deserts based on these other barriers, but we are considering future versions that may, given data availability.

What questions does this tool answer?

1. Where are the vaccine deserts in my state or zip code?
2. What facilities exist within the deserts that could potentially serve as vaccine distribution points, such as primary health care sites or pharmacies?
3. What are the exact locations and addresses of these potential facilities?
4. How are the deserts different according to mode of travel: drive, walk, or public transportation?
5. How are the deserts different according to the age-group requiring vaccination?
6. Which deserts have the highest social needs according to the CDC’s Social Vulnerability Index?
7. What percentage of people living in these areas lack health insurance?

Who should use this tool?

The tool aims to support decision-makers such as public health officials, health care providers, employers, researchers, community organizations and other stakeholders involved in COVID-19 vaccination. It is for anyone looking for scenarios that support equitable geographic access to vaccination. It is free and open to the public.

If you are looking for a COVID-19 vaccine near you, please visit Vaccines.gov.

How do I navigate this tool?

To start, select a state or enter a zip code in the top dropdown menus. The map of your selected area will appear, with the vaccine deserts shaded in orange.

Under "Select age group," select the target age-group for vaccination. The map will adjust to show vaccine deserts specifically for the selected age-group.

Under "Assess vulnerability," select a radio button to filter the map by social vulnerability. For example, when "High social vulnerability" is selected, the map will only show deserts in counties with high Social Vulnerability Index (SVI), a CDC metric explained in more detail below. Counties are divided into quintiles by SVI: the ⅖ of counties with the lowest SVI scores are classified as "low social vulnerability," the ⅖ with the highest scores as "high social vulnerability," and the middle ⅕ as "moderate social vulnerability."

Under "Shade vaccine deserts," select the option to shade counties by the percent of residents without health insurance, or choose to shade all deserts the same color.

Under "Set definition of vaccine desert," select a travel mode: drive, walk, or public transit. Under walk, select 15- or 30-minute travel times. These selections will change the size and shape of the shaded vaccine desert areas on the map accordingly.

Finally, under "Find potential new sites in vaccine deserts," select the types of sites you would like displayed on the map. Hover over each site to display its type and address.

In this way, once you have identified your vaccine deserts and areas of focus (SVI), you can consider potential solutions from the sites displayed.

Why is the data at the county level? We need hyper-local guidance.

The Vaccine Equity Planner is based on data that we have sufficient confidence in. We hope to add more granular data in future versions, including smaller geographic units where possible.

Why did you build this? There are so many COVID-19 maps already available.

To our knowledge, no other tool detects vaccine deserts and pinpoints potential new vaccination sites within those deserts. Most COVID-19 tools focus on past or current states of the epidemic, such as new or cumulative infections, death rates, or previous policy changes. Some provide statistically modeled projections of the future course of the pandemic, which can be very useful for planners but are highly complex and often not very specific. By contrast, the Vaccine Equity Planner takes a concrete forward-looking perspective, informing the specific, short-term decisions that planners will be making as we move into a high-supply, lower-demand phase of the vaccine rollout.

Also, the Vaccine Equity Planner is free, open-source, and based on publicly available data, while many comparable tools are proprietary, do not use public datasets, or have limited access. Many health departments and municipal governments have restricted budgets for the kinds of technical tools that can assist in the vaccine rollout, so we built our tool using philanthropic funds in order to keep it free for the users.

What about Puerto Rico and other US territories?

We are striving to include as much of the US as possible but are constrained by data availability. For Puerto Rico and the US territories, we have located many of the data sources needed to include them in the Vaccine Equity Planner, but some sources are more difficult to access. We are planning to add these regions to the site as soon as we can.

Data sources

Current active vaccination sites

The list of active vaccination sites comes from VaccineFinder and Google, and is sourced from authoritative databases from the government, retail pharmacies, and data aggregators. Information about the specific vaccine series offered at each site allows us to identify which age-groups the site serves. While these locations have been verified as vaccine delivery points, users should confirm directly with each site for the most up to date information about vaccine availability.

Catchment areas around current sites

The team at Google calculates the catchment areas around each current site. To do so, they first divide the territory of each county into squares of approximately 600m x 600m. The vaccination sites (destinations) and the starting points of a journey (sources) are snapped to centers of these squares. They compute point-to-point estimates of travel time and distance between the centers of these squares.

Finally, to compute the catchment area boundaries they do the following for each vaccination site:

- Using Google Maps' Directions API they compute the travel time and distance required to reach that site from a plurality of 600m x 600m squares in its vicinity (up to a radius of 50 km).
- To compute the catchment boundary for a particular mode of transport and particular travel time threshold:
    - They compute the union of all the squares in the vicinity of the site, from which the facility can be reached using the chosen transportation mode within the chosen travel time limit.
    - They draw a boundary circumscribing the union of these squares.
    - To optimize the data, They smooth the boundary while minimizing the distortion of the original shape.

The full boundary dataset is available on the github COVID-19 open data repository.

Potential new sites

The data for potential new sites were collected through open source data, as shown in table 1.

Table 1: Data sources for potential new sites

Type of site	Link to data source	Notes
Primary care clinics	National Plan and Provider Enumeration System (NPPES), NPI Downloadable File, Medicare Provider Utilization and Payment Data Health Landscape Pediatric file	We use the "Primary Practice Address" from NPPES to locate primary care clinics. We attempt to identify active clinics by selecting only primary care physicians with a record of services provided to Medicare beneficiaries based on the 2018 Medicare Provider Utilization file. In cases where there is no record of services provided to Medicare beneficiaries, we consider a location valid only if it's associated with more than one provider in the NPPES. Some of these sites do not have names in the data, only the type of facility (primary health care, pediatrics, family medicine, etc.) and location. We show the site name wherever possible. We also use data provided by Health Landscape to locate active pediatric clinics. Health Landscape sources practice locations using linked records from NPPES, the AMA physician masterfile and the Medicare PECOS file. Public link not available.
Federally Qualified Health Centers	HRSA Data Warehouse, All Health Center Sites	Many FQHCs already offer COVID-19 vaccines. Our algorithms select only those FQHCs not already vaccinating and located in vaccine deserts.
Pharmacies	Rx Open	Many pharmacies already offer COVID-19 vaccines.

		Our algorithms selected only those pharmacies not already vaccinating and located in vaccine deserts.
Retail sites	Infogroup US Historical Business Data, Harvard Dataverse	We have not vetted this dataset for the size or activity level of retail sites. Some may not be appropriate for vaccine distribution. Public link not available.
Places of worship	Homeland Infrastructure Foundation-Level Data (HIFLD), All Places Of Worship	We have not categorized these places of worship by faith tradition, or vetted this dataset for the size or activity level of congregations. Some places of worship may not be appropriate for vaccine distribution.
Schools	National Center for Education Statistics, School Locations & Geoassignments	
Urgent care facilities	Homeland Infrastructure Foundation-Level Data (HIFLD), Urgent Care Facilities	

Social vulnerability

County-level Social Vulnerability Index (SVI) data were obtained from the 2018 CDC SVI, which is used to prioritize public health resources for communities with the greatest needs during and following emergencies. The CDC generates SVI scores from 0–1 for all 3,142 U.S. counties based on 15 population-based social determinants of health measures, categorized into one of four themes: socioeconomic status, household composition and disability, racial/ethnic minority status and language, and housing type and transportation.

Uninsured Rates

The percent of a county's residents under the age of 65 who are uninsured were sourced from the 2020 release of the U.S. Census Bureau's Small Area Health Insurance Estimates (SAHIE) program.

How often is the source data updated?

Table 2: Data update schedule		
	Update schedule	
Data	**At data source**	**On Vaccine Equity Planner**
Current active sites	Weekly on (day)	Weekly (day TBD, check time stamp on upper right of map.) Results in new travel catchment areas.
Potential new sites	None, static.	Sites in deserts are refreshed weekly with new

		catchment areas around the current active sites.
Social vulnerability	Every few years	None, static.
Uninsured rates	Annually	None, static.

Methodology

How were vaccine deserts determined?

We identify deserts using the catchment areas around active vaccination sites. Each week, the team at Google provides the catchment areas around each active site for each mode of transportation and travel time. The catchment areas are provided as irregularly shaped polygons surrounding each site.

We determine deserts in three steps:

1. We take the union of all polygons that overlap each other.
   For example, if three vaccination sites serve one city and their catchment areas overlap, we draw a polygon around all three catchment areas to create a single unified polygon. This identifies all areas with access to at least one site by the selected travel mode and time. These are the “served areas.”
2. We take the inverse of the served areas.
   Our interest is in the places *without* access, so we then invert the polygons to identify areas outside the served areas, which we call “deserts.” Conceptually, this amounts to switching figure and ground on the map. This also allows the served areas to appear transparent on the map, allowing a clear view of the base map.
3. We intersect the desert polygon with county boundaries
   We would like to display certain county-level statistics such as SVI, so we divide up the desert polygons along county boundaries.

How did you categorize counties by SVI?

The CDC’s national county-level SVI represents each county’s percentile ranking, in terms of social vulnerability, across all counties in the United States. The CDC assigns counties to one of five SVI categories: very high vulnerability (0.8-1.0), high vulnerability (0.6-0.79), moderate vulnerability (0.4-0.59), low vulnerability (0.2-0.39), and very low vulnerability (0-0.19). Each group comprises exactly ⅕ of all counties in the United States. We combined the CDC’s “very high” and “high” categories into our “high” group, and the CDC’s “very low” and “low” categories into our “low” group. We kept the CDC’s “moderate” category as our “moderate” group.

Additional resources

Where can I find a COVID-19 vaccine near me?

Use Vaccines.gov to find a location near you, then call or visit the site's website to make an appointment.

Where can I read more research about vaccine deserts in the United States?

We invite you to read a scientific article by some of our colleagues here.

Who should I contact with questions or suggestions?

Please email us at vaccineplanner@ariadnelabs.org