

COVID-19 Vaccine Solutions Dashboard

Leveraging granular data to improve COVID-19 vaccination coverage in
Pima County, Arizona



March 29, 2022



OVERVIEW

Rapid, widespread vaccination coverage is needed to stop the spread of COVID-19 and contain the pandemic. Yet there are wide discrepancies in vaccine uptake rates at the community level. With scarce time and resources, an equitable COVID-19 vaccine rollout hinges on identifying where pockets of under-vaccination are located, which challenges are faced, and how vulnerable communities—those least resilient to COVID-19 impacts—are faring. This level of understanding is important for county-level decision-makers to target effective outreach and support the right communities in need. While data tools exist to understand the factors behind poor COVID-19 vaccine uptake and community vulnerability to pandemic impacts, there is not one tool that collates, visualizes, and interprets these data to guide community-specific action.

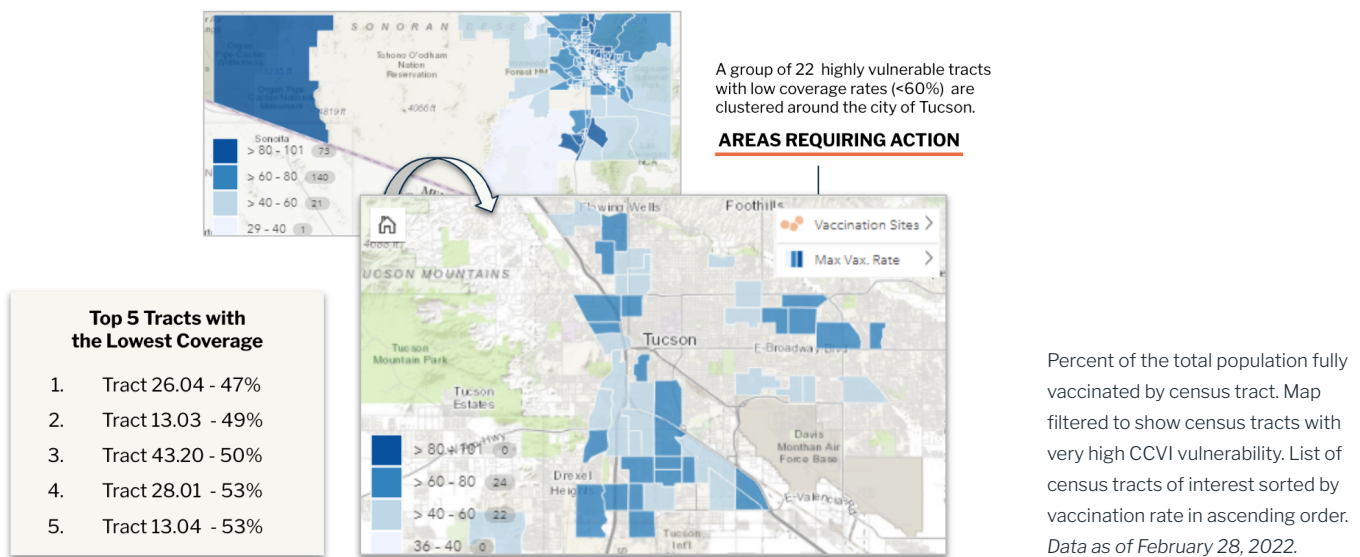
To solve this challenge, Partners In Health, the Pima County Health Department (PCHD), and Surgo Ventures partnered to create a census-tract-level dashboard to inform and evaluate local COVID-19 vaccine uptake solutions in Pima County, Arizona. The dashboard aggregates and innovatively visualizes PCHD vaccination, case rates, and vaccine site location data alongside Surgo's COVID-19 Community Vulnerability Index (CCVI) and COVID-19 Vaccine Coverage Index (CVAC) across all census tracts in Pima County, AZ. The CCVI identifies which communities are most vulnerable to the impacts of COVID-19 and why, and the CVAC identifies which communities are likely to face challenges in reaching widespread rollout and why, based on contextual barriers underlying supply- and demand-side challenges.

Fighting the COVID-19 pandemic calls for precision—understanding which communities are in most need of support and why. The dashboard, alongside local stakeholder knowledge, can aid decision-makers in the iterative design, evaluation, and improvement of locally appropriate vaccination strategies and has potential to scale to other public health equity challenges.

Identify and Prioritize Communities with Low Vaccine Uptake

Since the beginning of the pandemic, the Pima County Health Department (PCHD) has prioritized equity in its response—targeting services to the vulnerable populations most impacted, seeking to alleviate financial, language, and cultural barriers, and using data to use limited resources as efficiently as possible. Building off of PCHD’s earlier efforts, the dashboard helps to identify and intervene in low vaccine uptake areas that require urgent support, particularly the vulnerable areas that are least resilient to the health, economic, and social impacts of COVID-19 and/or currently considered a hotspot with rapidly increasing case rates.

Figure 1. COVID-19 vaccination rates, community vulnerability, and hotspot risk.



This map shows the percentage of each census tract’s population that have been fully vaccinated with the COVID-19 vaccine. The dashboard features allow you to filter the map by different equity criteria based on community vulnerability to pandemic outcomes and current hotspot risk, where cases are increasing the most rapidly. Vulnerability is measured by Surgo Ventures’ COVID-19 Community Vulnerability Index (CCVI), which captures how and why a community is vulnerable to the health, economic, and social impacts of COVID-19. Current hotspot risk is based on the average daily case rate per 100K population in the past two weeks. Both are categorized into 5 groups of concern based on a 0–1 score with 1 being the most vulnerable or highest hotspot risk and 0 being the least vulnerable or lowest hotspot risk. This prioritization enables PCHD to direct resources to the vulnerable, low-uptake communities facing new COVID case waves that are most in need and require urgent action.

Contextualize Vaccine Rollout Challenges

The dashboard profile feature visualizes the components (or thematic areas) of the CCVI as well as indicators from Surgo Ventures' COVID-19 Vaccine Coverage Index (CVAC) to contextualize challenges and guide vaccine rollout solutions across census tracts.

The CCVI's seven thematic areas break down the many facets of vulnerability to understand what makes a community least resilient to the negative impacts of COVID-19 (Table 1). Knowing this contextual information can help tailor vaccine uptake strategies to be locally appropriate.

Table 1. COVID-19 Community Vulnerability Index (CCVI)

Key Question	Theme	Description
What factors drive the overall community vulnerability in each census tract?	Socioeconomic Status	the relative wealth and economic health of a community
	Minority Status & Language	the relative presence of minorities and non-English speaking people within a community
	Household & Transportation	the relative crowding of housing, access to indoor plumbing, vehicle ownership, and the presence of dependents
	Epidemiological Factors	the relative size of high-risk COVID populations ¹
	Healthcare System Factors	the relative capacity, strength, accessibility and preparedness of the healthcare system to respond to COVID-19
	High Risk Environments	the relative presence of sub-groups living and working in high-risk conditions ²
	Population Density	the relative measure of population connectivity and opportunity for interactions

Learn more about the CCVI on [Surgo Ventures' Precision for COVID](#) website.

¹ High-risk populations are identified according to CDC guidelines as elderly adults and individuals with underlying conditions including respiratory conditions, heart conditions, obesity, diabetes, and conditions related to immunodeficiency.

² Sub-populations living and working in high-risk environments are identified as workers in high-risk industries with higher frequency and duration of workplace contacts, nursing home and assisted living residents, and prison populations.

To unpack what type of strategy and resource support is needed, the CVAC contextualizes which community-level characteristics are of most concern for hindering the rapid, widespread rollout of the COVID-19 vaccine. These factors are grouped by the CVAC's five thematic areas capturing supply- and demand-related vaccine uptake challenges (Table 2).

Table 2. COVID-19 Vaccine Coverage Index (CVAC)

Key Question	Theme	Description
Is uptake among standard vaccines low?	Historic undervaccination	Proportion of adults receiving flu vaccine
Which communities exhibit historic access disadvantages or communications challenges?	Socio-demographic barriers	Groups that tend to have lower historic vaccination coverage reported early mixed acceptance of the COVID-19 vaccine or faced inequities in accessing pandemic resources
Is there adequate infrastructure for vaccine administration?	Resource-constrained healthcare system	Low healthcare system capacity and infrastructure for vaccination rollout
What logistical and behavioral barriers may be limiting uptake?	Healthcare accessibility barriers	Potential barriers posed by cost and transportation
	Irregular care-seeking behavior	Lack of a designated medical home or routine care visits

Learn more about the CVAC on [Surgo Ventures' Precision for COVID vaccine](#) website.

Note: Not all CVAC indicators are available at the sub-county level. See our [methodology document](#) for a full list of CCVI and CVAC indicators presented in the dashboard profile.

Figure 2. Unique COVID-19 vaccination barrier profiles.

Each census tract has a unique COVID-19 vulnerability (CCVI) and vaccination barrier profile (CVAC). For example, census tract 43.20 and tract 28.02 are both highly vulnerable with low vaccination uptake (50–52% of their total populations had completed the initial vaccine regimen as of Feb. 28, 2022). Yet, each tract also faces different levels of concern for vaccination barriers. While both exhibit historic undervaccination, low access to information, and socioeconomic barriers, tract 43.20 has a higher proportion of residents that have not completed a college degree and live in non-English-speaking households, whereas transportation access and care-seeking is more of a challenge in tract 28.02.

CENSUS TRACT 43.20				CENSUS TRACT 28.02			
Indicator ▾	↕	Concern ▾	↕	Indicator ▾	↕	Concern ▾	↕
Adults recv. flu vax		High	0.73	Adults recv. flu vax		Very High	0.81
Median HH income		Very High	0.82	Median HH income		Very High	0.83
HH without smartphone		Very High	0.92	HH without internet access		High	0.79
HH without internet access		Very High	0.93	HH without smartphone		Very High	0.82
Limited-English speaking HH		High	0.66	Limited-English speaking HH		Low	0.31
Indiv. without degree		Very High	0.9	Indiv. without degree		High	0.61
Prop. racial & ethnic minority grps		Very High	0.85	Indiv. below poverty level		High	0.74
Indiv. below poverty level		Very High	0.95	Prop. racial & ethnic minority grps		High	0.64
Infrastructure for vaccine administration		Moderate	0.56	Infrastructure for vaccine administration		Moderate	0.56
Indiv. without health insurance		Very High	0.92	Indiv. without health insurance		High	0.72
Transit Connectivity Index		Moderate	0.54	Transit Connectivity Index		Very Low	0.15
HH without vehicle ownership		Moderate	0.42	HH without vehicle ownership		Very High	0.96
Adults without personal doctor		High	0.76	Adults without personal doctor		High	0.77
Adults without routine checkups		High	0.67	Adults without routine checkups		Very High	0.93

Comparison of CVAC barrier profiles in census tract 43.20 and 28.03. The level of concern per barrier is categorized by CCVI quintiles: very high (top 20% of tracts with a score of 0.8-1), high (0.6-0.8), moderate (0.4-0.6), low (0.2-0.4), and very low (the bottom 20% of tracts with a score of 0-0.2).

These insights can inform targeted responses that are tailored to the contexts of each community. In both tracts, trusted, accessible communication channels can be leveraged to promote vaccination, tailoring the approach in tract 43.20 with linguistically and culturally appropriate language. Mobile vaccination clinics and mass vaccination clinics located next to public transportation lines can close the transportation gap in tract 28.02, partnering with existing community-level programming to share information and motivate vaccine-seeking behaviors.

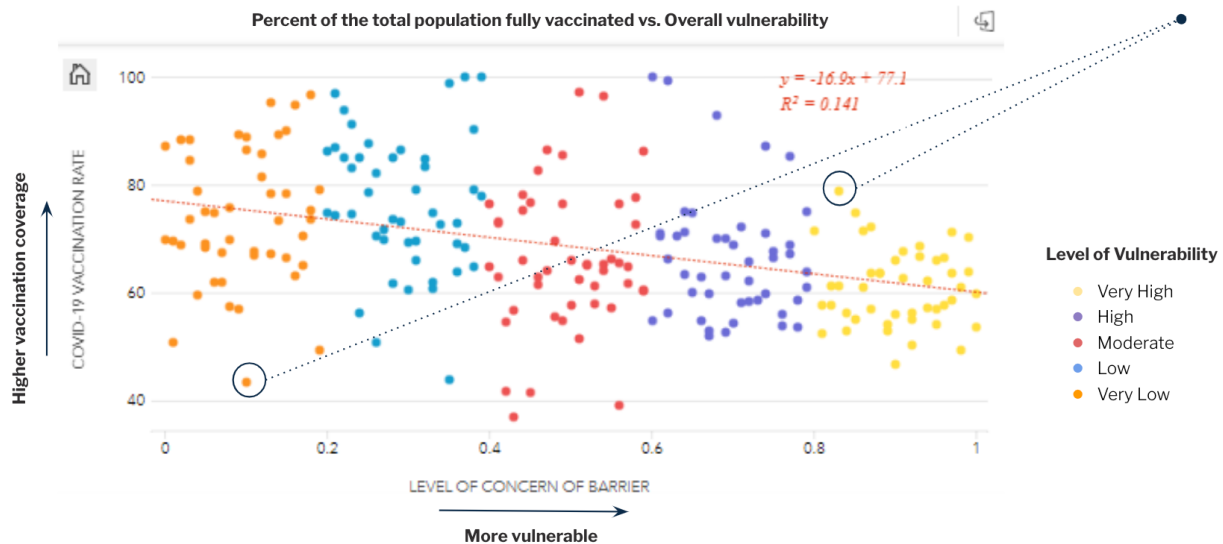
Design, Implement, and Monitor Solutions

Dashboard data is innovatively visualized to compare and contrast community challenges in the context of COVID-19 vaccination rates over time. This enables users to monitor if solutions are improving uptake, as well as identify areas that are both underperforming or exceeding expectations to inform a hyperlocal community of practice in response to COVID-19 vaccine inequity (Figures 3–4).

Figure 3. Tracking equity in COVID-19 vaccination coverage.

Vulnerable census tracts are vaccinating less

In communities that are considered highly to very highly vulnerable to COVID-19, fewer people have been fully vaccinated with the COVID-19 vaccine.



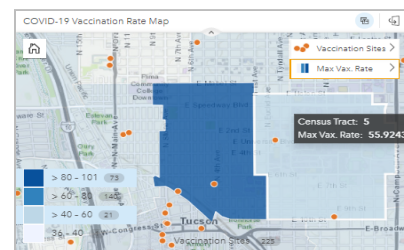
There are outliers—highly vulnerable Census Tract 13.02 has vaccinated 79% of the population, whereas less vulnerable Census Tract 44.23 has only vaccinated 43% of the population.

Percent of the total population fully vaccinated vs. overall CCVI vulnerability by census tract. Colors indicate the level of vulnerability categorized by CCVI quintiles: very high (top 20% of tracts with a score of 0.8–1), high (0.6–0.8), moderate (0.4–0.6), low (0.2–0.4), and very low (the bottom 20% of tracts with a score of 0–0.2). Data as of February 28, 2022.

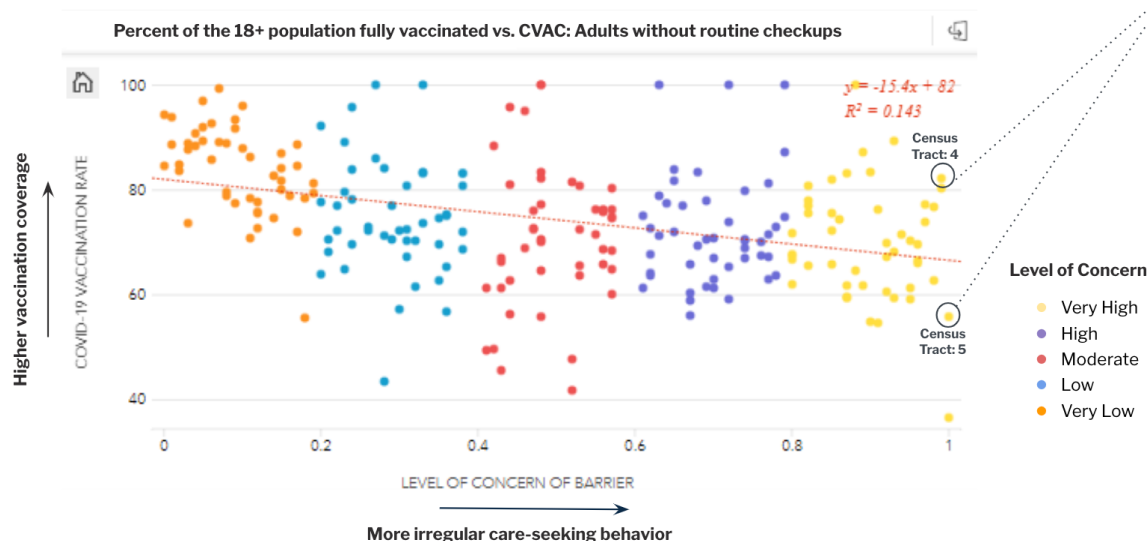
Figure 4. Comparing vaccination barriers for continuous improvement.

Identify success stories to shift resources and strategies

Not all tracts with irregular care-seeking behavior have low vaccination coverage rates. Vaccination sites in tract 5 can learn from the strategies used in tract 4 to better address care-seeking barriers and encourage uptake of the COVID-19 vaccine.



Census Tract 4 and 5 face very high concern for irregular care-seeking behaviors with more adults failing to complete routine care check-ups compared to other census tracts within the county. Despite similar levels of concern for this barrier, tract 4 has reached 82% coverage among the 18+ population compared to about 56% in tract 5.



Percent of the 18+ population fully vaccinated vs. level of concern for CVAC Barrier: Adults without routine checkups. Colors indicate the level of concern for CVAC barrier categorized by quintiles: very high (top 20% of tracts with a score of 0.8-1), high (0.6-0.8), moderate (0.4-0.6), low (0.2-0.4), and very low (the bottom 20% of tracts with a score of 0-0.2). Map displays percent of the 18+ population fully vaccinated overlaid with COVID-19 vaccine site location data.

All data as of February 28, 2022.

NEXT STEPS

The tool can be used by PCHD teams and local community-based organizations (CBOs) to tailor community solutions based on need and CBO expertise. Dashboard visuals can be used to:

- Facilitate discussions between PCHD and CBOs to design coordinated, tailored demand generation or supply-balancing strategies
- Advocate for additional pandemic resources in the vulnerable areas that have lower vaccination coverage rates
- Inform other COVID-19 response efforts (e.g. shifting testing resources to vulnerable areas falling behind in vaccine rollout)

As socialization and use of the dashboard continues to scale in 2022, requested and suggested improvements will be tracked. For example, in the future, PCHD teams hope to add time-series data to support monitoring and evaluation of strategies.

Adapting to Challenges Beyond COVID-19

The dashboard was built in a way to accommodate new data and has potential to incorporate new indicators of interest as well as scale to identify inequities in other public health areas of interest. Specifically, it will be possible to substitute different outcomes (e.g., drug overdoses, maternal morbidity, or vaccination rates for other diseases, among many others) for current ones (i.e., vaccination rates), as well as add new possible explanatory factors to the dashboard to broaden the scope of programmatic solution design. New elements, such as point-of-care facilities, can also be overlaid to provide even richer context.

METHODOLOGY

The dashboard was developed using ArcGIS Pro and ArcGIS Insights and is dynamically updated to reflect the most current COVID-19 case and vaccination rate data based on the cadence of PCHD data updates. Key features were inspired by a [4-step framework](#) to promote COVID-19 vaccine access, acceptance, and equity and further refined with Pima County Health Department teams. Beyond vaccination data, the metrics used to prioritize and profile community-level challenges have been previously recognized as useful metrics to inform and evaluate COVID-19 equity and response efforts. CCVI and CVAC indicators were percentile ranked across census tracts only in Pima County, AZ. (This differs from the original indices, which were percentile ranked across all U.S. geographies.) Most CVAC indicators used to generate the original index were only available at the county level or coarser geographies. As a result, only a subset of CVAC indicators available at the census-tract level were included in the dashboard.

For more information about the indicators used, please consult the [Pima County COVID-19 Vaccine Solutions Dashboard Indicators document](#).

About the U.S. COVID-19 Community Vulnerability Index (CCVI)

Surgo Ventures launched the [COVID-19 Community Vulnerability Index](#) in March 2020 to help federal, state, and local leaders target vulnerable communities with more informed and effective interventions. The index—which was inspired by the [CDC's Social Vulnerability Index](#) and is [featured as a CDC resource](#)—ranks U.S. communities in terms of their vulnerability to COVID-19 based on seven key factors: socioeconomic status; household and transportation; minority status and languages spoken; epidemiological factors; healthcare system factors; high-risk environments; and population density. Find the CCVI in use on CDC's COVID Data Tracker in both the [Trends in COVID-19 Cases and Deaths in the United States, by County-level Population Factors](#) and [COVID-19 Integrated County View](#). The CCVI has been previously [validated](#) and [recognized by the CDC](#) as a valuable resource to guide strategic response efforts to the marginalized areas at greatest risk of COVID-19.

About the COVID-19 Vaccine Coverage Index (CVAC)

Surgo Ventures launched the [COVID-19 Vaccine Coverage Index](#) (CVAC) in February 2021 to provide federal, state, and local leaders the precise, county-level data they will need to address underlying supply- and demand-side challenges and accelerate vaccine rollout. The index measures each U.S. county's barriers to getting their residents vaccinated quickly, safely, and equitably, based on five key themes: historic undervaccination, sociodemographic barriers, resource-constrained health systems, healthcare accessibility barriers, and irregular care-seeking behavior. The CVAC is strongly [associated with the speed of vaccine rollout](#) and has been [featured by the CDC](#) as a vaccine hesitancy measure.

ACKNOWLEDGEMENTS

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www.webcms.pima.gov/government/health_department

The Pima County Health Department is dedicated to help the residents of Pima County achieve and maintain an optimal level of wellness. The Health Department and its partners are committed to embracing and promoting diversity throughout their programs.

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