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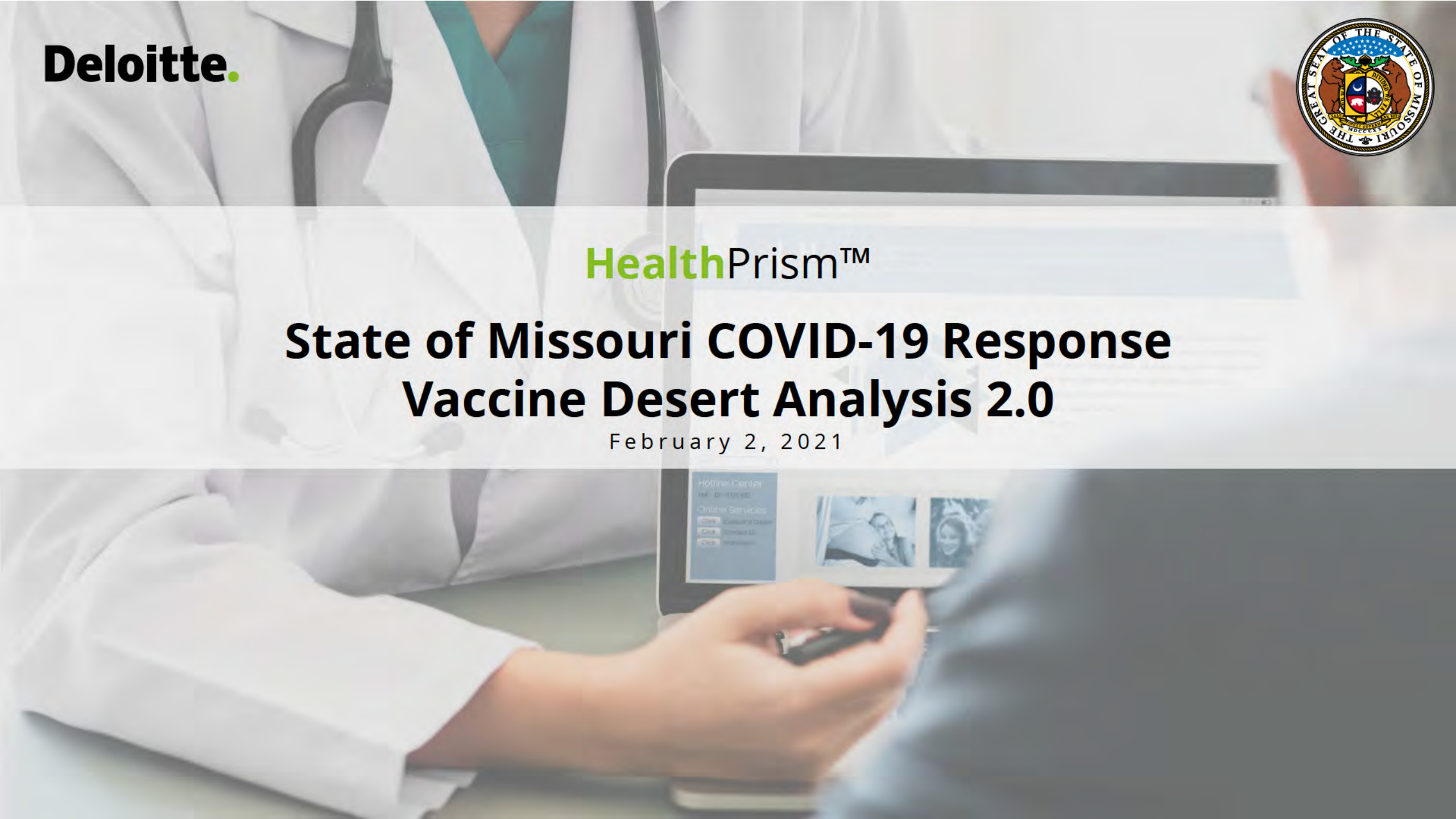

HealthPrism™

State of Missouri COVID-19 Response
Vaccine Desert Analysis 2.0

February 2, 2021

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Holistic Approach for Vaccine Distribution

Current analysis has focused on estimating vaccine distribution phase populations and vaccine provider geospatial analyses, which will serve as the building blocks for an integrated data view to inform vaccine ordering.

ANALYSIS COMPONENTS

Ongoing Phase Population Sizing: Using HealthPrism to size each vaccine phase. Current sizing has been done for both 1B Tier 2 populations and will continue for Tier 3 and beyond.

Geospatial: Identifying vaccine deserts based on provider locations. An updated version is the focus of today's conversation.

Today's focus

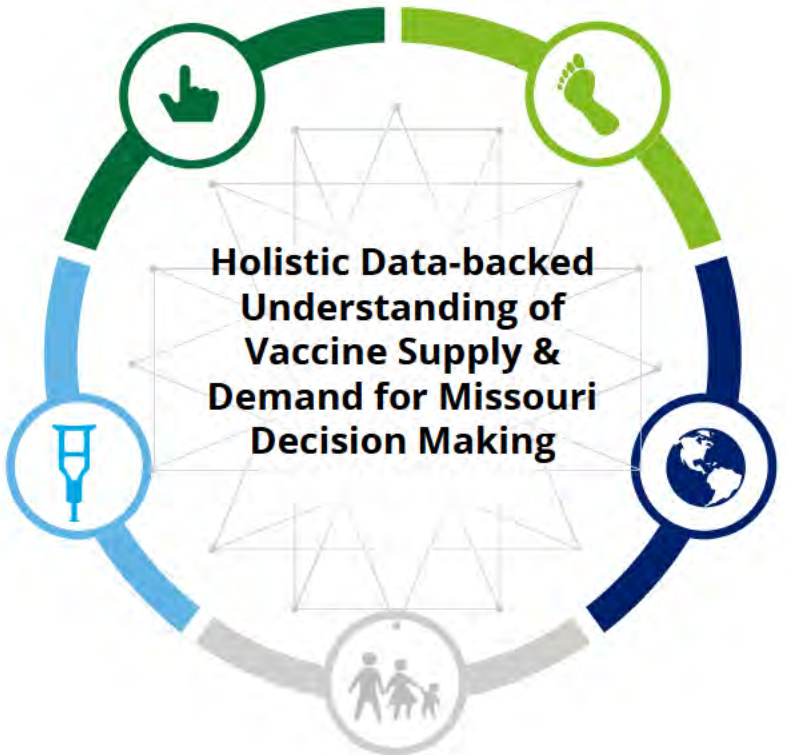
Demographic Details: Supplementing analyses with HealthPrism demographic characteristics by geographic area, to be included in forthcoming analyses.

Vaccines Administered: Incorporating vaccine doses administered by geographic area to estimate remaining unvaccinated population. Working to incorporate Missouri data and, in future, supplementing with HealthPrism vaccine hesitancy models.

Provider Supply: Understanding on-hand supply to optimally allocate or redistribute vaccines and track efficiency in doses administered. Currently working with Missouri to incorporate into data.

FUTURE STATE

Combining data sources and analyses will deliver an **integrated view** for Missouri to utilize, enabling faster decision making and improving vaccine ordering and distribution



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What is the goal of this document?

The goal of this document is to provide Missouri with an understanding of where there are areas lacking access to COVID-19 vaccine based on the evolving Vaccination Network.

How should this data be used and interpreted?

The data provided in this analysis allows the user to understand where statistically significant vaccine deserts exist in relation to surrounding Census Tracts. All relationships are relative to the distribution of statewide vaccination centers.

How should this data not be used?

This analysis is a snapshot of Missouri spatial vaccine access developed from January 18, 2021 locations. This analysis does not represent locations added after this date.

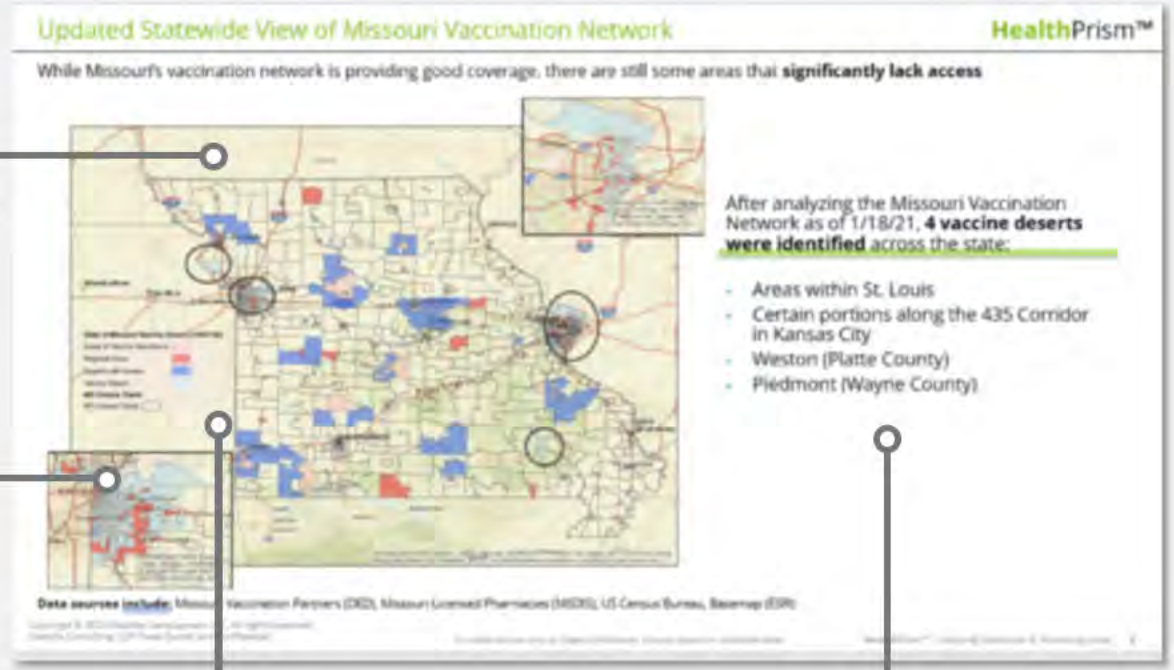
What information is included?

Statewide View

- Full view of vaccine desert locations and clusters at the statewide level

Census Tract View

- More granular level of detail at the census tract view and compares areas of low access to surrounding census tracts



Key/Legend

- Provides descriptive information on areas of abundance, vaccine hubs, deserts with access, vaccine deserts and areas that are not statistically significant vaccine deserts
  - ***Areas of Abundance:*** Census Tracts with many vaccine centers – adjacent to other vaccine abundant census tracts
  - ***Regional Hubs:*** isolated Census Tracts with many vaccine centers
  - ***Deserts with Access:*** – Census tracts with limited-no vaccine centers but adjacent to a Regional Hub
  - ***Vaccine Deserts:*** Limited-to-no vaccine access, surrounded by other similar areas

Insights

- Summary of key insights from the analyses or findings that stand out to highlight information which may be used to support response efforts

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Vaccine Desert Analysis: All Locations

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While Missouri's Vaccination Network expansion since late December **reduced the number of vaccine desert clusters**, there are still some areas that **significantly lack access. The Kansas City and St. Louis metro regions are experiencing expanding vaccine desert vulnerability.**

1. Boonville, Owensville, and Hayti are no longer vaccine deserts due to the State's expanding network

2. The dichotomy between vaccine access and vaccine deserts is more pronounced for North City St. Louis and certain portions along the 435 Corridor in Kansas City

3. New, isolated, vaccine deserts now exist over Weston and Piedmont, and existing vaccine deserts expanded in Kansas City and St. Louis

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Evolution of Vaccine Desert Distribution

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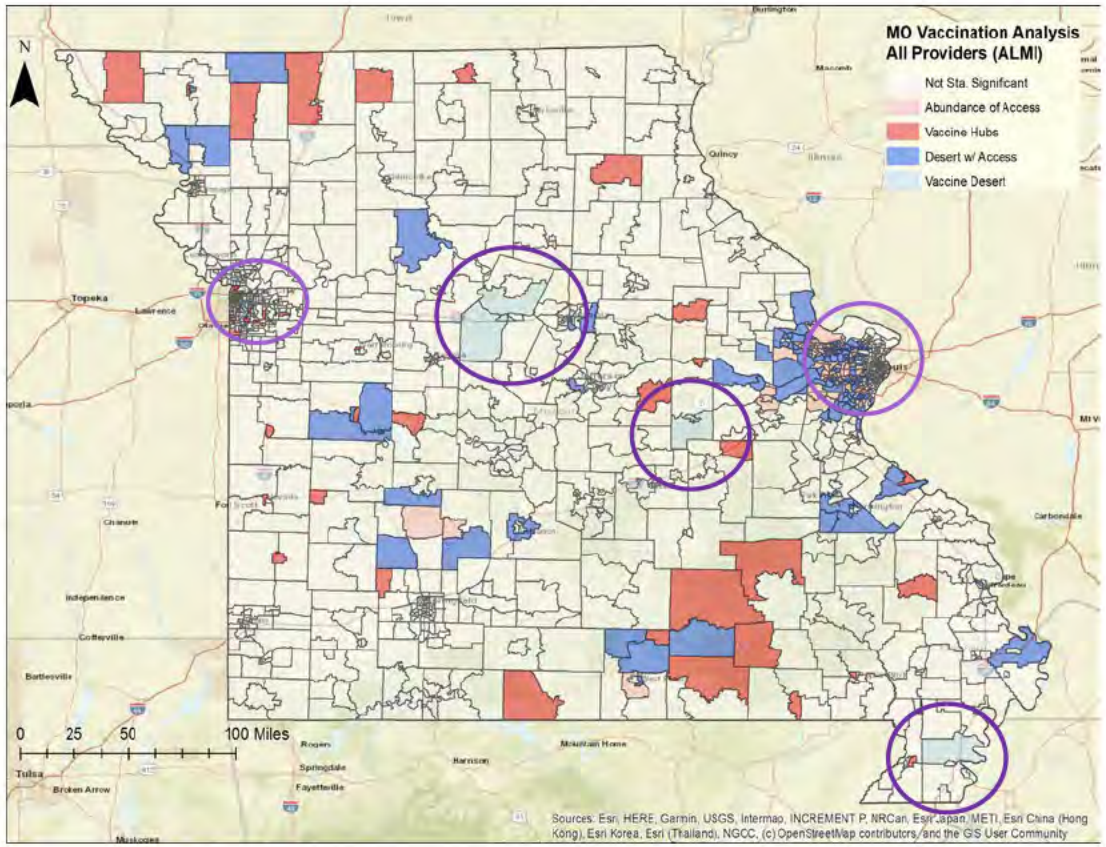
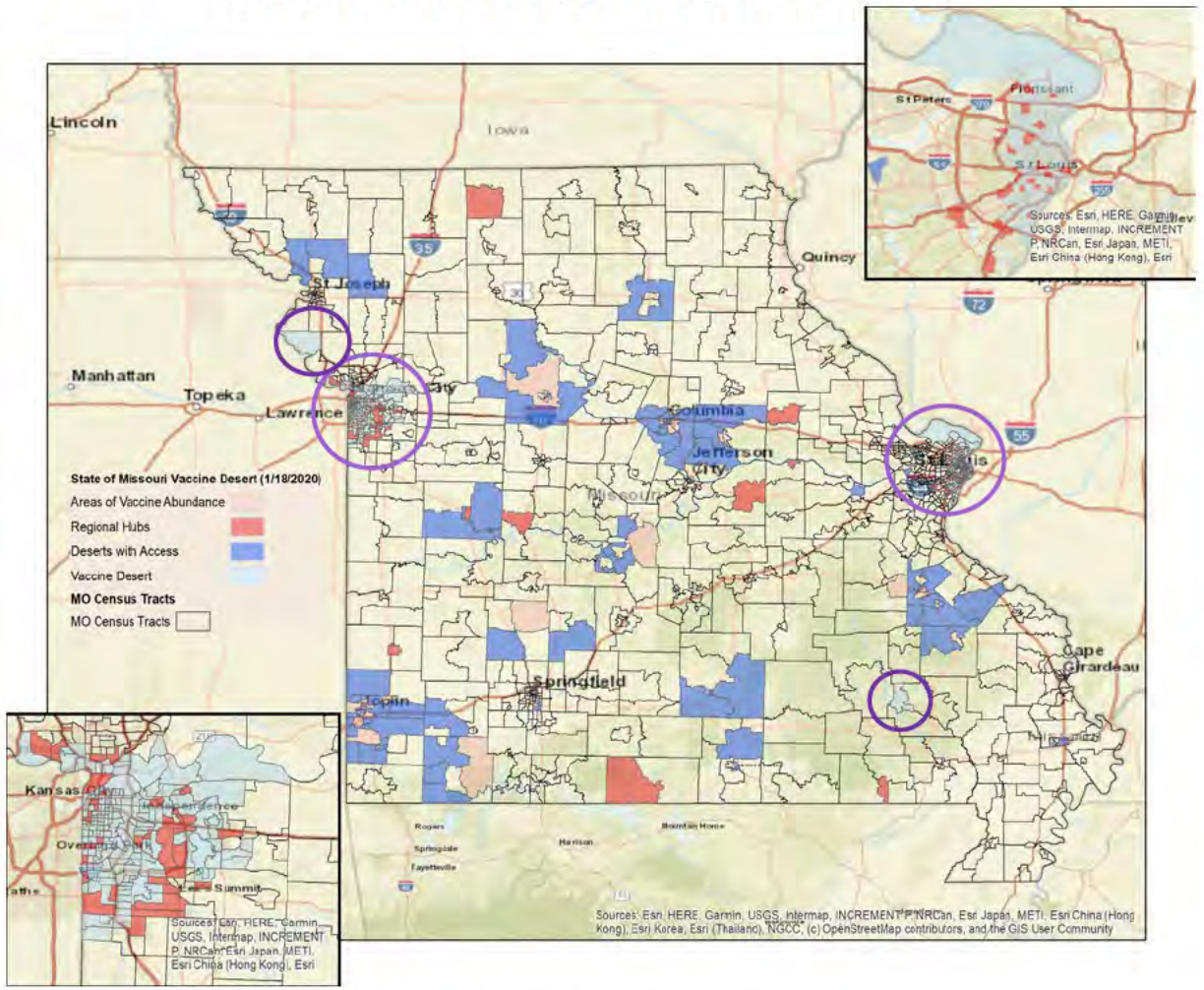
While Missouri's Vaccination Network expansion since late December **reduced the number of vaccine deserts**, there are still some areas that **significantly lack access.**

PRELIMINARY ANALYSIS AS OF 12/29/20



SECONDARY ANALYSIS AS OF 1/18/21



Data sources include: Missouri Vaccination Partners (DED), Missouri Licensed Pharmacies (MSDIS), US Census Bureau, Basemap (ESRI)

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Updated Statewide Vaccination Network

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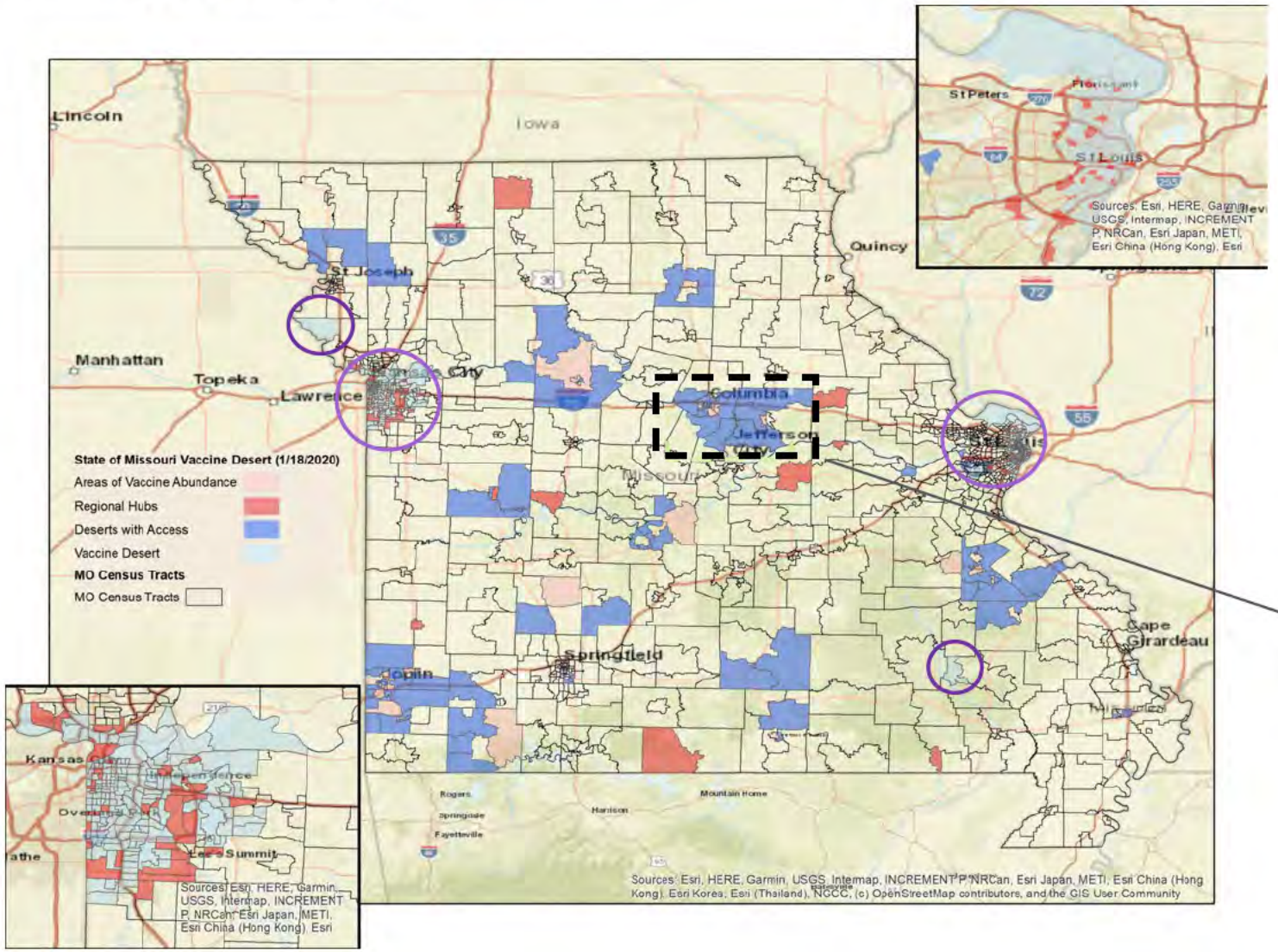
Vaccine deserts still exist in **urban areas within St. Louis** and **Kansas City**, in addition to rural areas in **Weston (Platte County)** and **Piedmont (Wayne County).**



After analyzing the Missouri Vaccination Network as of 1/18/2021, **four (4) vaccine deserts were identified** across the state:

- Areas within St. Louis
- Areas within Kansas City
- Weston (Platte County)
- Piedmont (Wayne County)

Data on 1/18/2021 did not include majority of University of Missouri Medical Centers and would affect the region indicated.

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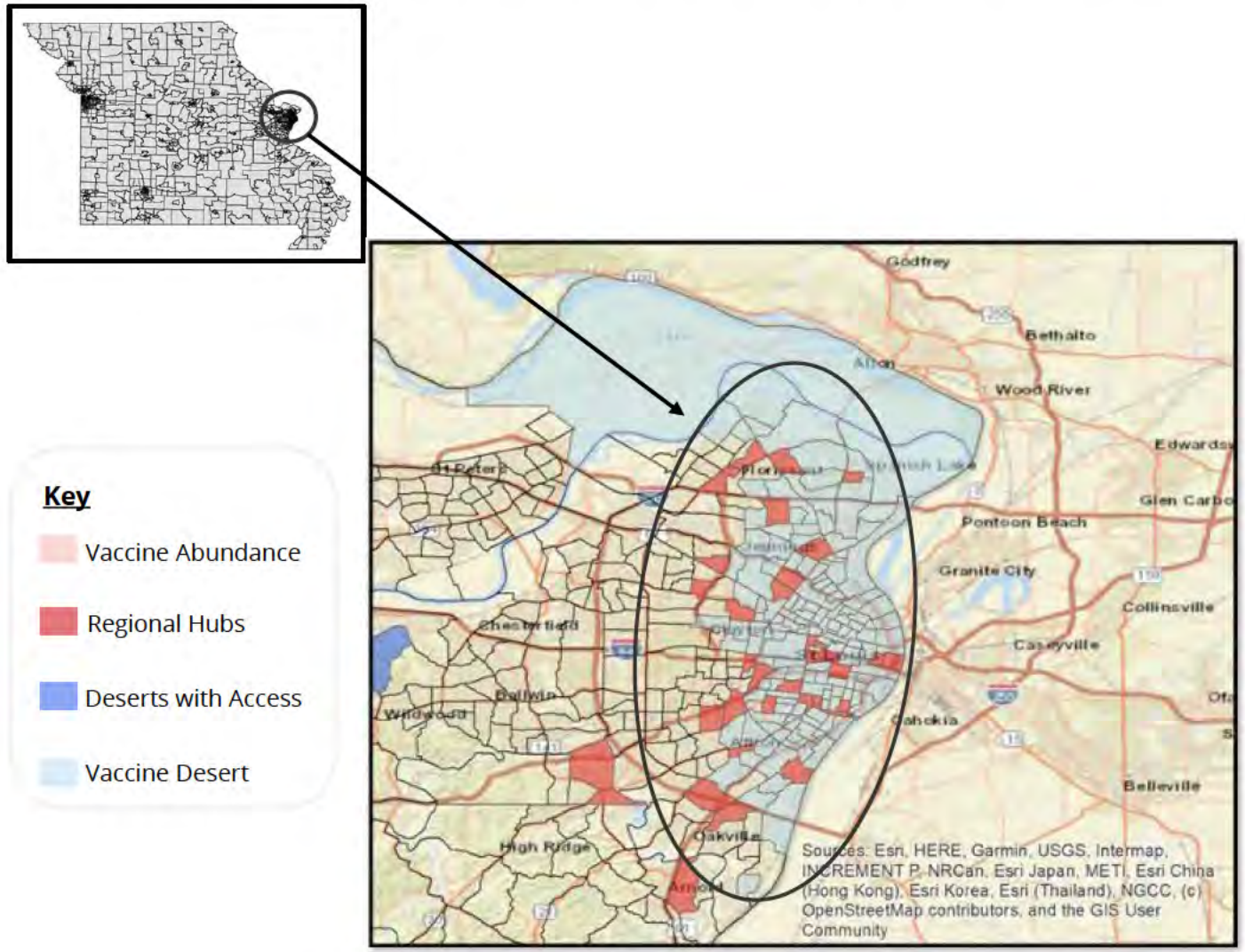
Vaccine Desert Details | St. Louis

Despite Missouri's expansion of its Vaccination Network, certain areas within St. Louis are **still reflecting vaccine deserts**.



AREA INSIGHTS

- The eastern census tracts in St Louis (circled) became either a regional hub or a vaccine desert compared to the previous desert analysis
- This infill pattern suggests a growing inequity in vaccine center access within the St Louis city center

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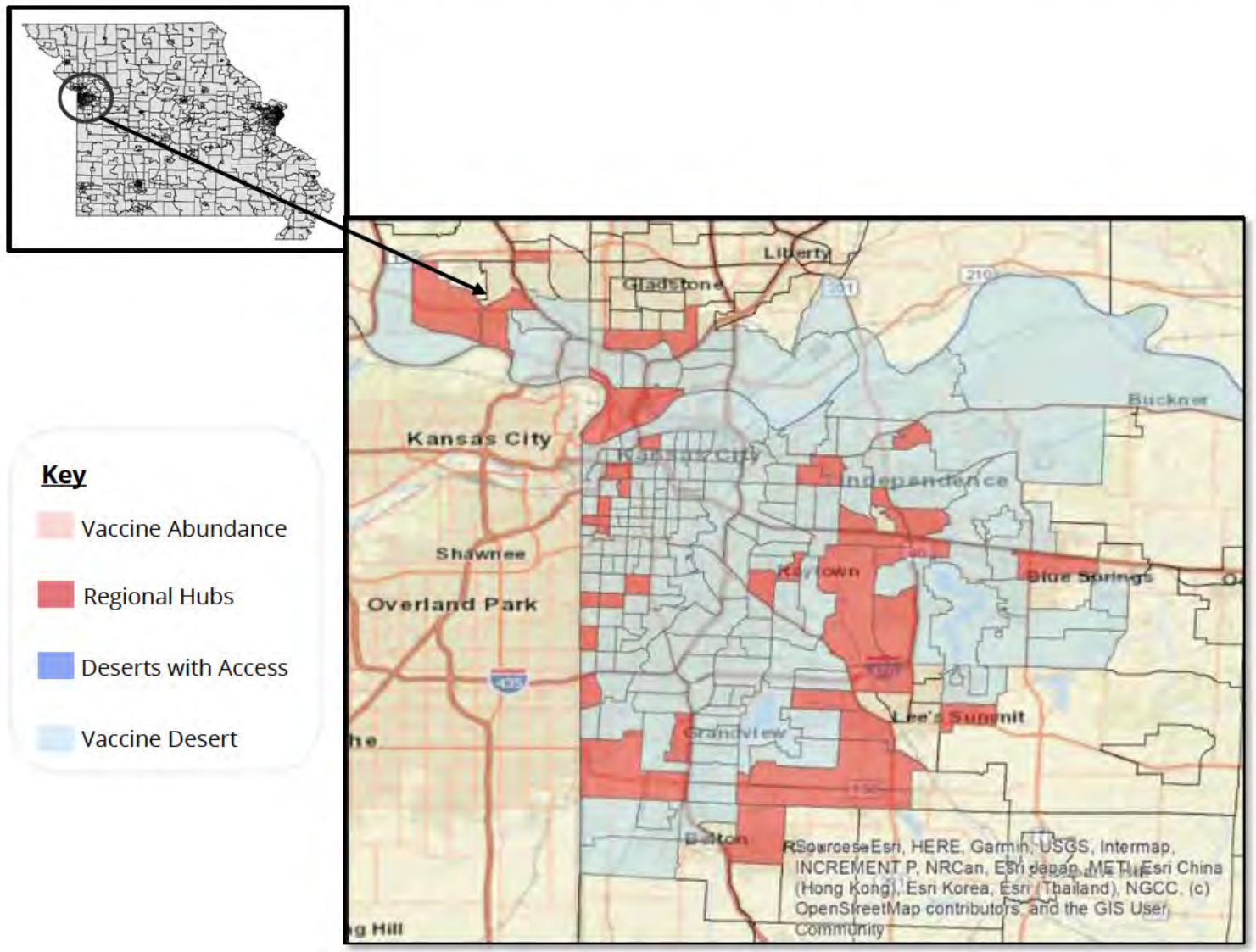
Vaccine Desert Details | Kansas City

Despite Missouri's expansion of its Vaccination Network, certain areas within Kansas City are **still reflecting vaccine deserts.**



AREA INSIGHTS

- The I-435 corridor remains a persistent vaccine desert from the previous analysis
- Like St Louis, areas within Kansas City proper became either a regional hub or a vaccine desert compared to the previous desert analysis
- The contiguous zones of vaccine desert extended further from 12/20/20 through 1/18/21

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Vaccine Desert Analysis: Public Access

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Public vs Private Vaccine Location Classification

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In order to conduct a public-focused vaccine desert analysis, rules were created to classify vaccination sites based on the data provided by the State.

GENERAL ASSUMPTIONS

- Only include vaccination sites that are listed as "Active" for Provider Status
- Only include vaccination sites that are listed as "Immunization" for Provider Type

Public Access *Accessible for any Missourian to receive a vaccine, pending position in phased distribution*	**Private Access** *Only accessible to employees and/or patients*	**Not Included** *Sites that are not part of the vaccine desert analysis*
• Pharmacy • FQHC • Hospital • Local Public Health Agency • RHC (Rural Health Clinic) • Walk-in/Urgent Care • Public Health, Other • Public Health, Local Public Health Agency • Missouri DOH	• Childcare provider • Corrections facility • Nursing and Long-Term Care • Preschool/Daycare/Headstart • Private practice • School or school-based health center • All locations listed as "Other"*	• All out of state locations
1194 Total Sites	**294 Total Sites**	**2 Total Sites**

***Note:** Sample locations listed as "Other" are provided in the Appendix

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Statewide View of Publicly Accessible Missouri Vaccination Network

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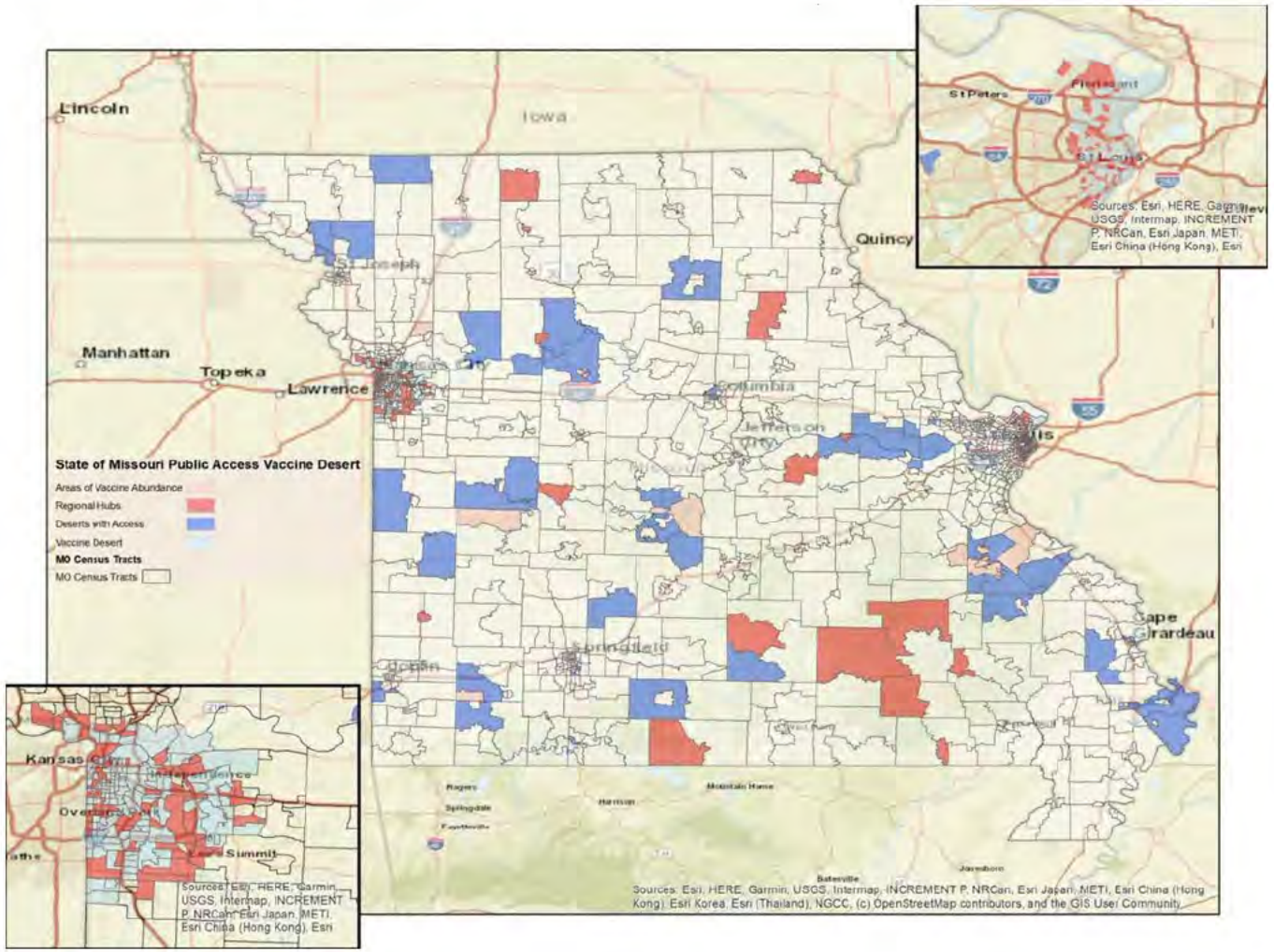
Publicly available vaccination locations are **more evenly distributed** across the State of Missouri. When adding in private vaccination access, **more deserts emerge.**



After analyzing the evolving Missouri Vaccination Network as of 1/18/21 for publicly accessible vaccination centers, **2 vaccine deserts were identified** across the state:

- 1) North City St. Louis; 2) Certain portions along the 435 Corridor in Kansas City
- **Public access vaccination sites are more evenly distributed**, resulting in fewer vaccine deserts despite nearly a 300-vaccine center reduction from the entire statewide network
- **Rural deserts disappeared** and the urban centers remained relatively unchanged from statewide vaccination networks
- Results indicate that vaccination centers catering to private groups aggregate near **suburban and exurban geographies**

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Vaccine Desert Analysis: Focus on 1B Tier 2 Medically High-Risk Population (18-64)

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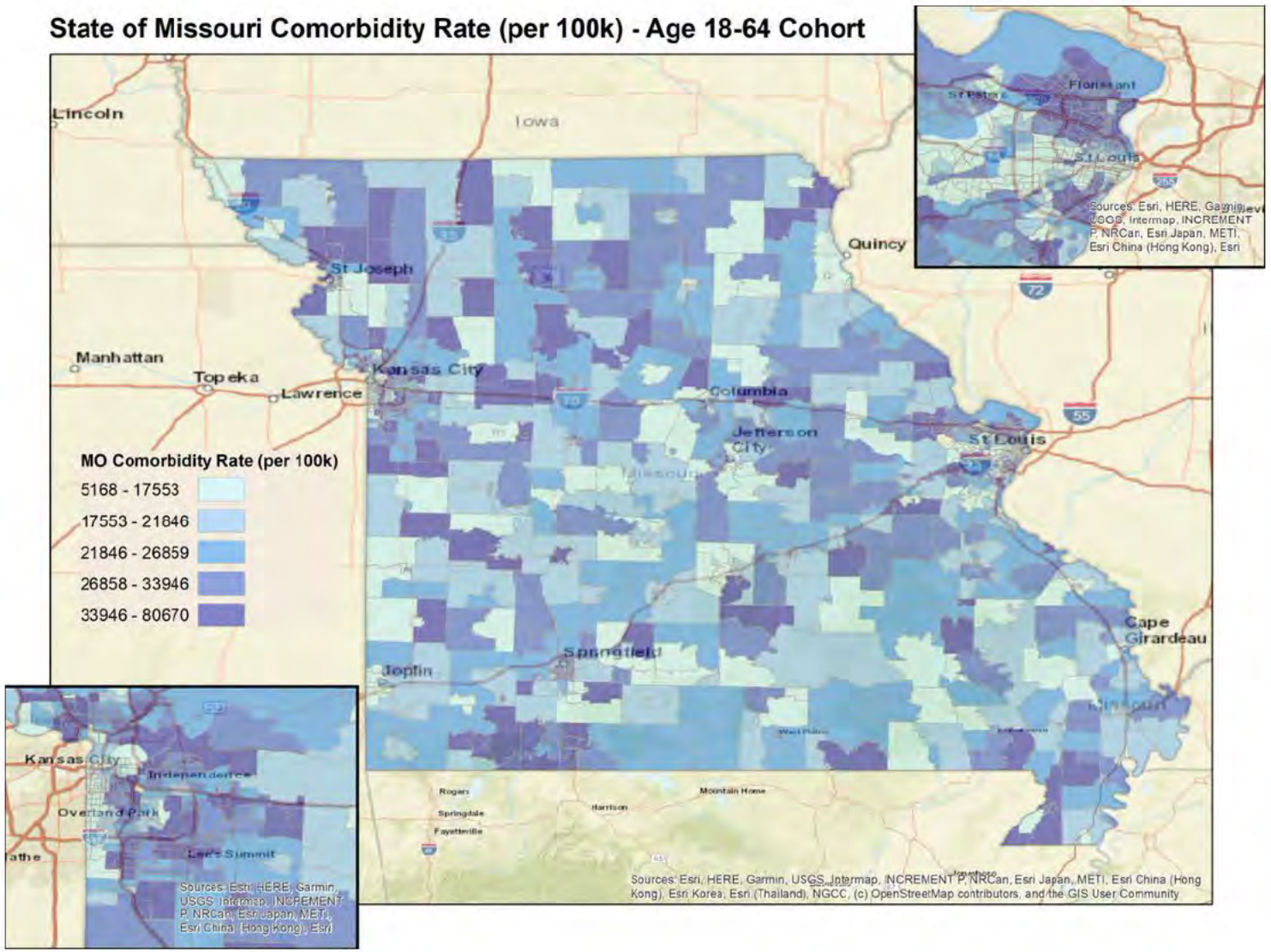
Missouri Statewide View for High-Risk Individuals (1+ Comorbidities)

HealthPrism™

The map below highlights the rates of **individuals age 18-64** with a high likelihood for **1 or more comorbidities** identified as medically vulnerable in Phase 1B, Tier 2 vaccine distribution.



PROCESS SUMMARY

- Individuals identified in HealthPrism data as having 1 or more medical comorbidity were aggregated to their home Census Tract
- Prevalence of individuals was converted into rates for equal comparison of medical vulnerability from one Census Tract to another
- Prevalence of medical comorbidities trend towards developed regions

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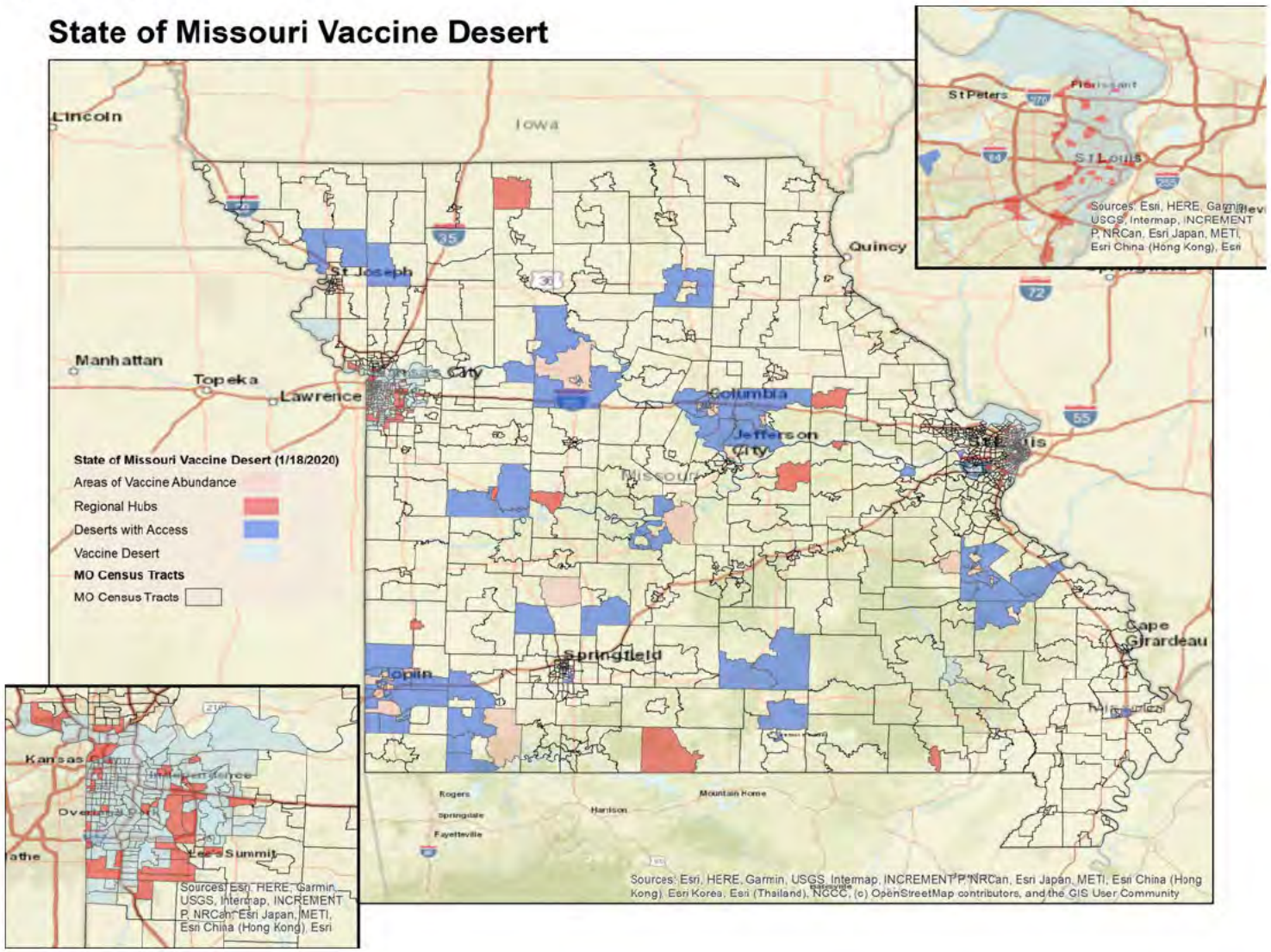
Refresher: Statewide Missouri Vaccine Deserts

HealthPrism™

As displayed previously, the map below identifies the **vaccine deserts** throughout Missouri, **inclusive of all locations** (publicly and privately accessible).



CONSIDERATIONS

Vaccine deserts must overcome **different obstacles** to provide quality access

- Population dynamics
- Geographic distances and thresholds
- Demographic profiles

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Convergence of Medically Vulnerable in Vaccine Deserts

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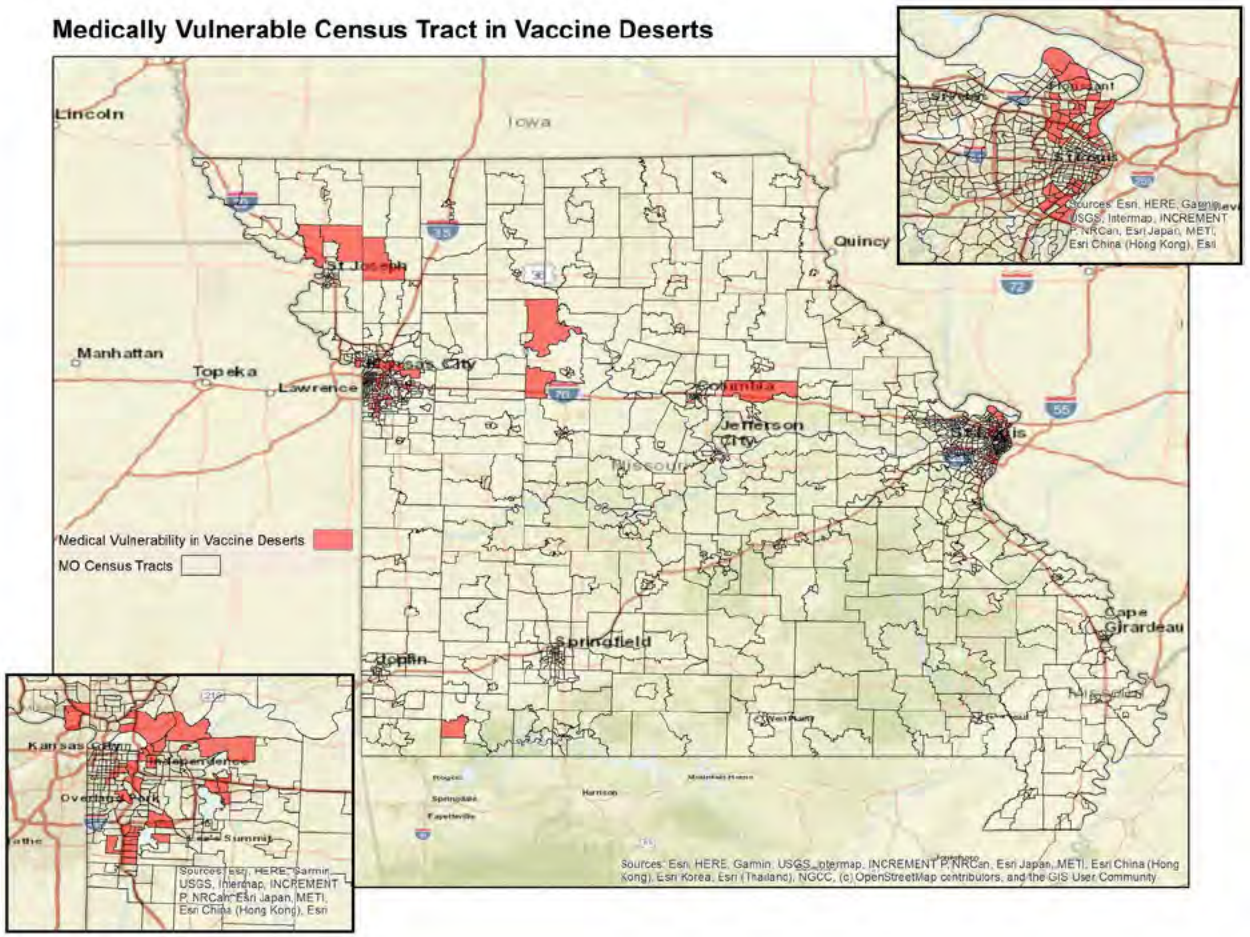
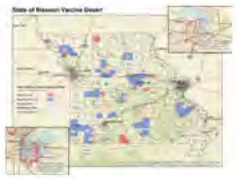
Combining data from the preceding slides, this map highlights in **red** areas of significant medical vulnerability due to **low access to vaccine** and high **rates of individuals with a high likelihood of 1 or more comorbidities.**



INSIGHTS

Top Quintile Census Tracts for Comorbidity Prevalence

Vaccine Desert Census Tracts



- Using Convergence Analysis, 223 Census Tracts across the State of Missouri were identified as medically vulnerable within the Statewide Desert Analysis
- The vast majority of medically vulnerable Census Tracts (84%) exist within the Kansas City (96 Census Tracts) and St Louis (92 Census Tracts) vaccine deserts

Inequitable geographic distribution of vaccination clinics occurs in the two major metropolitan regions within the State of Missouri

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Appendix

Data Methodology & Limitations

Additional Vaccine Location Classification Information

Further Geospatial Detail on Urban Public Access Vaccine Deserts

Preliminary Vaccine Desert Analysis

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Data Methodology & Limitations

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Data Sourcing & Limitations

Data Sources

- Missouri Vaccination Partners (DED)/ShowMeVax
- Missouri Licensed Pharmacies (MSDIS)
- Basemap (ESRI)
- [redacted]

Limitations & Considerations

- Focusing on the 1B Tier 2 population requires a separation of the age cohorts into two groups – those who are 18-64 and those who are 65+. As comorbidities (both total number and severity) increase with age, it is necessary to separate the analysis into two cohorts to remove the presence of confounding factors (age) from the analysis.
- As identified in the 1B Tier 2 analysis, these populations do not include individuals with intellectual/developmental disabilities and immunocompromise due to organ transplant because of data only existing at the census tract level from American Community Survey and the Missouri Hospital Association, respectively
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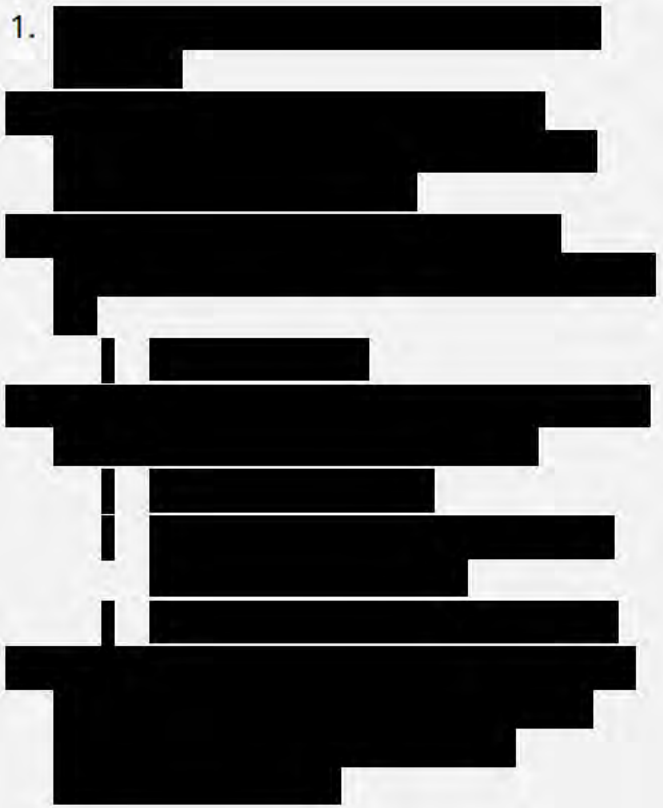
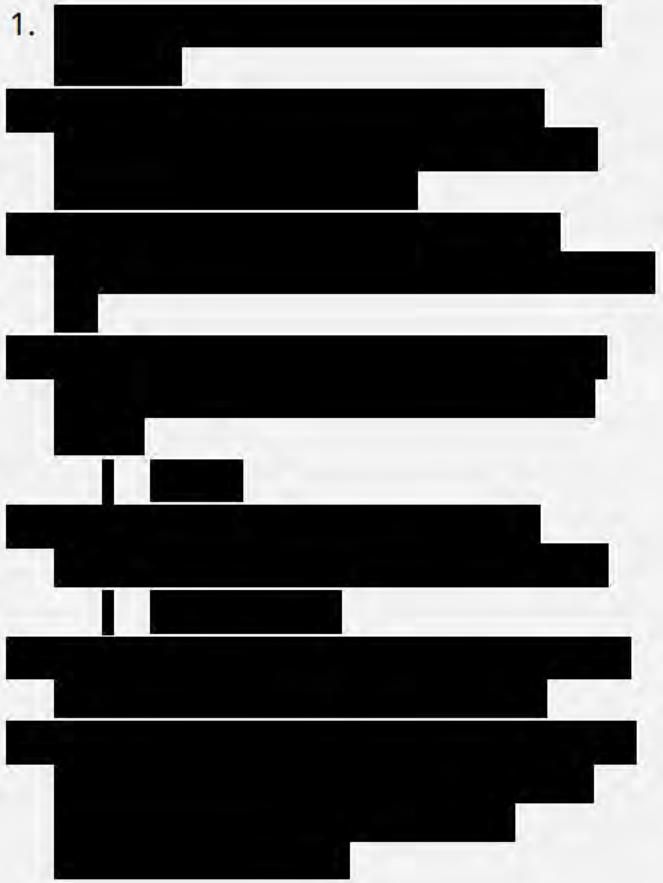
Statewide Vaccine Desert

1. [redacted]



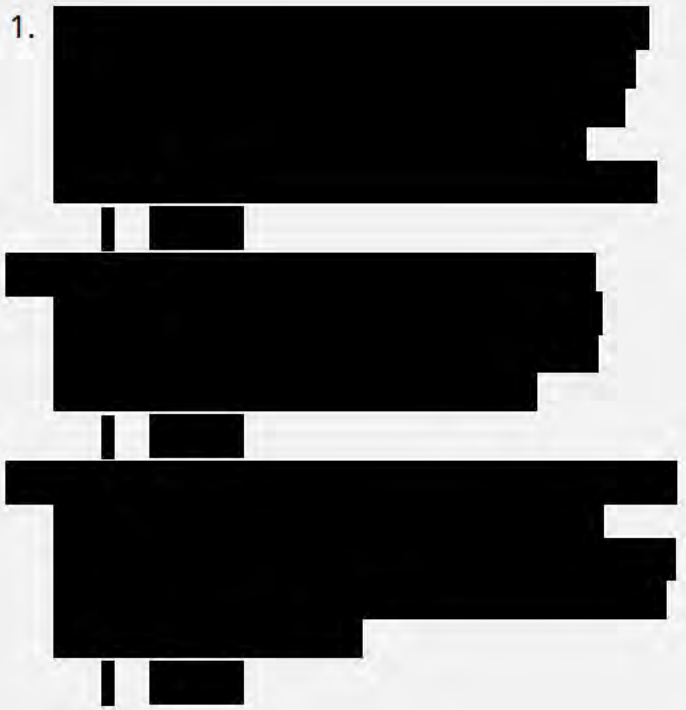
Public Access Vaccine Desert Analysis

1. [redacted]



Medical Vulnerability in Vaccine Deserts

1. [redacted]



***Note**: More detailed methodology steps provided in attached Word document*

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Content is meant to supplement knowledge and resources already available to you.

Content may be used to complement local efforts already taking place in your State and to assist with providing a level of granularity and frequency of updates that are not available in public datasets.

Information presented is illustrative of a sample of analyses and capabilities that may be available to you to support COVID-19 response and recovery efforts in Missouri.

Insight(s) represent content generated as of a specific date – content and insights are subject to change given updated data.

Content is populated by Deloitte proprietary sources and publicly available sources, both of which are non-static and continuously updating.

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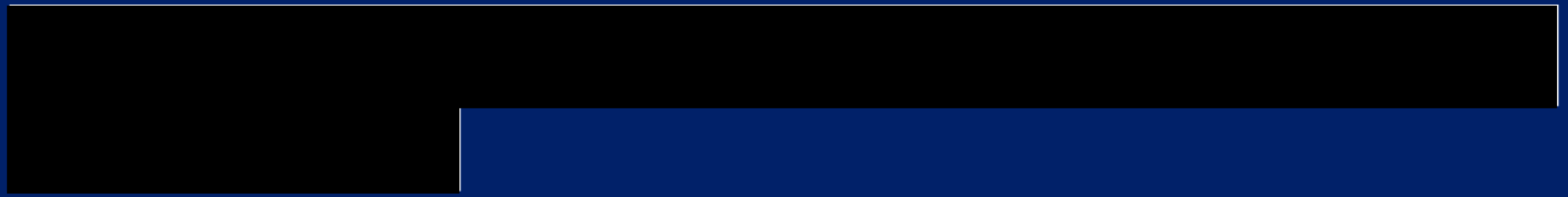

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Further Geospatial Detail on Urban Public Access Vaccine Deserts

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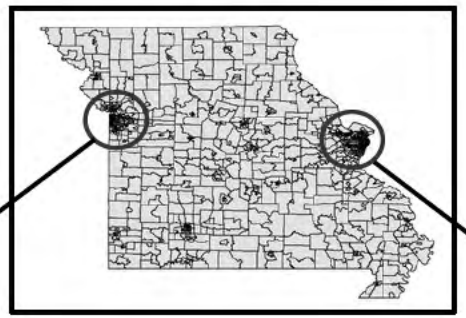
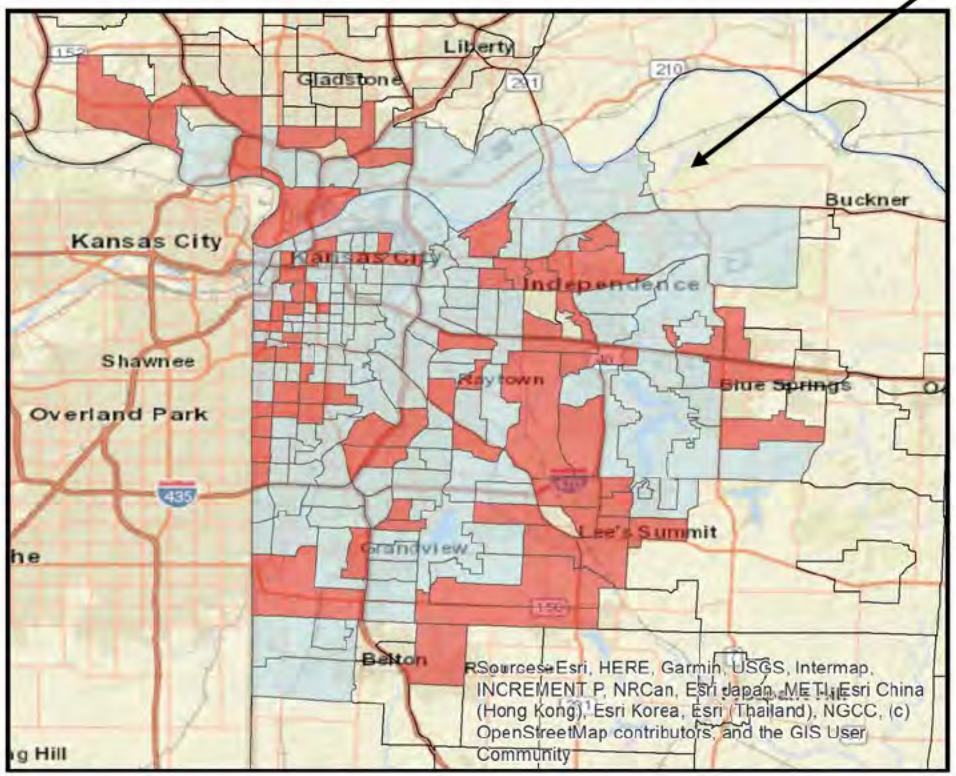
Public Access Vaccine Desert Details | Kansas City and St. Louis

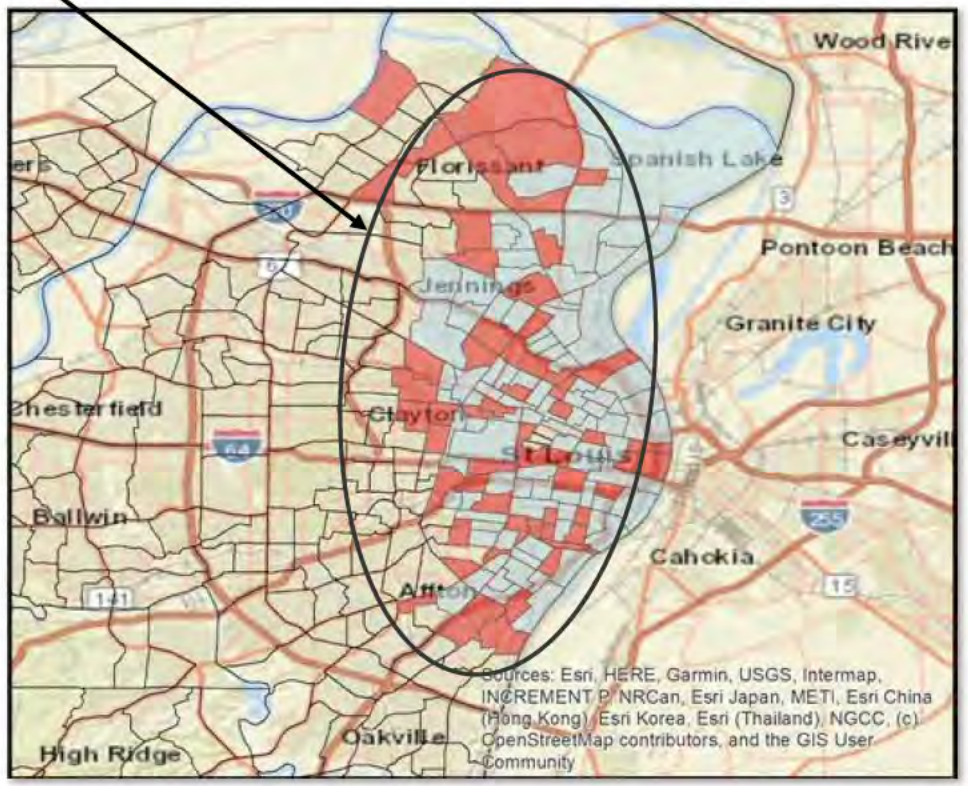
Despite Missouri's expansion of its Vaccination Network, the Kansas City and St. Louis metro areas are experiencing growing vaccine deserts





Key

- Vaccine Abundance
- Regional Hubs
- Deserts with Access
- Vaccine Desert



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Preliminary Vaccine Desert Analysis as of 12/29/2020

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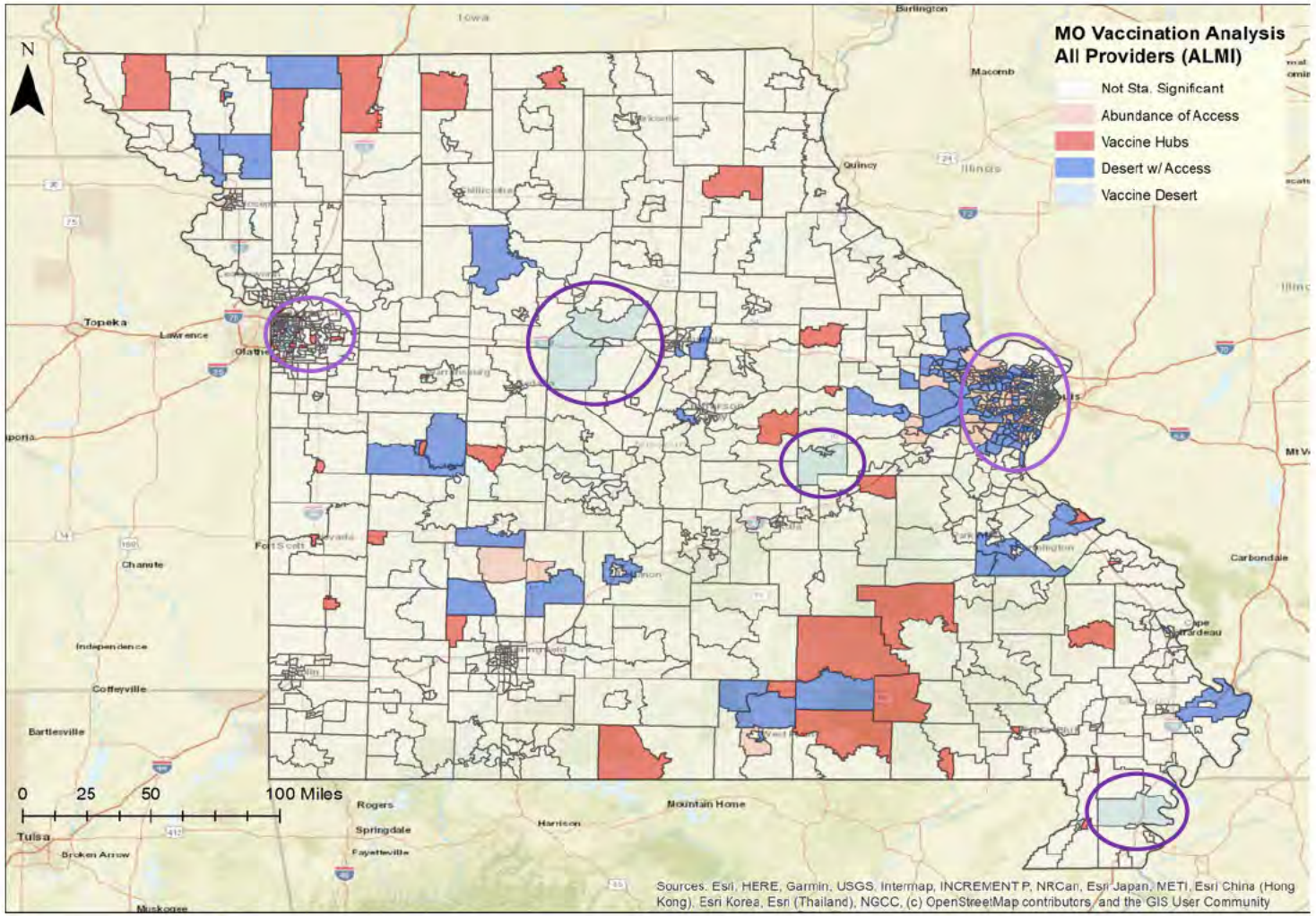
BLUF: The existing Missouri Vaccination Network offers **good coverage across the State**, but greatly **benefits from the CDC Pharmacy Partnership** for Long-Term Care Program.



After analyzing the Missouri Vaccination Network, **five (5) vaccine deserts were identified** across the state:

- **North City St. Louis**
- **Certain portions along the I-435 corridor in Kansas City**
- **Boonville**
- **Owensville**
- **Hayti**

Data sources include Missouri Vaccination Partners (DED), Missouri Licensed Pharmacies (MSDIS), US Census Bureau, Basemap (ESRI)

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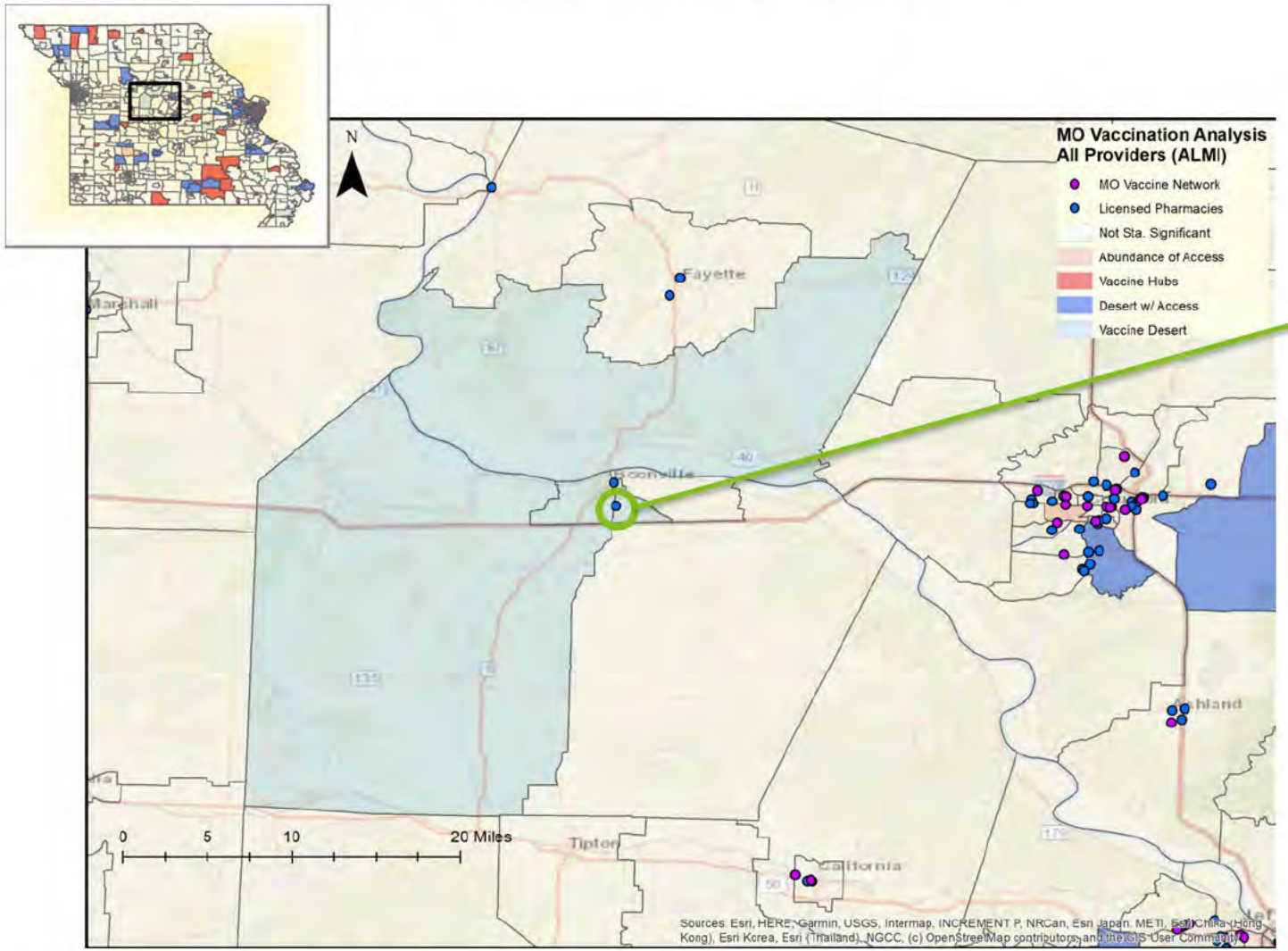
Boonville, a rural location in central Missouri, has been **identified as a vaccine desert** using a test of spatial autocorrelation known as Anselin's Local Moran's I.



The Boonville vaccine desert would **benefit from strategic connections to the Walmart pharmacy chain.**

- Walmart pharmacies, such as the one highlighted here, are **already administering vaccines in other States** as part of the Federal response.
- Blue dots not highlighted represent more local pharmacies not associated with national initiatives.

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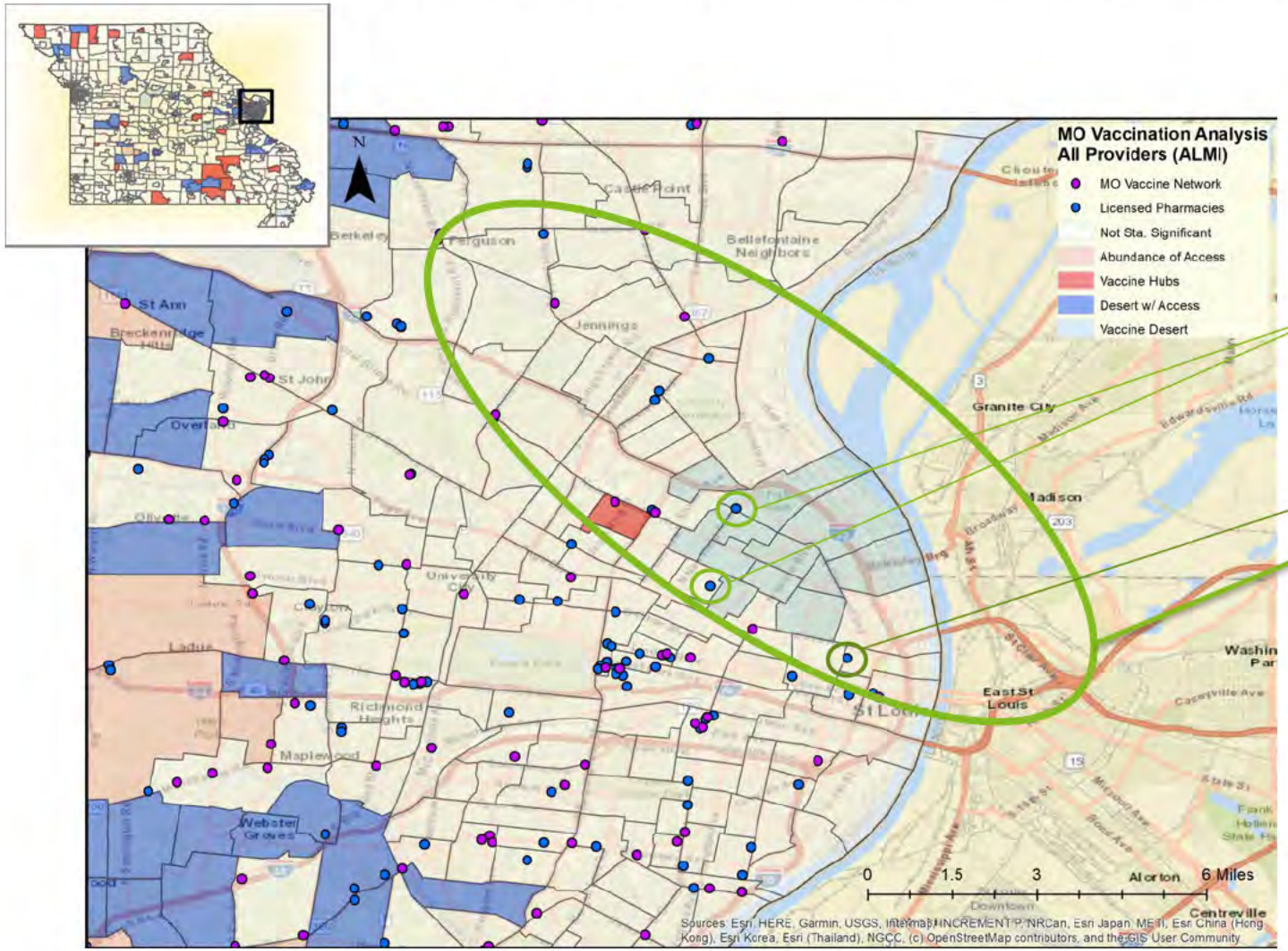
Parts of Saint Louis, one of two major metropolitan regions in Missouri, has been **identified as a vaccine desert** using a test of spatial autocorrelation known as Anselin's Local Moran's I.



The Saint Louis vaccine desert would benefit from **strategic partnerships** with **CareSTL Health** and **Affinia Healthcare**.

This region comprises **predominantly lower socioeconomic** communities with **higher than state-average minority population demographics.**

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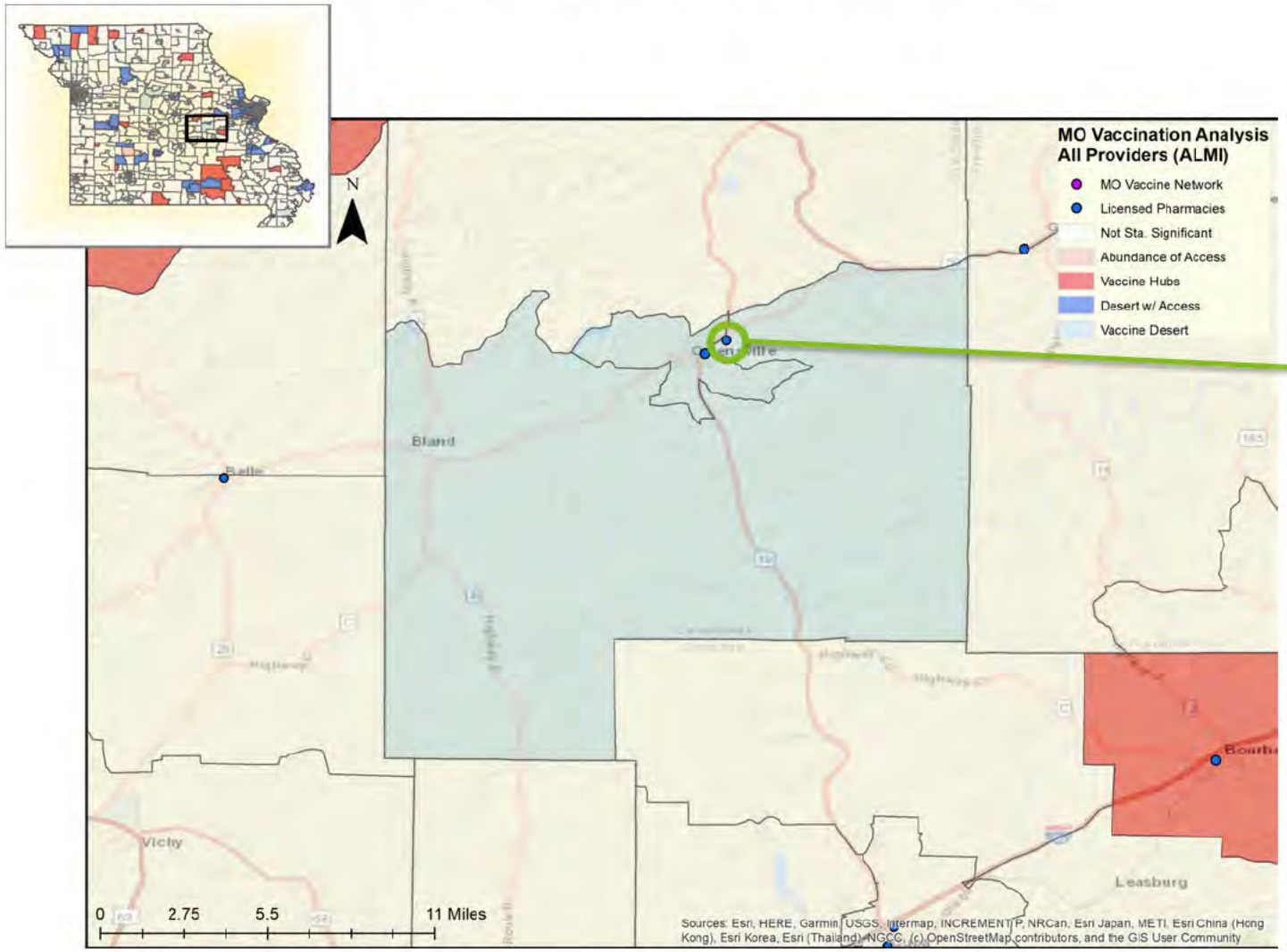
Owensville, a rural location in east/central Missouri, has been **identified as a vaccine desert** using a test of spatial autocorrelation known as Anselin's Local Moran's I.



The Owensville vaccine desert would **benefit from strategic connections to the Walmart pharmacy chain.**

- Walmart pharmacies, such as the one highlighted here, are **already administering vaccines in other States** as part of the Federal response.
- Blue dots not highlighted represent more local pharmacies not associated with national initiatives.

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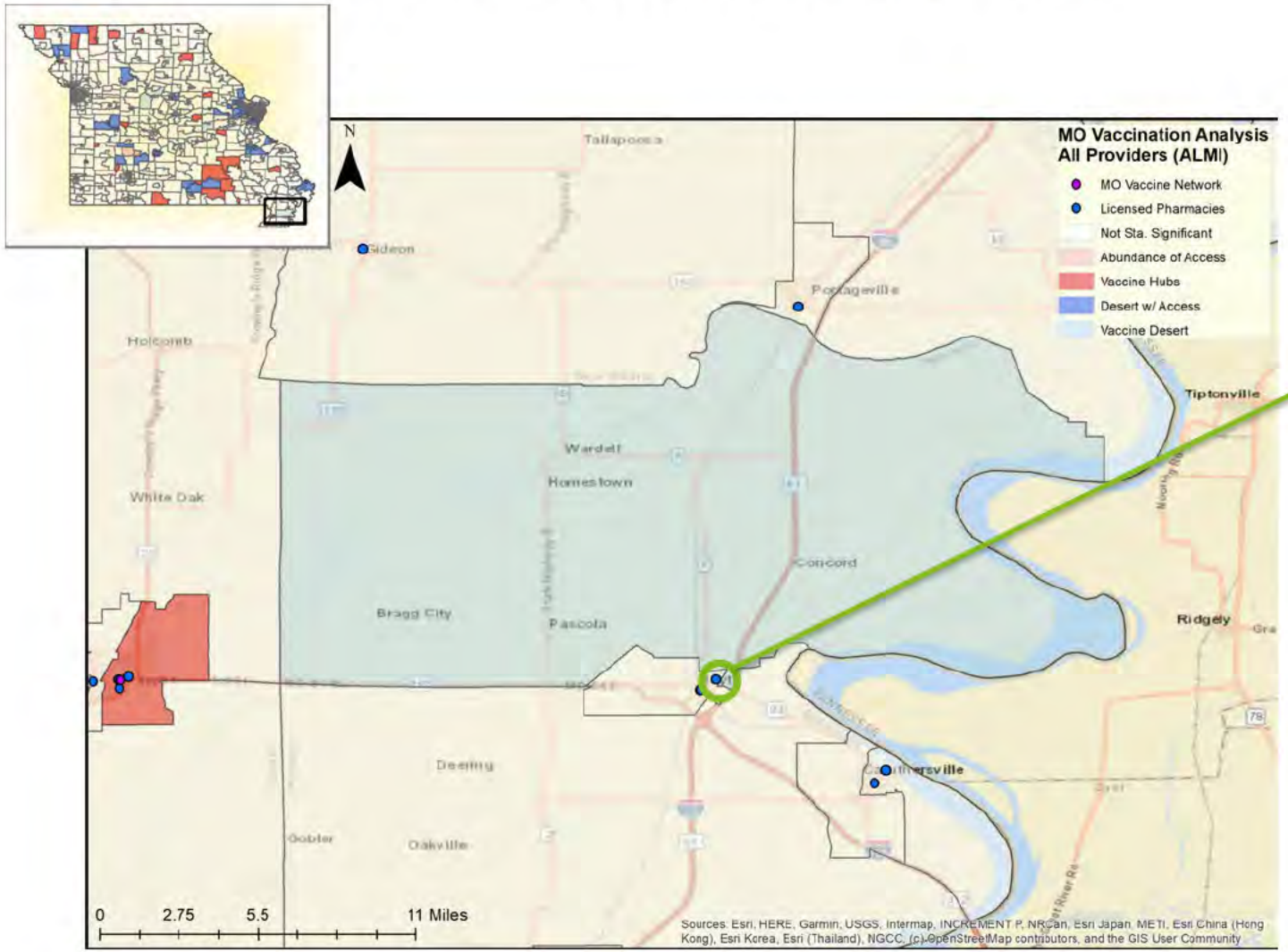
Hayti-Portageville, a rural location in southeastern Missouri, has been **identified as a vaccine desert** using a test of spatial autocorrelation known as Anselin's Local Moran's I.



The Hayti-Portageville vaccine desert would benefit from a **strategic partnership with the Pemiscot County Memorial Hospital.**

- There are **167 hospitals** across the State of Missouri, yet **less than 1/3 are enrolled in the State's vaccination network**.
- Blue dots not highlighted represent more local pharmacies not associated with national initiatives.

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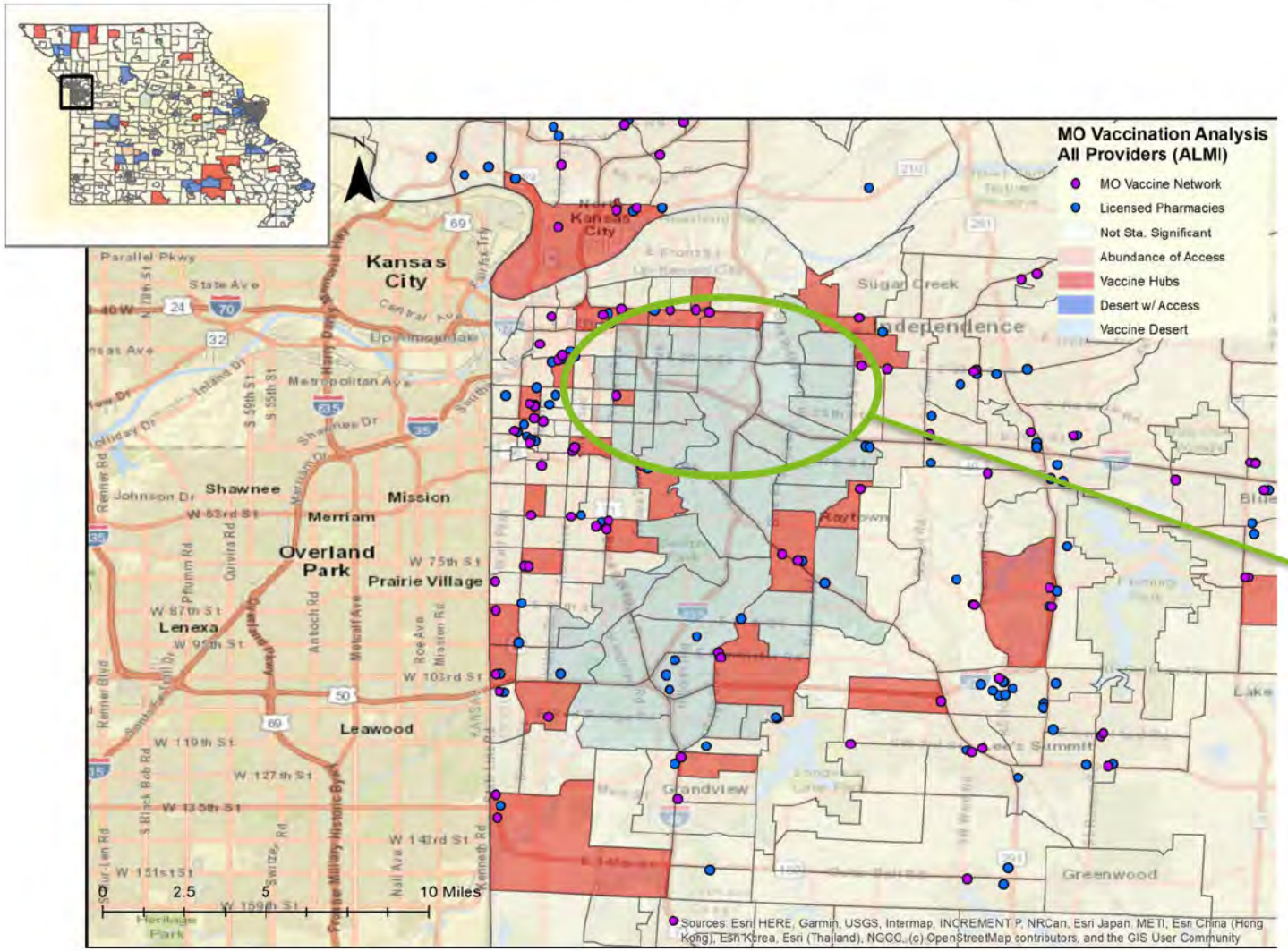
Kansas City, one of two major metropolitan regions in Missouri, has **been identified as a vaccine desert** using a test of spatial autocorrelation known as Anselin's Local Moran's I.



In Kansas City, there is **no easily accessible** (>500 meters walking distance) **and vaccination-ready facility** to serve the I-435 corridor.

This region comprises **predominantly lower socioeconomic** communities with **higher than state average minority populations.**

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