Appendix Methods Material

We obtained 2020 shape files for mapping U.S. states, counties, and Zip Code Tabulation Areas (ZCTA) from the U.S. Census Bureau's TIGER/Line Shapefiles[1].

We obtained shape files used to map COVID-19 Test-to-Treat locations from the U.S. Department of Health & Human Services[2]. We mapped the locations of Test-to-Treat facilities over ZCTA (zip code) boundaries using ArcMap. For each individual Test-to-Treat location, we drew a 20-mile radius around the facility. Using ArcMap, we identified any ZCTAs that fell completely outside the 20-mile radius of all Test-to-Treat facilities and categorized these areas as "underserved" by the Test-to-Treat program.

We obtained shape files used to map the locations of Public Therapeutic Provider locations from the U.S. Department of Health & Human Services[3]. We restricted this data to Paxlovid providers only, and mapped the data over ZCTA (zip code) boundaries in ArcMap.

We gathered data on poverty levels at the ZCTA level using data from the American Community Survey (2020 5-year estimates) via the U.S. Census Bureau's data.census.gov platform (see Table S1701)[4]. Using the poverty cut-offs detailed in the U.S. CDC Covid Data Tracker, we categorized each ZCTA as either "high" (> 17.3%), "medium" (>12.3-17.3%), or "low" (<12.3%) poverty.[5] We merged these data categories with the U.S. Census Bureau ZCTA shapefiles to identify the count and percentage of high, medium, and low-poverty ZCTAs in both "served" and "underserved" areas.

We gathered data on total population and the percentage of residents of Hispanic ethnicity at the ZCTA level using data from the American Community Survey (2020 5-year estimates) via the U.S. Census Bureau's data.census.gov platform (see Table B03002).[6] We calculated an estimate of percentage of residents by ethnicity from the table estimates for total population and population by Hispanic/non-Hispanic ethnicity. Using the cut-offs for Hispanic/Latino population levels detailed in the U.S. CDC Covid Data Tracker, we categorized each ZCTA as either "high" (> 45.5%), "medium" (>18.3-45.5%), or "low" (<18.3%) concentration of Hispanic/Latino residents.[5] We merged these data categories with the U.S. Census Bureau ZCTA shapefiles to identify the count and percentage of ZCTA with a high, medium, and low level of Hispanic residents in both "served" and "underserved" areas.

We gathered data on total population and the percentage of Black residents and American Indian/Native Alaskan residents at the ZCTA level using data from the American Community Survey (2020 5-year estimates) via the U.S. Census Bureau's data.census.gov platform (see Table B02001).[7] We calculated an estimate of percentage of residents by race from the table estimates for total population and population by group. Using the cut-offs detailed in the U.S. CDC Covid Data Tracker, we categorized each ZCTA as having either a "high" (> 37%), "medium" (>2.5-37%), or "low" (<2.5%) percentage of Black residents.[5] Similarly, we categorized each ZCTA as having either a "high" (>30.1%), "medium" (>0.7-30.01%), or "low" (<0.7%) percentage of American Indian/Native Alaskan residents.[5] We merged these data categories with the U.S. Census Bureau ZCTA shapefiles to identify the count and percentage of ZCTA with a high, medium, and low level of Black residents and American Indian/Native Alaskan residents in both "served" and "underserved" areas.

To assign an urbanicity category at the ZCTA level, we used data provided by the USDA on rural-urban commuting area codes (RUCAs).[8] The RUCA coding scheme categorizes zip codes in the U.S. into 10 categories based on urbanicity and local commuting levels. Using the RUCA data, we created a summary variable that categorizes ZCTAs into one of four urbanicity categories (including local commuting patterns): metropolitan, micropolitan, small town, and rural. We merged this categorical data with ZCTA shape files to identify the count and percentage of ZCTAs in both "served" and "underserved" areas.

We used cutoff points established by the U.S. CDC's Covid Data Tracker to categorize ZCTAs for demographic groups of interest, including percentage of residents by race/ethnicity (Black, Hispanic, Native American), and percentage of residents below the poverty level. The COVID Data Tracker creates these cutoff points based on terciles of population characteristics by county.[5]

For the sensitivity analyses, we repeated this process using radii of 15 miles, 10 miles, and 5 miles.

References

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8. United States Department of Agriculture Economic Research Service. Rural-urban commuting area codes. https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes.aspx Accessed: July 13, 2022.

Appendix Table 1. Sensitivity Analysis - Characteristics of Underserved Zip Codes (Compared to Served) in the Continental United States using a radius of 5, 10, and 15 miles

Characteristic	15-mile radius		10-mile radius		5-mile radius	
	Underserved Zip Codes (No Test-to-Treat program within radius) (n=17,163)	**Served Zip Codes** (Test-to-Treat program(s) within radius) (n=16,137)	**Underserved Zip Codes** (No Test-to-Treat program within radius) (n=19,887)	**Served Zip Codes** (Test-to-Treat program(s) within radius) (n=13,413)	**Underserved Zip Codes** (No Test-to-Treat program within radius) (n=23,456)	**Served Zip Codes** (Test-to-Treat program(s) within radius) (n=9,844)
Urbanicity [a]						
Metropolitan (urban centers with 50,000+ population and surrounding zip codes)	5,126 (28.7%)	12,708 (71.3%)	6,672 (37.4%)	11,162 (62.6%)	9,059 (50.8%)	8,775 (49.2%)
Micropolitan (urban clusters with 10,000-49,999 population and surrounding zip codes)	3,473 (72.6%)	1,314 (27.4%)	3,890 (81.3%)	897 (18.7%)	4,350 (90.9%)	437 (9.10%)
Small town (urban clusters with 2,500-9,999 population and surrounding zip codes)	2,829 (79.3%)	739 (20.7%)	3,107 (87.1%)	461 (12.9%)	3,363 (94.3%)	205 (5.70%)
Rural (clusters <2,500 population and primary flow of commuting is local)	5,264 (84.0%)	1,003 (16.0%)	5,675 (90.6%)	592 (9.40%)	6,048 (96.%5)	219 (3.5%)
Race / Ethnicity [b, c]						
Percent Black						
High (>37%)	811 (40.1%)	1,209 (59.9%)	923 (45.7%)	1,097 (54.3%)	1,093 (54.1%)	927 (45.9%)
Medium (>2.5-37%)	3,226 (31.6%)	6,973 (68.4%)	3,853 (37.8%)	6,346 (62.2%)	4,859 (47.6%)	5,340 (52.4%)
Low (<=2.5%)	12,522 (62.8%)	7,419 (37.2%)	14,412 (72.3%)	5,529 (27.7%)	16,686 (83.7%)	3,255 (16.3%)
Percent Hispanic						
High (>45.5%)	521 (32.6%)	1,077 (67.4%)	586 (36.7%)	1,012 (63.3%)	715 (44.7%)	883 (55.3%)
Medium (>18.3-45.5%)	1,025 (31.6%)	2,220 (68.4%)	1,176 (36.2%)	2,069 (63.8%)	1,486 (45.8%)	1,759 (54.2%)
Low (<= 18.3%)	15,013 (55.0%)	12,304 (45.0%)	17,426 (63.8%)	9,891 (36.2%)	20,437 (74.8%)	6,880 (25.2%)

Characteristic	15-mile radius		10-mile radius		5-mile radius	
	Underserved Zip Codes (No Test-to-Treat program within radius) (n=17,163)	**Served Zip Codes** (Test-to-Treat program(s) within radius) (n=16,137)	**Underserved Zip Codes** (No Test-to-Treat program within radius) (n=19,887)	**Served Zip Codes** (Test-to-Treat program(s) within radius) (n=13,413)	**Underserved Zip Codes** (No Test-to-Treat program within radius) (n=23,456)	**Served Zip Codes** (Test-to-Treat program(s) within radius) (n=9,844)
Percent Native American						
High (>30.1%)	289 (79.8%)	73 (20.20%)	314 (86.7%)	48 (13.30%)	342 (94.5%)	20 (5.5%)
Medium (>0.7-30.1%)	10,204 (69.2%)	4,541 (30.8%)	11,501 (78.0%)	3,244 (22.0%)	12,967 (87.9%)	1,778 (12.1%)
Low (<= 0.7%)	5,998 (35.3%)	10,971 (64.7%)	7,302 (43.0%)	9,667 (57.0%)	9,250 (54.5%)	7,719 (45.5%)
Poverty [b, c]						
High (>17.3%)	4,580 (56.9%)	3,463 (43.1%)	5,234 (65.1%)	2,809 (34.9%)	5,966 (74.2%)	2,077 (25.8%)
Medium (>12.3-17.3%)	3,180 (57.4%)	2,356 (42.6%)	3,627 (65.5%)	1,909 (34.5%)	4,134 (74.7%)	1,402 (25.3%)
Low (<= 12.3%)	8,720 (47.4%)	9,673 (52.6%)	10,239 (55.7%)	8,154 (44.3%)	12,436 (67.6%)	5,957 (32.4%)

a. Urbanicity status was drawn from the USDA dataset on rural-urban commuting area codes; in this dataset, zip codes are considered "metropolitan" if located within an urban center of more than 50,000 people, along with the surrounding zip codes where the primary commuting flow of the zip code is into the urban center. "Micropolitan" zip codes are located within urban clusters with a population of 10,000 to 50,000 people and/or if the primary commuting flow of the zip code is into such a micropolitan area. "Small Town" zip codes are located within urban clusters with a population of 2,500 to 9,000, including surrounding zip codes with primary commuting flow into the urban cluster. "Rural" zip codes are those with a "local" primary commuting flow (i.e., little commuting to urban areas or urban clusters). Urbanicity status was unavailable for 844 zip codes in the continental United States (including 451 "served" zip codes and 393 "underserved" zip codes based on the 20-mile radius definition).

b. Information on race/ethnicity and poverty status was drawn from the American Community Survey (2020 5-year estimates). Poverty status information was unavailable for 1,328 zip codes in the continental United States (including 741 "served" and 587 "underserved" zip codes). Information on the percentage of Black and Hispanic residents was unavailable for 1,140 zip codes (including 628 "served" and 512 "underserved" zip codes). Information on the percentage of Native American (American Indian/Native Alaskan) residents was unavailable for 1,224 zip codes (including 653 "served" and 571 "underserved" zip codes based on the 20-mile radius definition).

c. Thresholds for percentage of racial/ethnic subgroups and percent of population in poverty are drawn from the CDC's COVID Data Tracker, which creates thresholds based on terciles of population characteristics by county.

Appendix Figure 1: Sensitivity Analysis – Maps of Underserved Zip Codes in the Continental United States using a radius of 5, 10, 15, and 20 miles, July 18, 2022