WILMAPCO

DATA REPORT

Connectivity Analysis

Draft June 2025

Introduction

Working with the University of Delaware's Center for Applied Demography and Survey Research (CADSR), we analyzed transportation connectivity[1] within the WILMAPCO region, which includes New Castle County, Delaware and Cecil County, Maryland. Connectivity to nine destination types from every housing unit in the region was determined for walking, bicycling, transit, and car trips. Housing unit-based connectivity statistics were aggregated to Census blocks, which becomes the resolution of the analysis. Census blocks are classed based on the collective level of housing unit connectivity *to at least one destination within these destination types*[2]. The analysis provides a rich survey of regional connectivity—or, as it more commonly turned out, dis-connectivity.

To summarize the results of this analysis, an overall average of 93% of homes are connected to all destination types by car, 42% by transit, 20% by biking, and 6% by walking. When applying these results to concentrations of demographic groups, homes in Black, Hispanic, and low-income neighborhood concentrations had equal or better connectivity to all destinations than average on every mode. However, people living in senior and youth neighborhood concentrations often had more limited transportation connectivity than average.

[1] This work builds upon earlier WILMAPCO/CADSR connectivity analyses. In 2015, we considered walking, biking, bus, and car connectivity from neighborhood concentrations to supermarkets, libraries, senior centers, and low-wage employment centers. In 2019, we expanded this to a regionwide analysis with additional destination types. Advances in computer processing power and geospatial infrastructure data enabled much finer-grained results for this analysis.

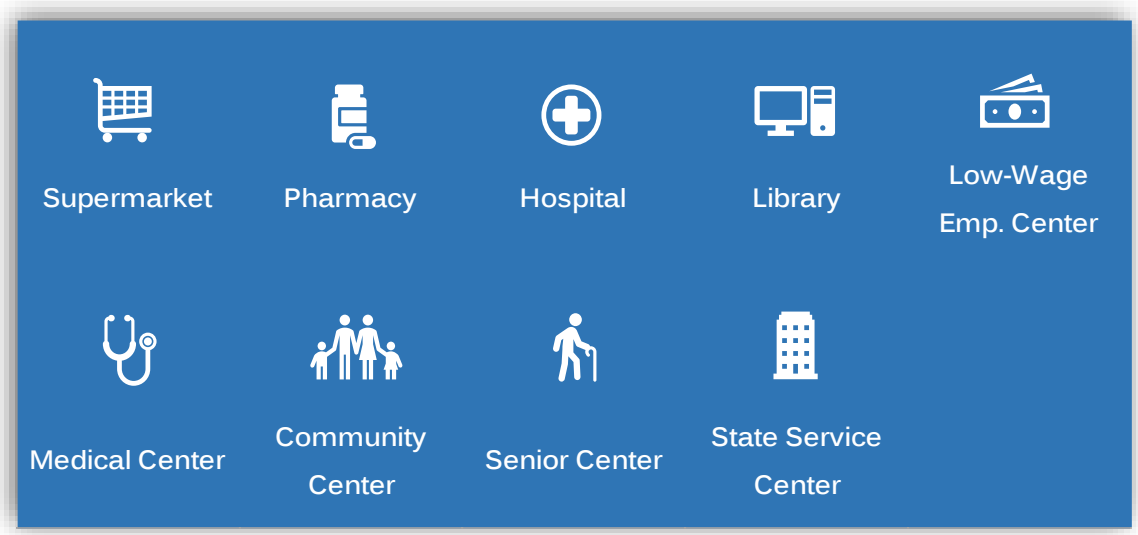
[2] The classes used in our mapping analysis, vary from completely disconnected (0% of housing units connected to at least one destination, per destination type), to having "weak" connections (1%-74%), "strong" connections (75%-99%), or complete (100%) connections.

Methodology

As shown in the graphic on the following page, nine key destination types were identified. These were places our Mobility Opportunities Work Group felt were important for people (especially from Economic Opportunity and Mobility Challenged neighborhoods) to be able to reach. Geographic Information System (GIS) data were developed for each destination type – pinpointing all supermarkets, pharmacies, hospitals, etc. Most of these data were derived from existing data on file at CADSR.

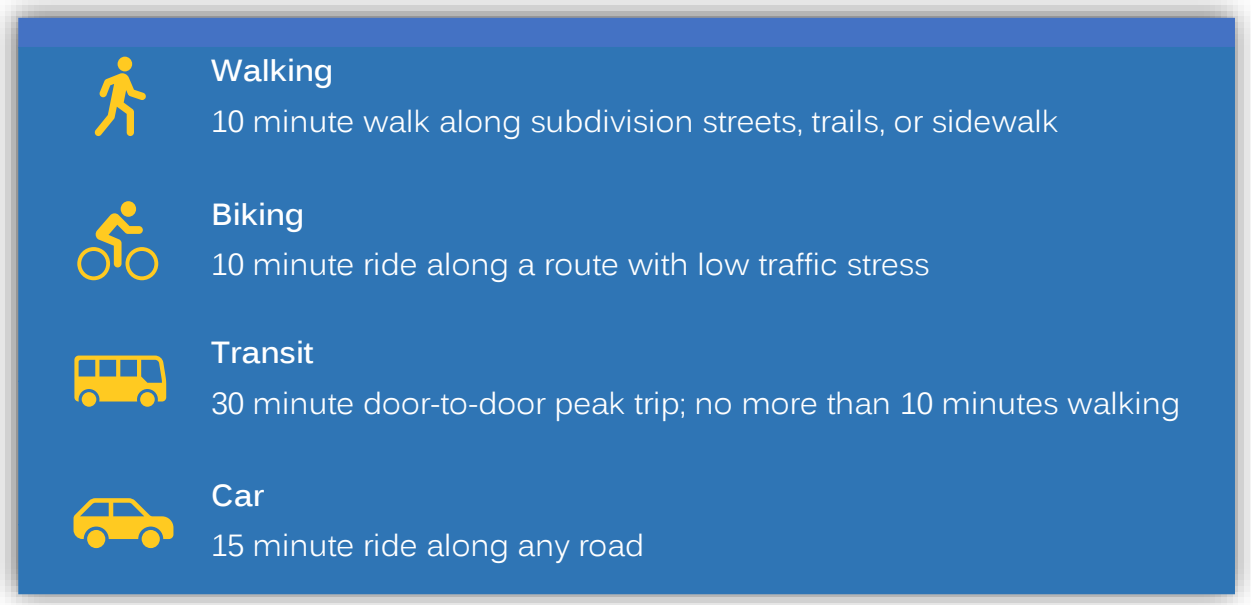
Low-wage employment centers were identified as clusters with a predominance of jobs below the median wage in New Castle County. Data was obtained from a variety of sources, including CADSR libraries, the US Census Bureau, commercial entities, and local and state government resources.

Key Destinations



Connectivity to these destinations was measured on four travel modes – walking, biking, public transit, and by car. A housing unit was marked "connected" to a destination type by walking or biking when a person could reach at least one of the destinations (in that type) within a low-stress 10-minute walk or ride. Connected housing units on public transit had to reach destinations on a 30-minute door-to-door (house to destination) peak hour, fixed-route bus trip, including transfers. No more than 10 minutes of that trip could be spent walking along a low-stress route. Car connected housing units were those within a 15-minute car ride, along any road, between the housing unit and destination.

Connectivity Definitions, by Mode



The final product of our connectivity analysis is the percentage of connected housing units, by mode and destination type, within each block. Because we also know the total number of housing units within each block, we were also able to produce corresponding regional level connectivity statistics.

For mapping purposes, we classed the blocks based on their level of connectivity for each mode and destination type. Here are the classifications:

- **None** = 0% of housing units connected
- **Weak** = 1% to 74% of housing units connected
- **Strong** = 75% to 99% of housing units connected
- **Connected** = 100% of housing units connected

To illustrate how the analysis is built, consider the diagram on the following page. This considers hypothetical walking access to libraries. Housing units within an easy 10-minute walk to at least one library are marked "connected." Next, let's say within one block 50% of housing units are connected to libraries by walking. With 50% connectivity, that block is classed as a "weak" connection. Comparatively, neighboring blocks are classed as having no connections (0% connectivity), strong connectivity (75% – 99% housing unit connectivity) or connected (100% housing unit connectivity). These analyses are repeated for each block for each mode and each destination type in the region.
A couple words of caution are necessary here. First, just because we mark a housing unit or Census block as having a good connection, it does not mean that that connection is used. In too many of our urban communities, for example, crime and the threat of crime keeps families from walking and bicycling more. A pharmacy down the street, or the park or school a few blocks away, are sometimes not accessible because of safety.

Finally, while we took pains to ensure that the destinations were complete, errors are possible, and changes to destinations are inevitable – for instance, the opening or closing of a grocery store or pharmacy. The transportation infrastructure that makes the connections possible also changes – for instance, a new pedestrian path is added to an area, closing a gap in the low-stress walking network. The improvement or degradation of connectivity to the types of key destinations addressed in this analysis can significantly alter quality of life and safety of communities. Consideration of the outputs and a regular re-assessment can address data updates and changes in land use and infrastructure.

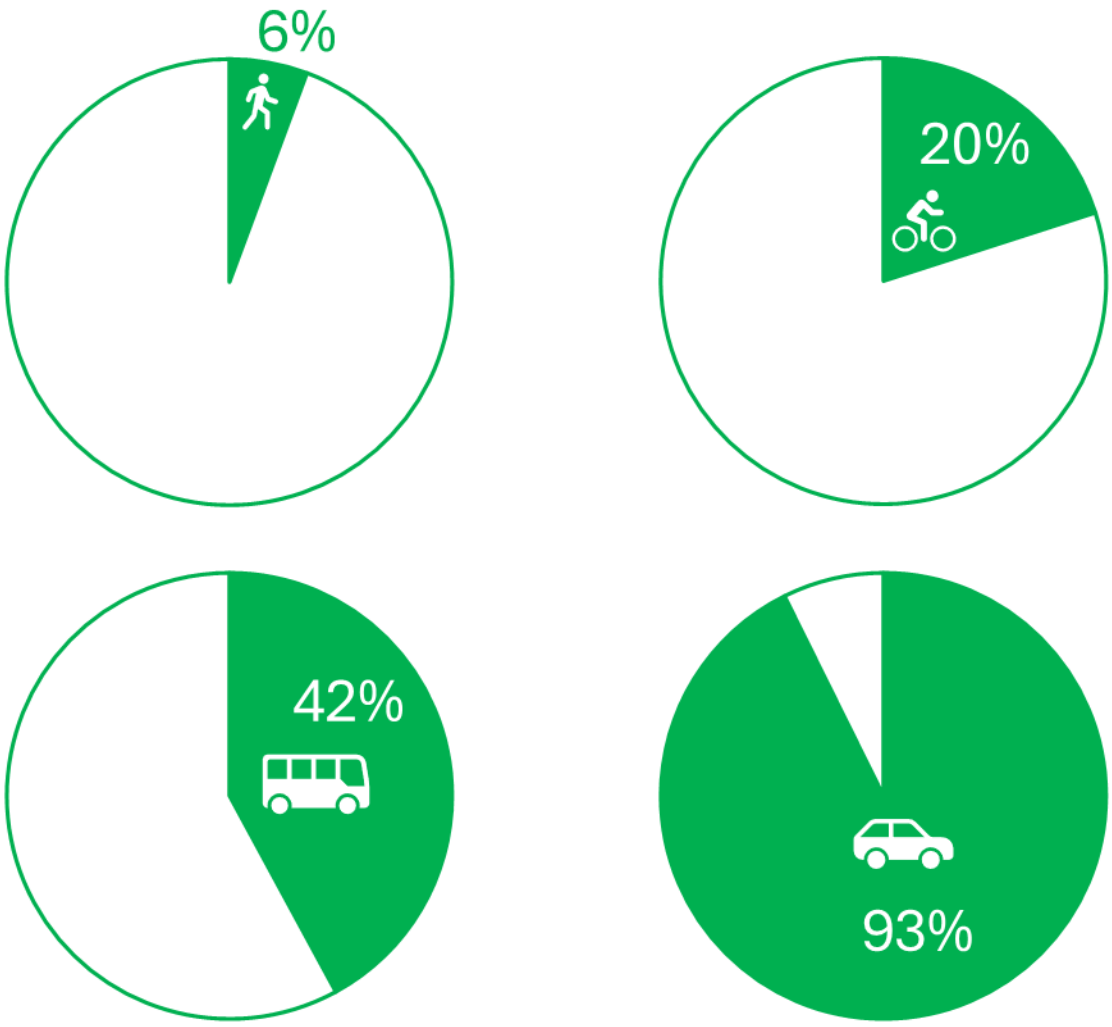
Hypothetical Connectivity Diagram – Walking to Libraries

Overall Connectivity Results

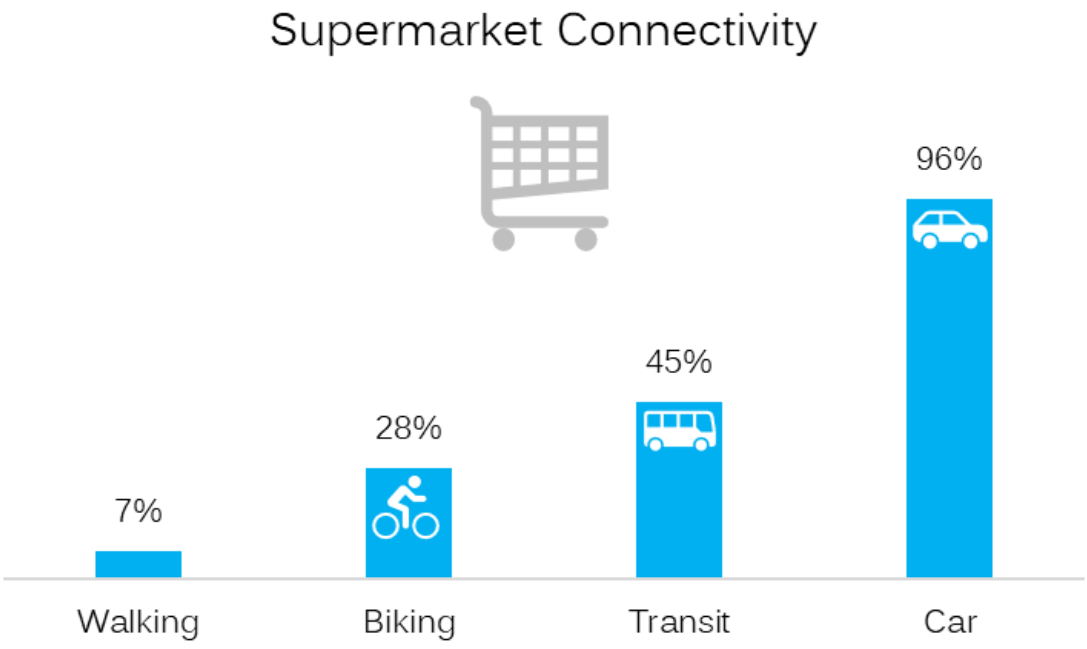
Our analysis results show just how car dependent the WILMAPCO region has become. An overall average of 93% of homes are connected to all combined destination types by car. By contrast, less than a quarter of homes have good connections, on average, to destinations by walking or biking and less than half by transit. Average good transit connectivity (42%) from homes to destinations outpaces average bike connectivity (20%). Both are above the average walking connectivity. Fewer than one in ten (6%) of homes have good walking connections to destinations.

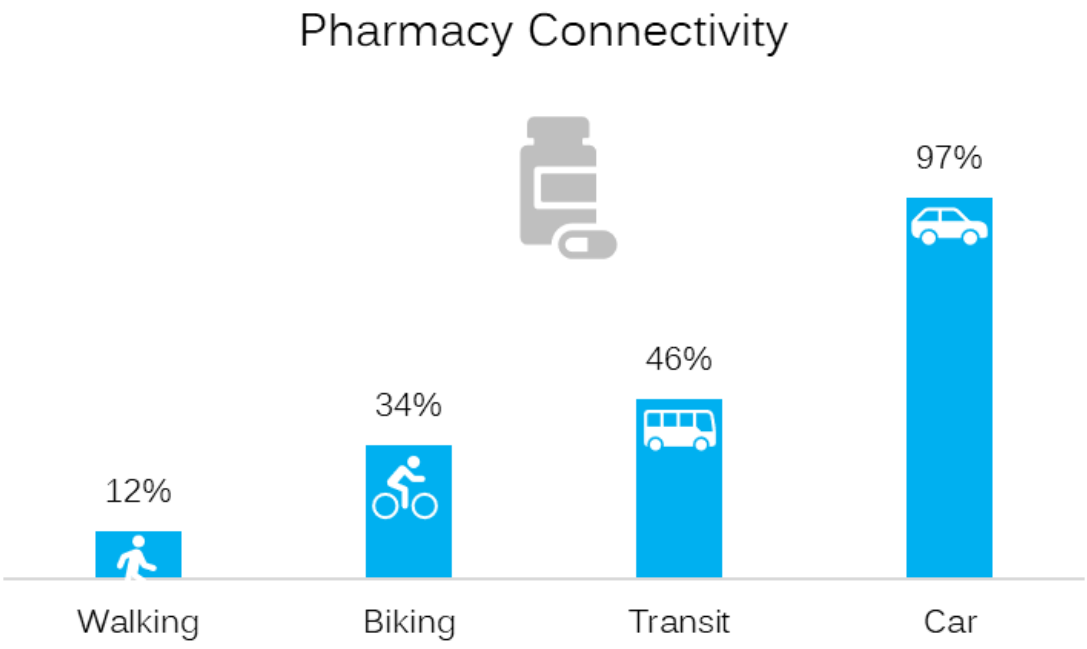
Average Percentage of Households Connected to Destinations (Combined), by Mode

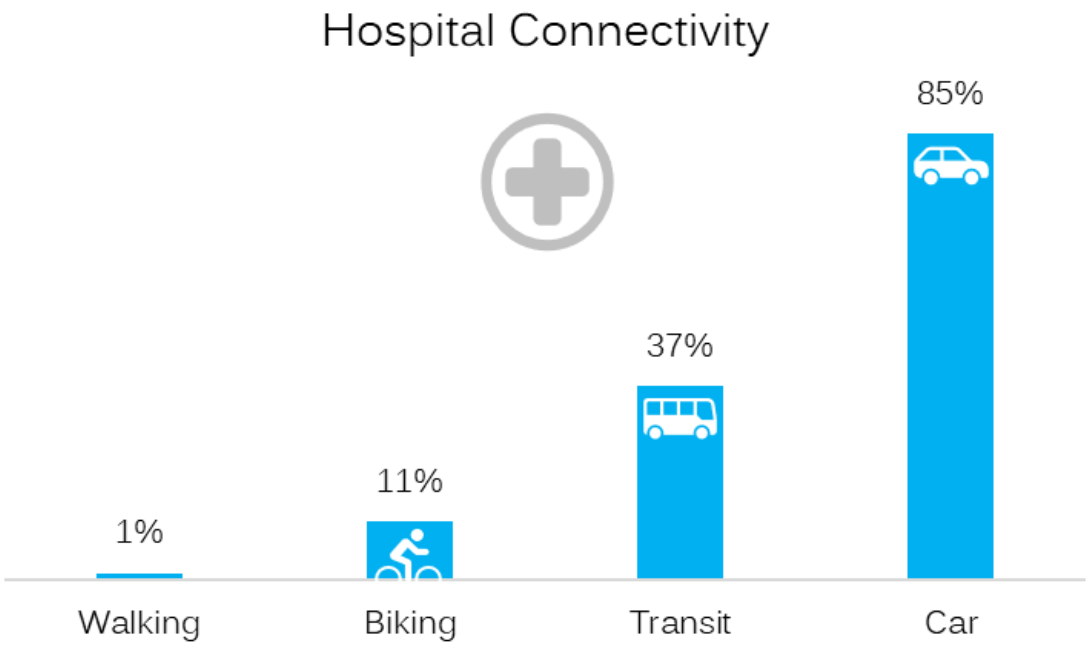
WILMAPCO Region, 2024

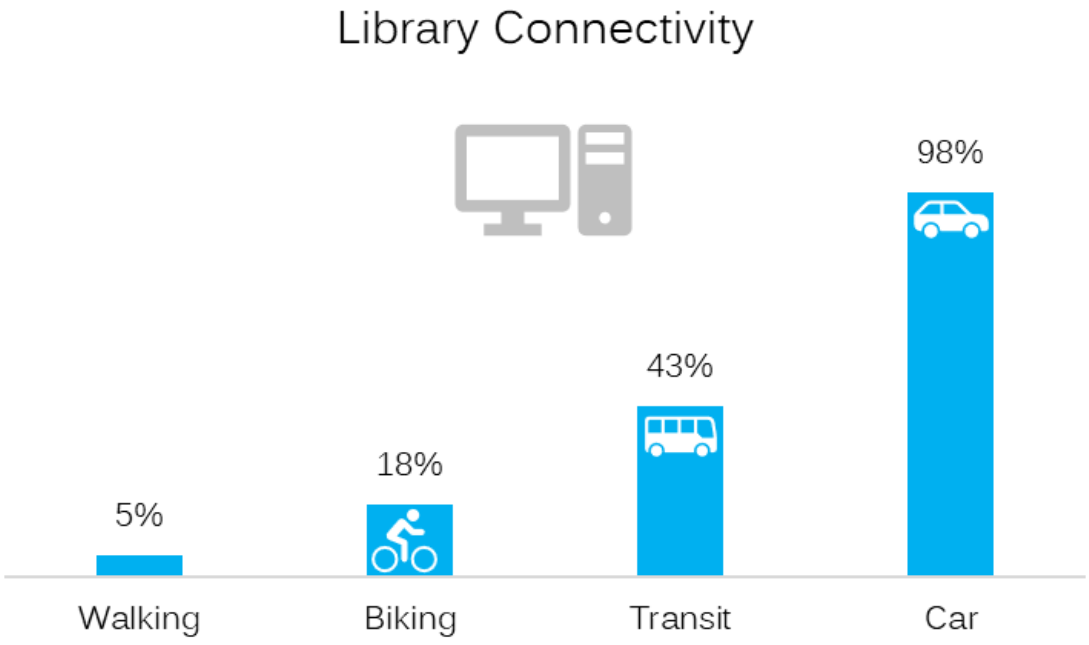


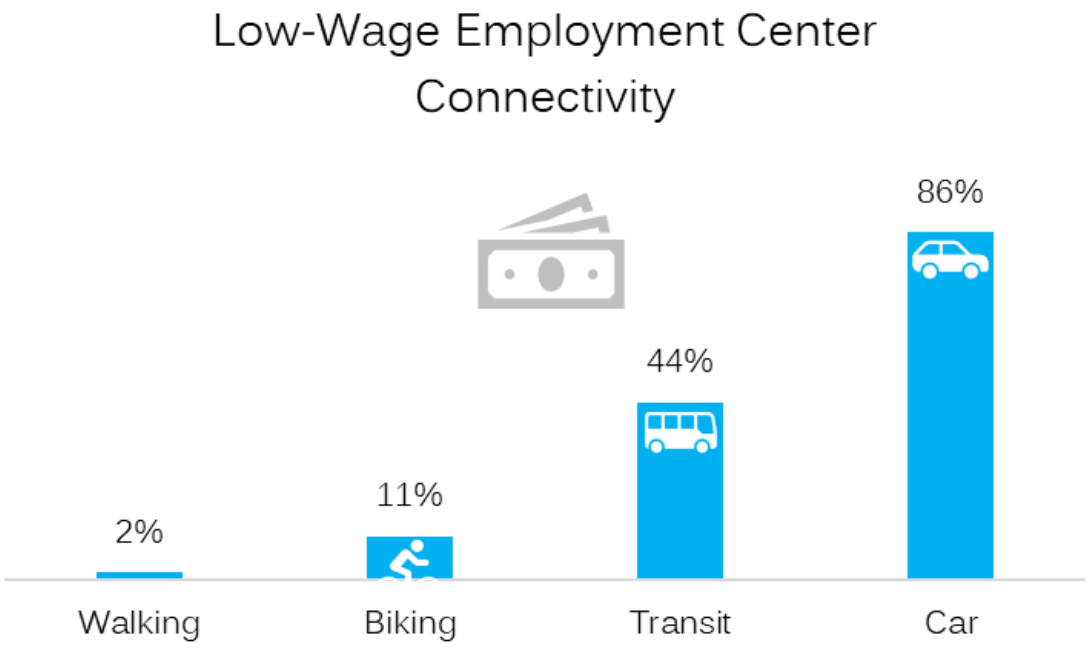
More detailed results, by destination type, are found in the graphs below. These show the percentage of homes across the WILMAPCO region that are connected to at least one of the destinations, within each type, by each mode.

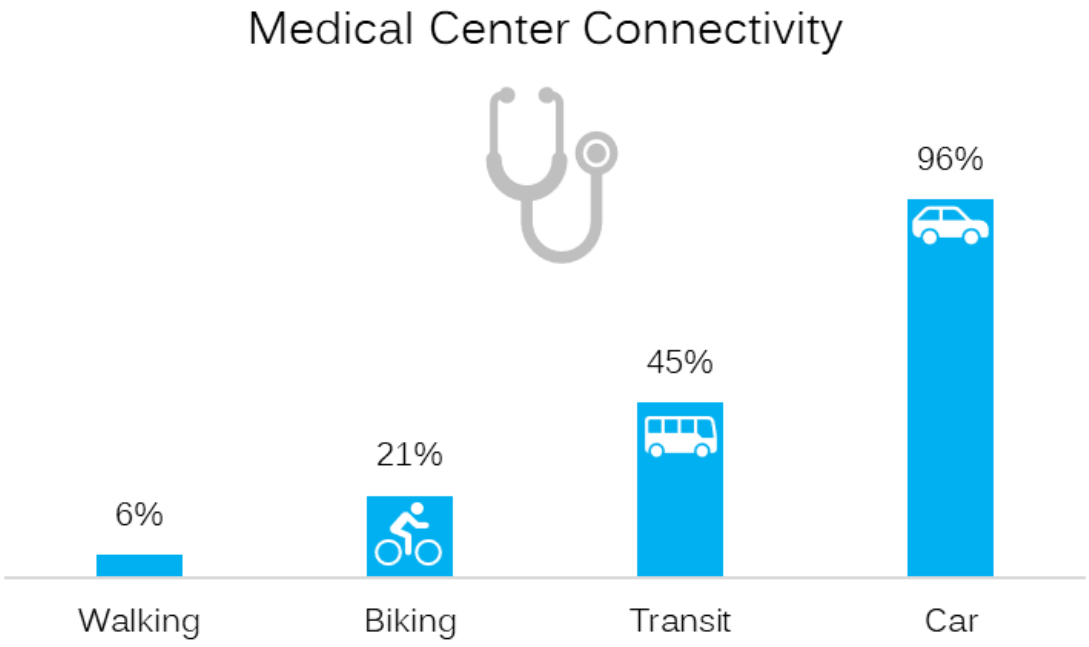


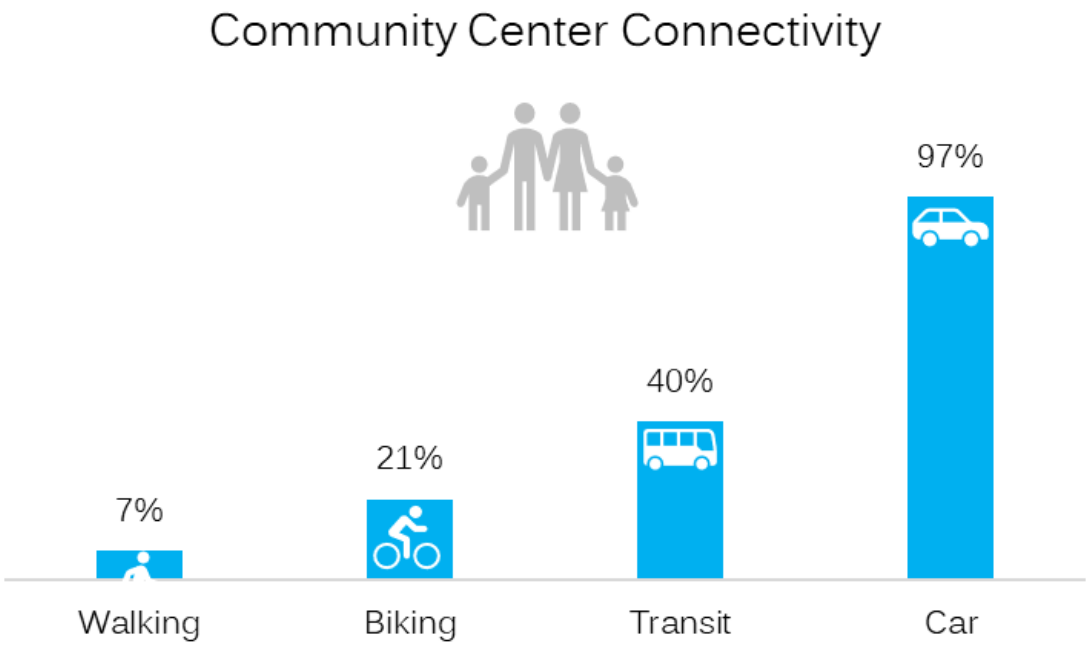


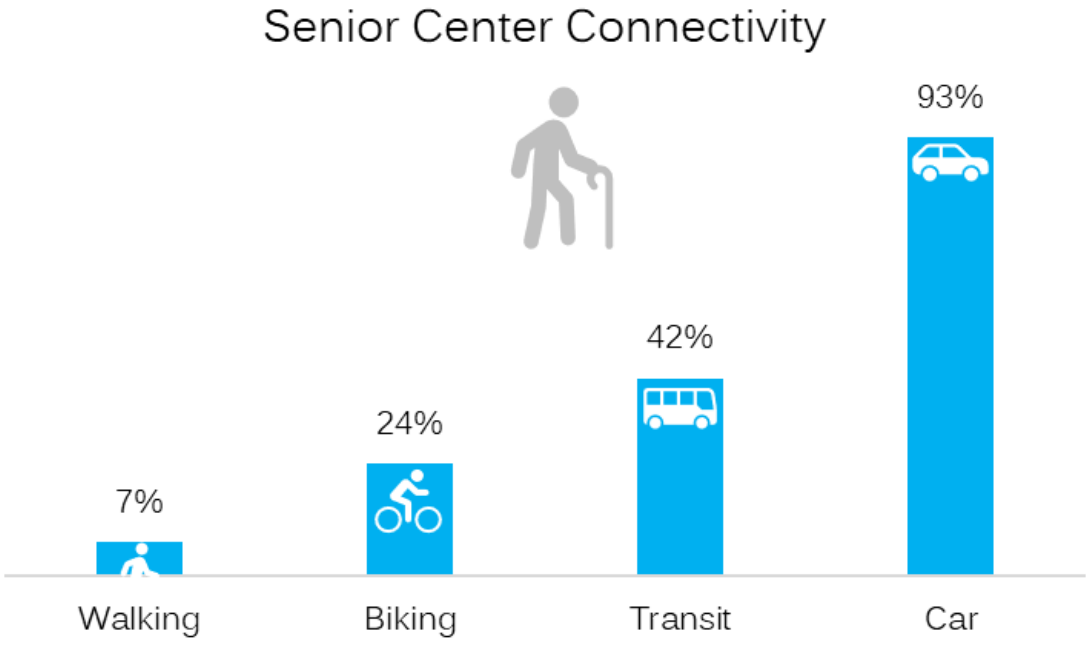

Hospital Connectivity
85%
37%
11%
1%
Walking
Biking
Transit
Car

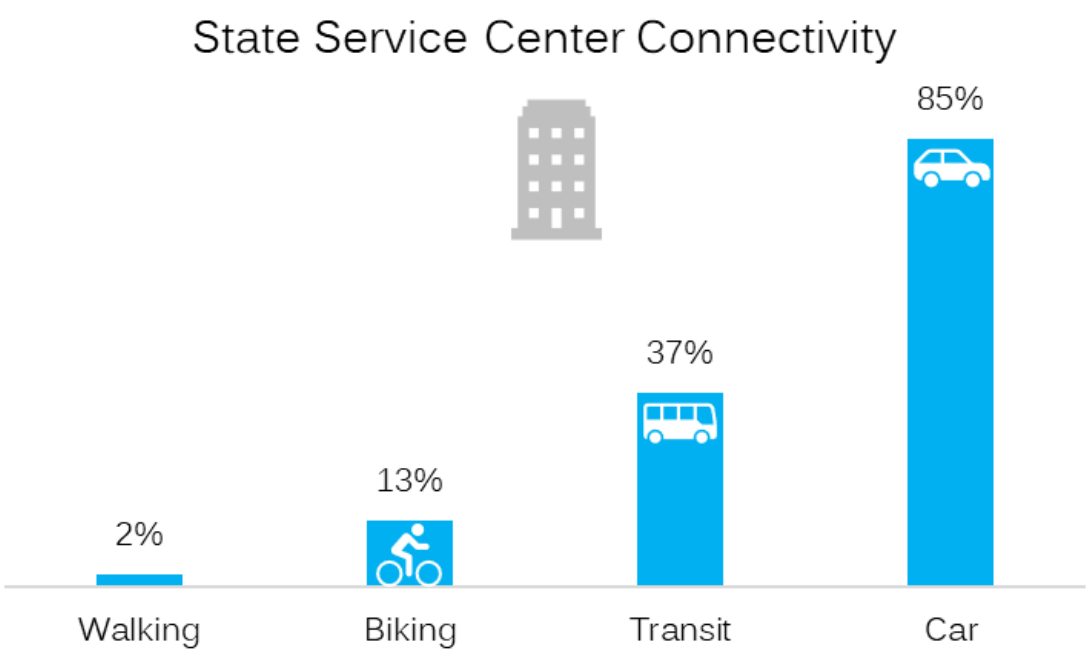

Library Connectivity
98%
43%
18%
5%
Walking
Biking
Transit
Car


Low-Wage Employment Center Connectivity
2%
11%
44%
86%
Walking
Biking
Transit
Car


Medical Center Connectivity
6%
21%
45%
96%
Walking
Biking
Transit
Car


Community Center Connectivity
7%
21%
40%
97%
Walking
Biking
Transit
Car


Senior Center Connectivity
7%
24%
42%
93%
Walking
Biking
Transit
Car



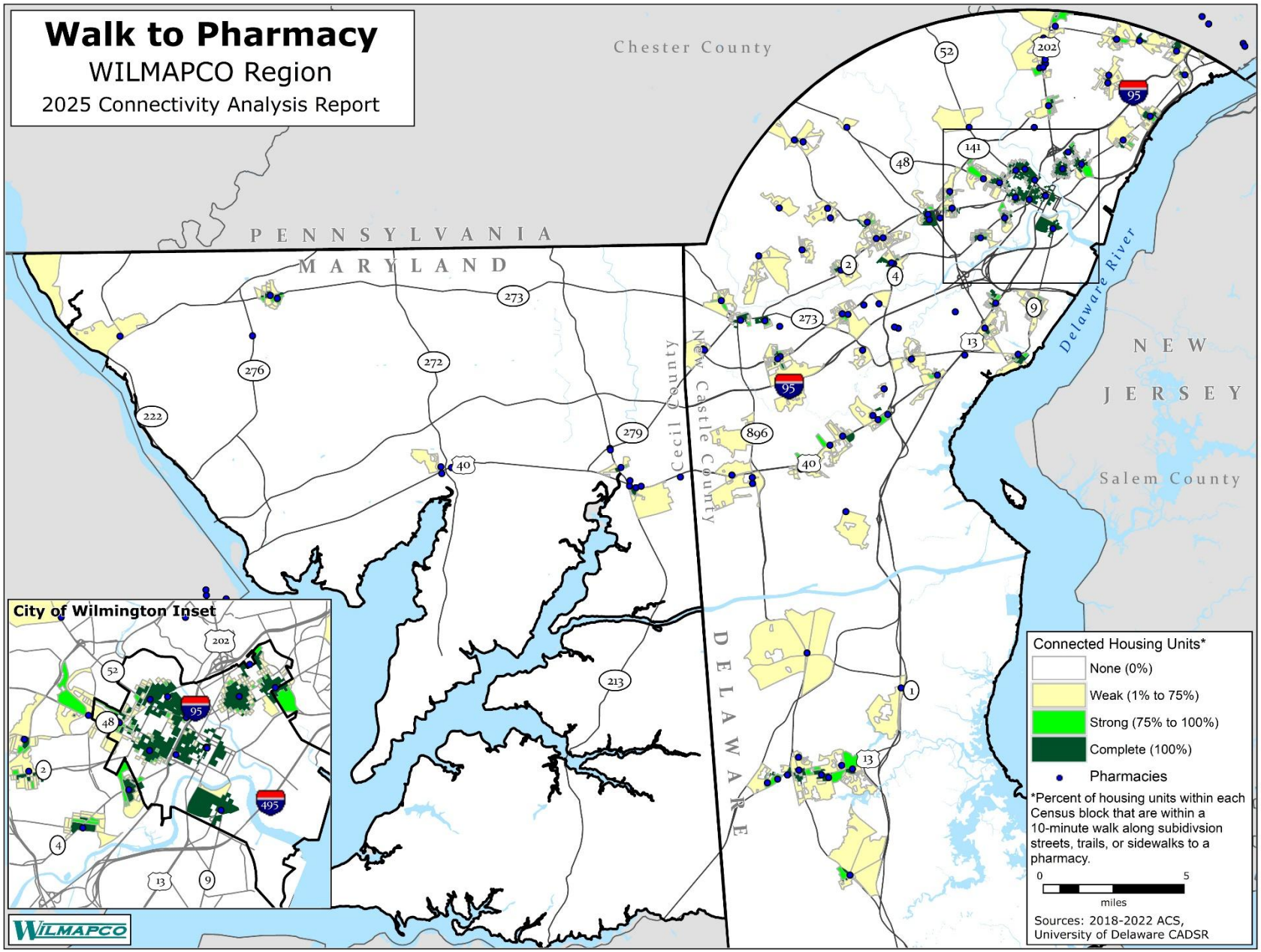
The map series found on the following pages illustrates the connectivity analysis at the Census block level. We consider access analyses to specific destination types on a specific mode as examples only. Interactive maps available at www.wilmapco.org/tj [in progress] house our complete spatial analyses.

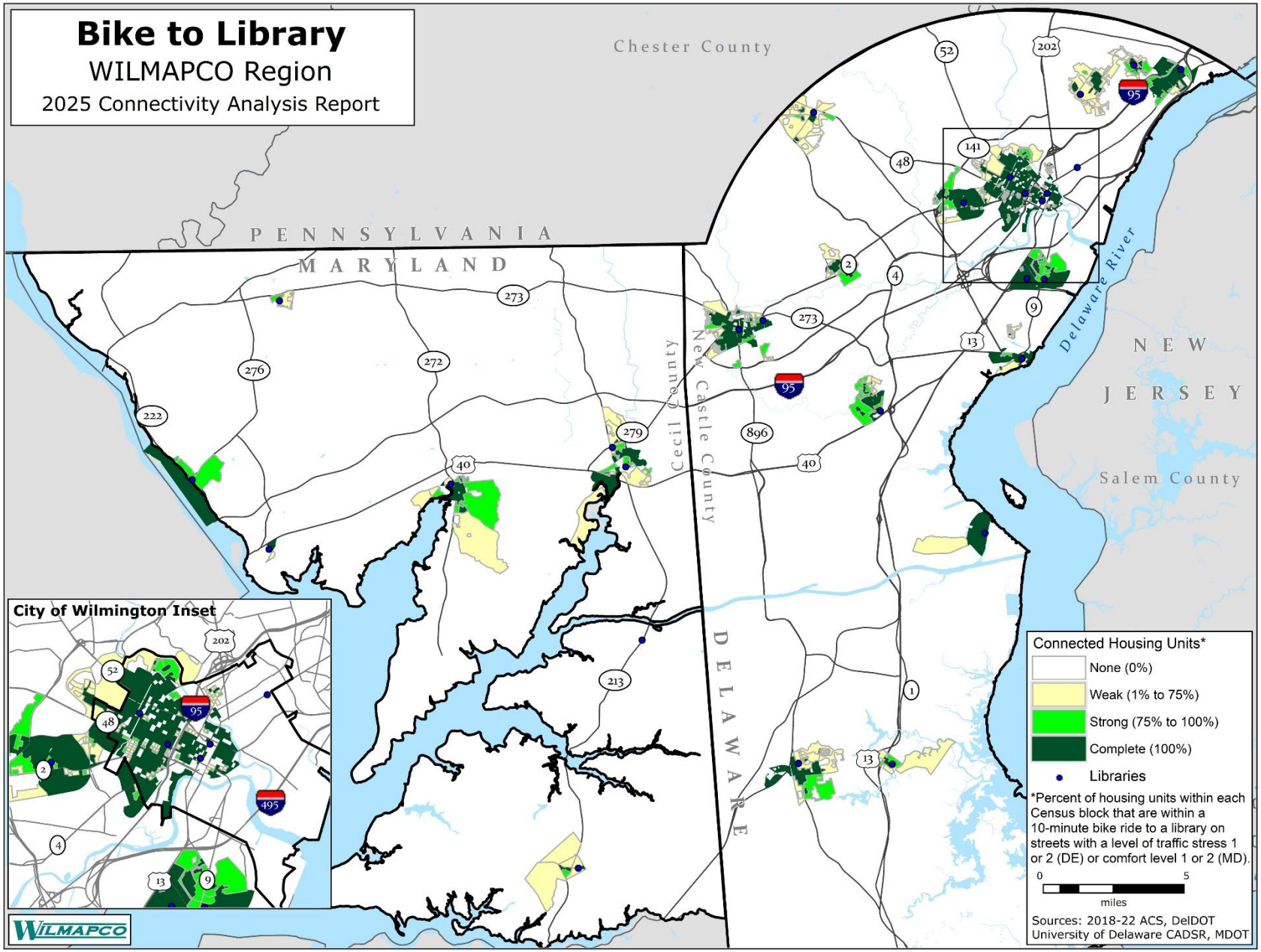
The first map examines walking connectivity to pharmacies. Only neighborhoods in parts of Wilmington had complete connections to pharmacies (100% of housing units within each block were within a 10-minute easy walk to at least one pharmacy). Strong neighborhood connections to pharmacies (where >75% of homes were within an easy walk to a pharmacy) were identified just outside of Wilmington, as well as a handful of neighborhoods in Newark, Glasgow, Middletown, and Rising Sun. Many more neighborhoods had weak walking connections to pharmacies (where 1 – 75% of homes were within an easy walk to a pharmacy). These were identified along major roads between Elkton and Claymont, along with communities around North East, Rising Sun and Middletown. Other neighborhoods and places were disconnected (0% of housing units connected) from pharmacies by walking.

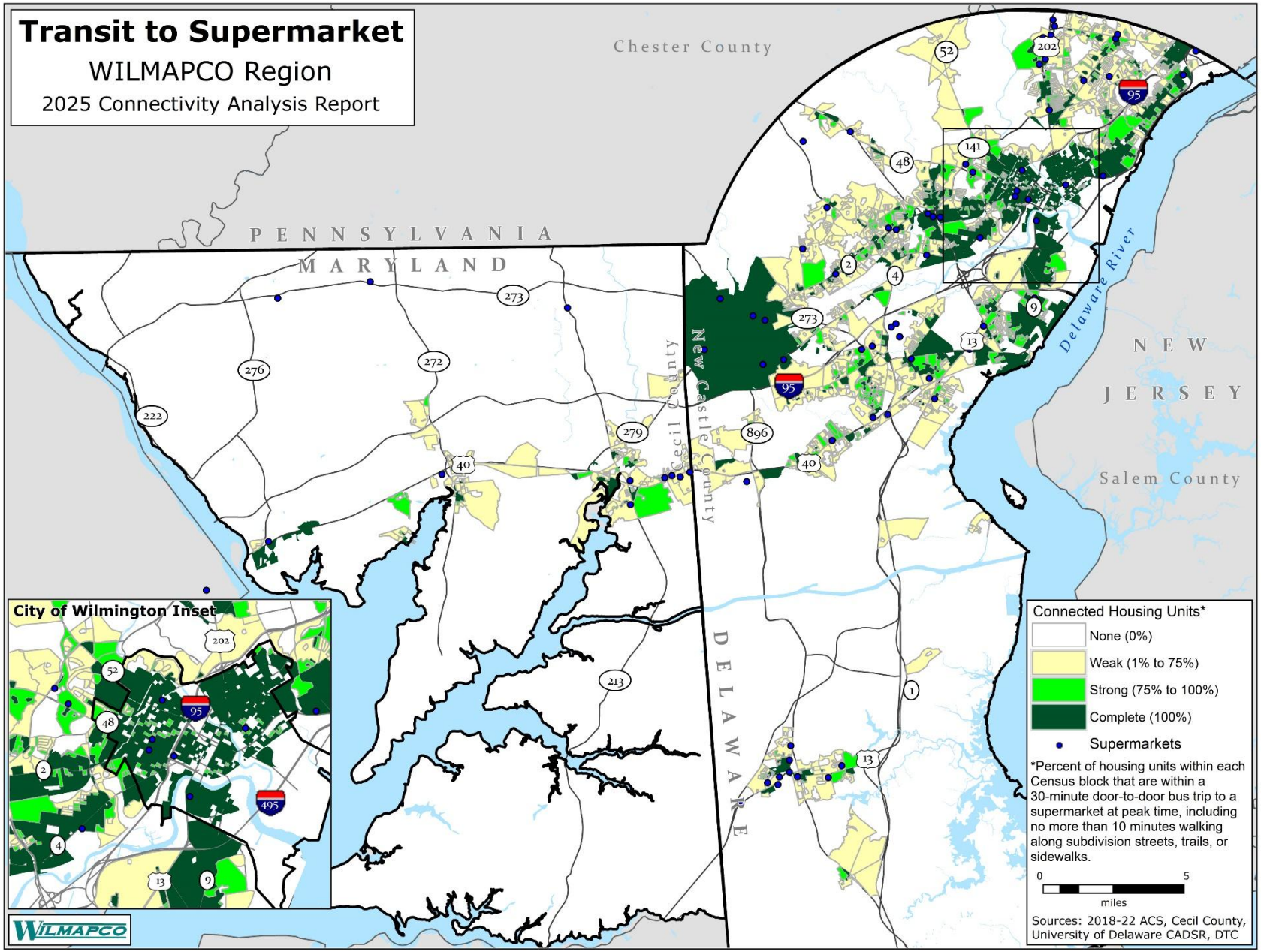
A second map illustrates bike connectivity to libraries. Much of Wilmington is fully connected to at least one library by biking. Some neighborhoods around suburban libraries, meanwhile, have strong to complete connections. Libraries in rural areas mostly have weak to strong connectivity via bicycle to surrounding communities.

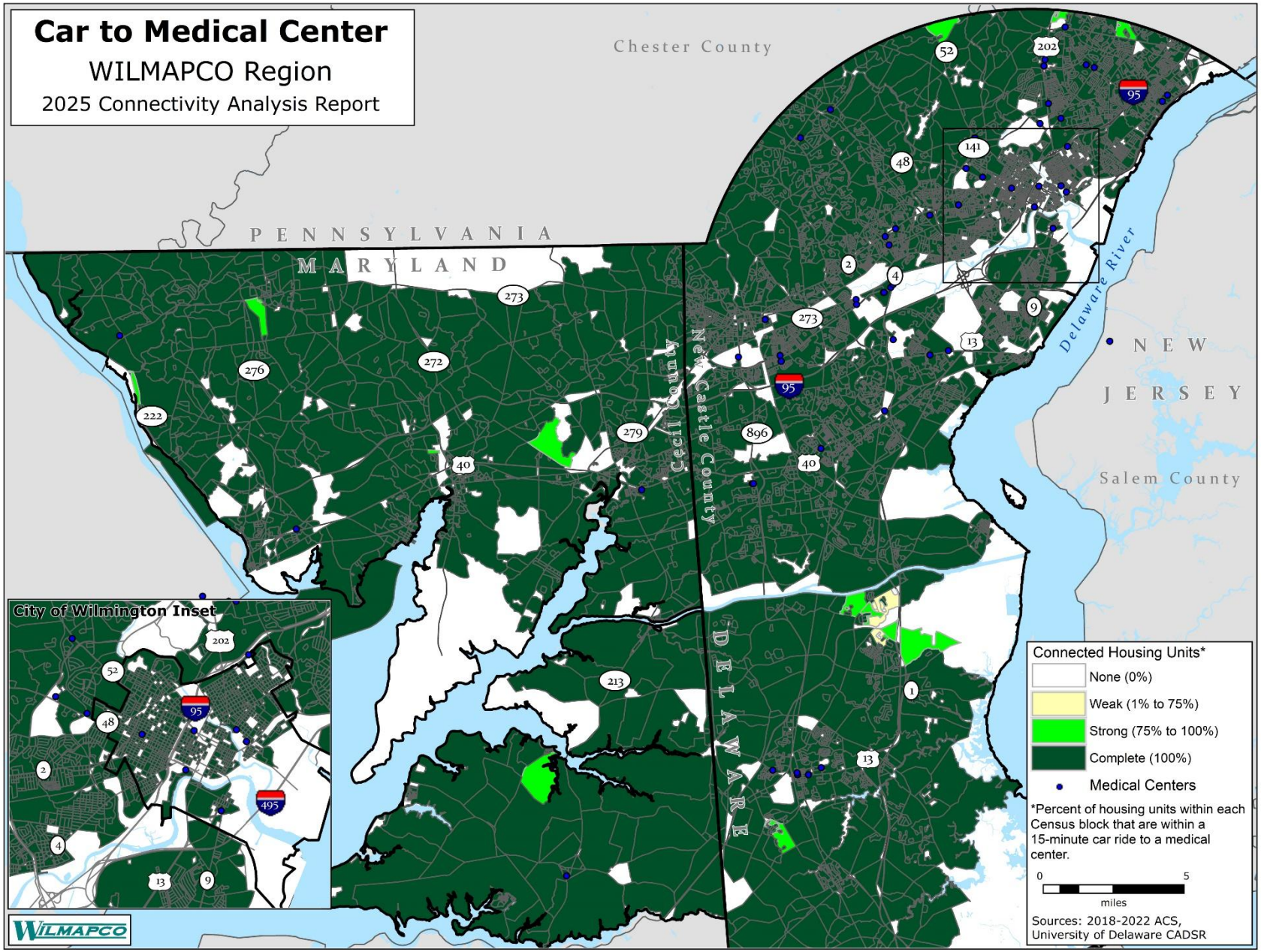
A third map shows transit connectivity to supermarkets. Much of Wilmington and Newark have strong to complete transit connectivity to supermarkets. Meanwhile, many communities along the I-95 corridor stretching from Perryville to Claymont have weak to strong transit connectivity to supermarkets. Apart from Middletown, our outer suburbs and rural areas lack good transit connectivity to supermarkets.

The fourth and final map in this series considers car access to medical centers. Most neighborhoods have complete to strong connections. Primary exceptions are areas along the Chesapeake Bay in Cecil County, which show no connections.


Walk to Pharmacy
WILMAPCO Region
2025 Connectivity Analysis Report
Chester County
PENNSYLVANIA
MARYLAND
NEW JERSEY
DELAWARE
Cecil County
New Castle County
Salem County
Delaware River
City of Wilmington Inset
Connected Housing Units*
None (0%)
Weak (1% to 75%)
Strong (75% to 100%)
Complete (100%)
Pharmacies
*Percent of housing units within each Census block that are within a 10-minute walk along subidivsion streets, trails, or sidewalks to a pharmacy.
0
5
miles
Sources: 2018-2022 ACS, University of Delaware CADSR
WILMAPCO


Bike to Library
WILMAPCO Region
2025 Connectivity Analysis Report
Chester County
PENNSYLVANIA
MARYLAND
Cecil County
New Castle County
DELAWARE
NEW
JERSEY
Salem County
Delaware River
City of Wilmington Inset
Connected Housing Units*
None (0%)
Weak (1% to 75%)
Strong (75% to 100%)
Complete (100%)
Libraries
*Percent of housing units within each Census block that are within a 10-minute bike ride to a library on streets with a level of traffic stress 1 or 2 (DE) or comfort level 1 or 2 (MD).
0
5
miles
Sources: 2018-22 ACS, DelDOT
University of Delaware CADSR, MDOT
WILMAPCO

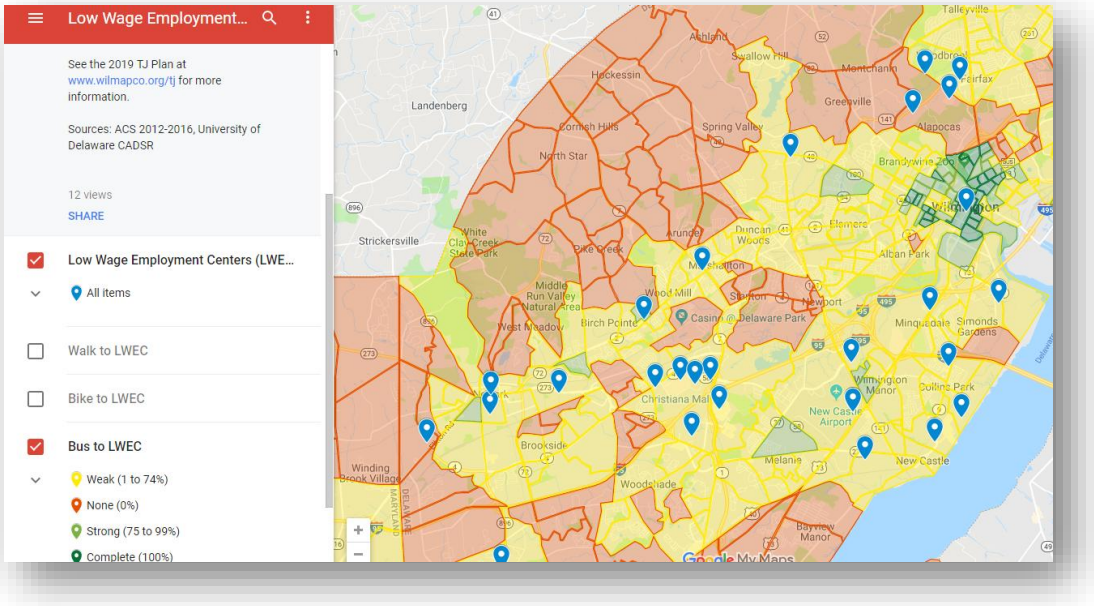

Transit to Supermarket
WILMAPCO Region
2025 Connectivity Analysis Report
Chester County
PENNSYLVANIA
MARYLAND
NEW JERSEY
DELAWARE
New Castle County
Cecil County
Salem County
Delaware River
City of Wilmington Inset
Connected Housing Units*
None (0%)
Weak (1% to 75%)
Strong (75% to 100%)
Complete (100%)
Supermarkets
*Percent of housing units within each Census block that are within a 30-minute door-to-door bus trip to a supermarket at peak time, including no more than 10 minutes walking along subdivision streets, trails, or sidewalks.
0
5
miles
Sources: 2018-22 ACS, Cecil County, University of Delaware CADSR, DTC
WILMAPCO


Car to Medical Center
WILMAPCO Region
2025 Connectivity Analysis Report
Chester County
PENNSYLVANIA
MARYLAND
Cecil County
New Castle County
DELAWARE
NEW JERSEY
Salem County
Delaware River
City of Wilmington Inset
Connected Housing Units*
None (0%)
Weak (1% to 75%)
Strong (75% to 100%)
Complete (100%)
Medical Centers
*Percent of housing units within each Census block that are within a 15-minute car ride to a medical center.
0
5
miles
Sources: 2018-2022 ACS, University of Delaware CADSR
WILMAPCO

Interactive Maps

Connectivity Analysis

See the full spatial analysis of regional connectivity and zoom into your neighborhood. Interactive maps [in progress] are available on the WILMAPCO website. Visit www.wilmapco.org/tj.



Connectivity Results in Neighborhood Concentrations

We also examined the connectivity results through the lens of economic opportunity. We analyzed if households within neighborhood concentrations identified in the 2025 Mobility Opportunities Plan had weaker connectivity to destinations than average on the various transportation modes. They did not. In all cases, homes in Black, Hispanic, or low income neighborhood concentrations had equal or better connectivity to the destinations than average on every mode considered[3]. The tables on the following pages show these results.

Since alternative transportation options are so weak in the WILMAPCO region, severe gaps exist from these neighborhood concentrations (and indeed most neighborhoods) to key destinations by walking, bike, and bus. For example, nearly a quarter (23%) of those living in low-income areas cannot easily reach a community center by bus. Nine in ten (90%) residents of Hispanic neighborhoods are beyond easy walking distance to a library. These are examples of challenges that should be explored by follow-up regional and local analyses, with specific recommendations for improvements. Our Public Opinion Survey reinforces these concerns, as low income and Black respondents were more likely to have problems with transportation access.

Compared to the connectivity data shown in the 2019 analysis, this analysis involved a more fine-grained identification of neighborhood concentrations, using Census blocks rather than block groups. As a result, Black and low income concentrations are more accurately identified as being in areas well connected by transit to each destination type. However, the smaller, more localized boundaries for Black concentrations placed them further from some supermarkets, resulting in a lower walking connectivity to supermarkets (16%, down from 40%) in those neighborhoods.

[3] Black and Hispanic neighborhood concentrations in the WILMAPCO region are home to residents with significantly lower median annual incomes. Like low-income neighborhood concentrations, they represent areas of economic opportunity. We include results from our Asian and White neighborhood concentrations, both home to residents with higher median incomes, for comparative purposes.

Walking and Biking Connectivity, by Homes within Neighborhood Concentrations

	Supermarket	Pharmacy	Hospital	Library	Low-Wage Emp. Center	Medical Center	Community Center	Senior Center	State Service Center
Regional Average	7%	12%	1%	5%	2%	6%	7%	7%	2%
NEIGHBORHOODS									
Black	16%	29%	3%	14%	4%	16%	20%	22%	8%
White	3%	5%	0%	2%	1%	1%	3%	2%	0%
Hispanic	15%	20%	4%	10%	2%	12%	17%	16%	2%
Asian	7%	9%	1%	2%	1%	6%	1%	2%	1%
Low Income	19%	33%	8%	19%	5%	17%	31%	33%	10%

	Supermarket	Pharmacy	Hospital	Library	Low-Wage Emp. Center	Medical Center	Community Center	Senior Center	State Service Center
Regional Average	28%	34%	11%	18%	11%	21%	21%	24%	13%
NEIGHBORHOODS									
Black	54%	55%	27%	30%	18%	47%	46%	50%	38%
White	12%	16%	6%	12%	4%	9%	13%	10%	2%
Hispanic	38%	47%	18%	31%	17%	34%	29%	39%	18%
Asian	21%	27%	4%	10%	9%	12%	9%	11%	5%
Low Income	59%	68%	41%	44%	31%	53%	55%	64%	44%

Transit and Car Connectivity, by Homes within Neighborhood Concentrations

	Supermarket	Pharmacy	Hospital	Library	Low-Wage Emp. Center	Medical Center	Community Center	Senior Center	State Service Center
Regional Average	45%	46%	37%	43%	44%	45%	40%	42%	37%
NEIGHBORHOODS									
Black	75%	75%	64%	73%	74%	74%	68%	71%	67%
White	20%	20%	17%	20%	19%	20%	20%	19%	17%
Hispanic	66%	67%	60%	65%	66%	67%	63%	66%	57%
Asian	39%	39%	29%	38%	38%	38%	30%	36%	33%
Low Income	83%	84%	76%	81%	83%	83%	77%	82%	74%

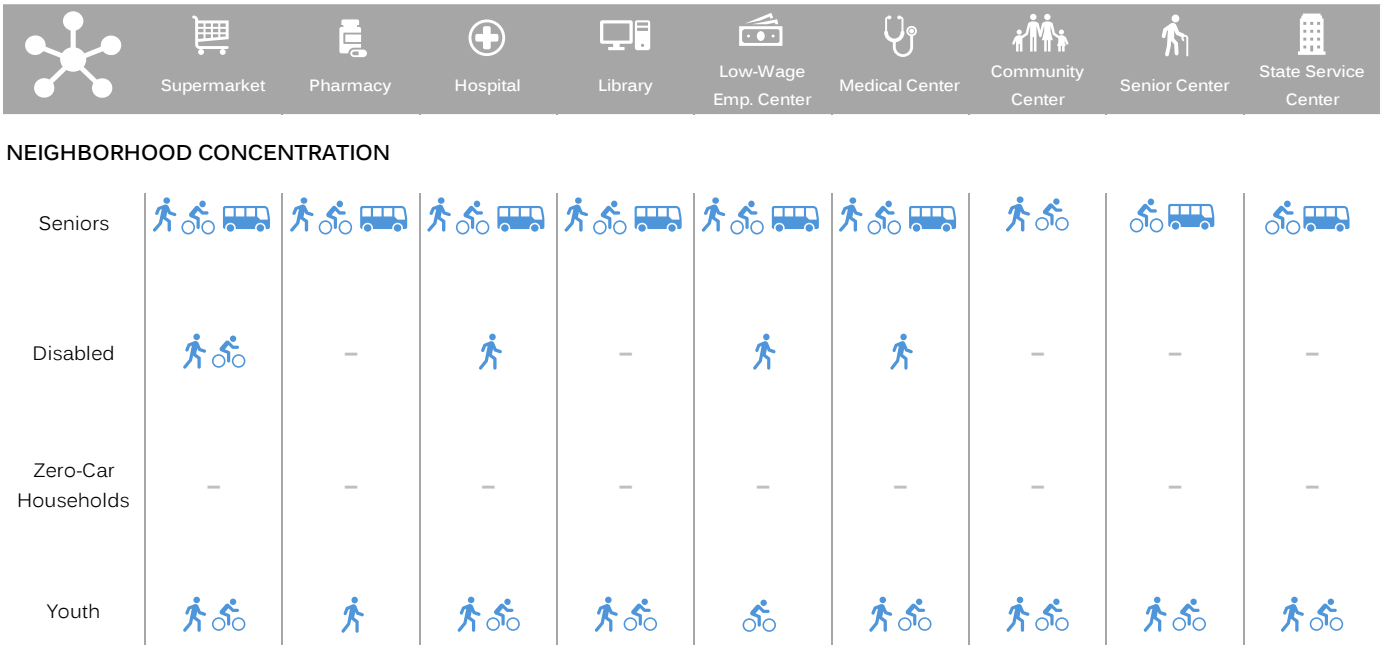
	Supermarket	Pharmacy	Hospital	Library	Low-Wage Emp. Center	Medical Center	Community Center	Senior Center	State Service Center
Regional Average	96%	97%	85%	98%	86%	96%	97%	93%	85%
NEIGHBORHOODS									
Black	98%	98%	94%	98%	94%	99%	98%	98%	95%
White	93%	95%	59%	96%	69%	91%	97%	78%	60%
Hispanic	98%	99%	96%	99%	96%	99%	99%	99%	95%
Asian	100%	100%	88%	100%	96%	100%	100%	99%	89%
Low Income	97%	97%	95%	97%	95%	98%	97%	98%	96%

Connectivity Results in Mobility Challenged Neighborhoods

We examined connectivity from housing units in neighborhoods with heavy concentrations of seniors, households with at least one person with a disability, households without vehicles, and youth to key destinations. The methodology used for this analysis follows that from the previous section.

Unlike our EO communities, we found that people living in senior and youth neighborhood concentrations often had more limited transportation connectivity than average. The graphic below shows the areas of concern. People living in neighborhood concentrations of zero-car households had better connectivity than average, and people living in all neighborhoods of interest had better-than-average connectivity by car.

Transportation Connectivity Concerns by Neighborhood Concentration



Neighborhoods with a high proportion of seniors had weaker-than-average walking, biking, and transit connections to all destinations (excluding transit connections to community centers and walking connections to senior centers and state service centers). However, in our Public Opinion Survey, senior respondents were less likely to have problems with transportation than those under 65, unless they were disabled.

Neighborhoods with a high proportion of households with at least one disabled member showed weak walking connectivity to supermarkets, hospitals, low-wage employment centers, and medical centers, as well as weak biking connections to supermarkets.

Neighborhoods with high proportions of youth had weak walking and biking connections to all destinations, except for biking connections to pharmacies and walking connections to low-wage employment centers.

The tables that follow provide more detailed analysis results. While the destinations identified above had weaker than average connectivity, we must continue to stress that given the limited walking, bicycling, and transit networks in our region, major connectivity gaps exist for most households across the region. This includes people living in neighborhoods home to a high proportion of seniors, disabled, youth, and zero-car households. Consider these facts: 93% of homes in senior concentrations cannot easily walk to a senior center; 61% of homes in zero-car household concentrations cannot easily bike to a community center; and 93% of homes in youth concentrations cannot easily walk or bike to low-wage jobs. These are examples of challenges that should be explored by follow-up regional and local analyses, with specific recommendations for improvements.

The example map on page 25 shows transit connectivity from neighborhoods with concentrations of seniors to medical centers. While some senior neighborhoods along the I-95 corridor from Claymont to Newark, as well as some neighborhoods in Middletown, had strong to complete transit connectivity to medical centers, outlying senior communities did not. Most senior communities in outer suburban and rural areas had no connectivity. While it is certainly impractical to place transit lines everywhere, this and other analyses would help begin a process to more strategically guide bus routing in inner suburban communities and guide future land use and zoning policy. Follow up studies should examine the practicality and local desirability of improving walking, biking, and transit connections from these neighborhoods to medical centers and other destinations.

Walking and Biking Connectivity, by Homes within Mobility Challenged Neighborhoods

	Supermarket	Pharmacy	Hospital	Library	Low-Wage Emp. Center	Medical Center	Community Center	Senior Center	State Service Center
Regional Average	7%	12%	1%	5%	2%	6%	7%	7%	2%
NEIGHBORHOODS									
Seniors	4%	10%	0%	1%	0%	3%	1%	7%	3%
Disabled	3%	29%	0%	7%	0%	4%	10%	24%	4%
Zero-Car Households	14%	31%	3%	12%	4%	11%	18%	23%	7%
Youth	3%	7%	0%	0%	3%	0%	0%	0%	0%

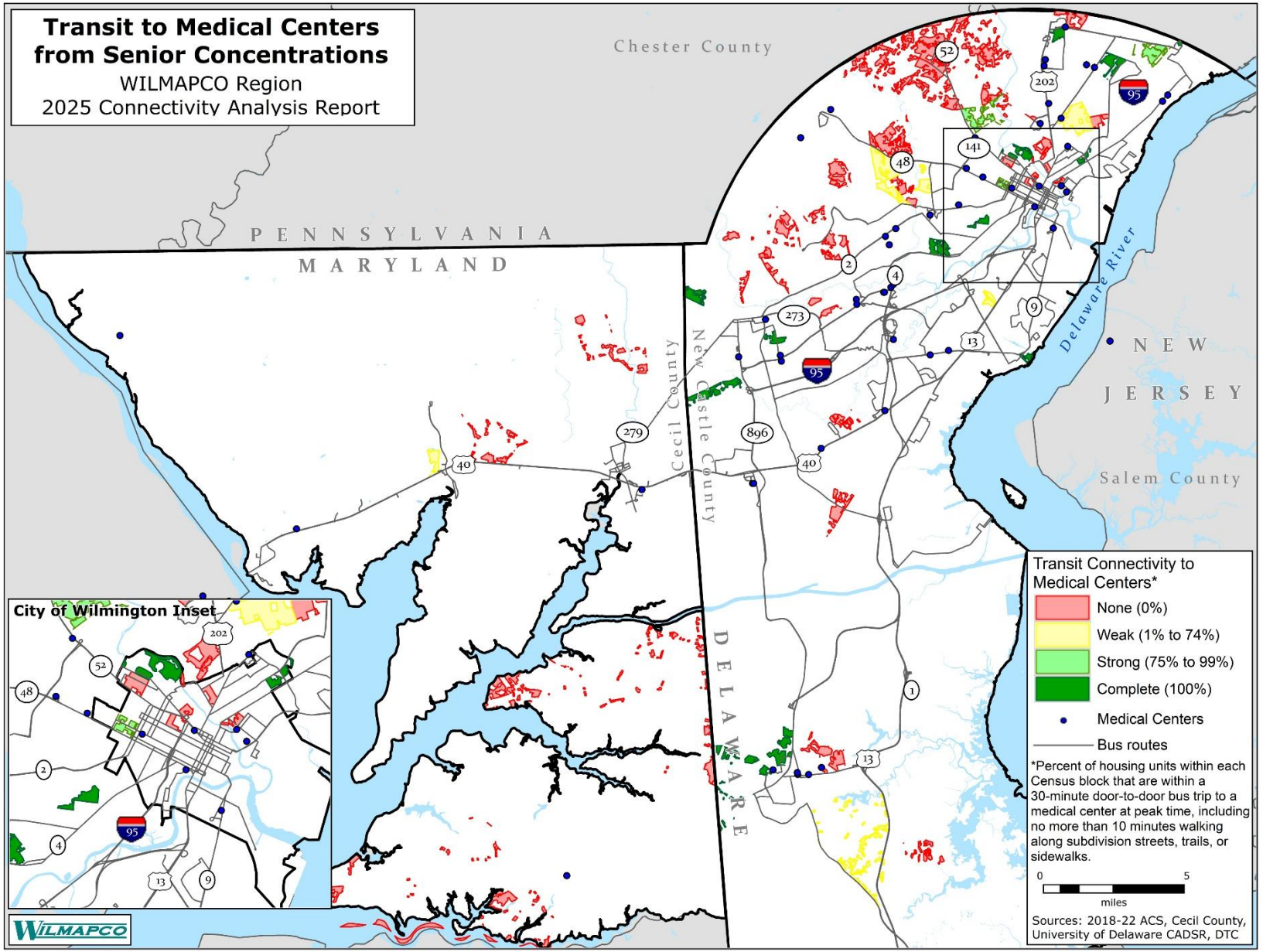
	Supermarket	Pharmacy	Hospital	Library	Low-Wage Emp. Center	Medical Center	Community Center	Senior Center	State Service Center
Regional Average	28%	34%	11%	18%	11%	21%	21%	24%	13%
NEIGHBORHOODS									
Seniors	17%	29%	8%	9%	5%	17%	14%	17%	8%
Disabled	25%	59%	22%	20%	19%	22%	25%	35%	23%
Zero-Car Households	45%	61%	34%	36%	29%	38%	39%	44%	36%
Youth	19%	48%	4%	11%	7%	14%	13%	8%	4%

Transit and Car Connectivity, by Homes within Mobility Challenged Neighborhoods

	Supermarket	Pharmacy	Hospital	Library	Low-Wage Emp. Center	Medical Center	Community Center	Senior Center	State Service Center
Regional Average	45%	46%	37%	43%	44%	45%	40%	42%	37%
NEIGHBORHOODS									
Seniors	42%	43%	32%	36%	41%	42%	42%	41%	36%
Disabled	68%	69%	49%	68%	68%	69%	65%	68%	67%
Zero-Car Households	76%	77%	66%	73%	73%	75%	76%	75%	70%
Youth	74%	74%	46%	74%	74%	74%	46%	74%	46%

	Supermarket	Pharmacy	Hospital	Library	Low-Wage Emp. Center	Medical Center	Community Center	Senior Center	State Service Center
Regional Average	96%	97%	85%	98%	86%	96%	97%	93%	85%
NEIGHBORHOODS									
Seniors	99%	99%	90%	100%	78%	99%	100%	96%	95%
Disabled	100%	100%	76%	100%	100%	100%	100%	100%	96%
Zero-Car Households	97%	100%	89%	100%	95%	100%	100%	98%	94%
Youth	100%	100%	100%	100%	76%	100%	100%	100%	100%

Transit Connectivity to Medical Centers from Senior Neighborhoods



Summary and Next Steps

This analysis showed just how overwhelmingly car-dependent the WILMAPCO region has become. While an average of 93% of homes are connected to all destination types by car, only 42% are connected by transit, 20% by biking, and 6% by walking. In the average Census block, transit connectivity is best to supermarkets, pharmacies, and medical centers, while hospitals and state service centers are least accessible by transit. Supermarkets, pharmacies, community centers, and senior centers are the most accessible destination types by walking and biking, but the ability to easily walk or bike to most destinations is severely limited by high-stress roads dividing most neighborhoods.

When analyzing results within concentrations of demographic groups, homes in Black, Hispanic, and low-income neighborhood concentrations had equal or better connectivity to all destinations than average on every mode. However, as alluded in the previous paragraph, severe gaps exist from these neighborhood concentrations to key destinations by walking, biking, and transit. People living in neighborhoods with a high proportion of youth had more limited walking and biking connectivity than average. Senior concentrations had more limited walking, biking, and transit connectivity than average to nearly all destination types.

This data can be used to better inform subregional studies of connectivity gaps within their study areas. It can also be used in regionwide analyses and prioritization processes to determine areas of greatest need for walking, biking, and transit improvements. Changes to destinations are inevitable, such as the opening or closing of a grocery store or pharmacy, and transportation infrastructure also changes. The improvement or degradation of connectivity to the types of key destinations addressed in this analysis can significantly alter quality of life and safety of communities. These changes should be considered when using this data, especially in localized studies, and a regular re-assessment can address data updates.