

**DEMOGRAPHICS  
& BENEFITS:  
REAL ESTATE**

**RETAIL**

**TOURISM**

**ECONOMIC**

**DEVELOPMENT**

**CONSTRUCTION**

**HEALTH**

**SOCIAL EQUITY**

**ENVIRONMENTAL**

**TRANSPORTATION**

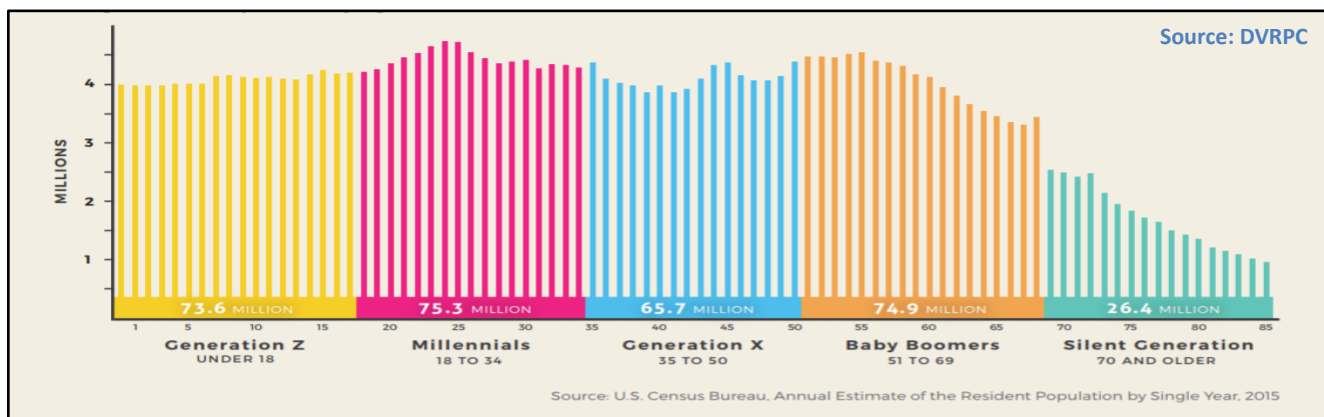
# Purpose and Benefits of Bicycle Facilities

Since Mercer County's Complete Streets Policy adoption in 2012, the County has been striving to promote a multi-modal approach to transportation. The policy calls for County officials to promote walkability, pedestrian safety, increased bicycle use and alternative modes of transportation throughout the County in order to increase public safety, sustainability, efficiency, mobility and air quality, while decreasing overall traffic congestion. This policy initiative is driven by significant demographic changes as well as significant research quantifying the many economic, environmental, mobility and social benefits of complete streets.

## Demographic Changes

According to Census Bureau population projections for the US, in 2015 individuals between the ages of 18 and 34 numbered 75.3 million, surpassing baby boomers (74.9 million) as the largest generational cohort in the United States. This generation is now entering a period in which their purchasing power is growing at an exponential rate and will soon take over the previous generation to become our nation's dominant consumer base. Everyday decisions like housing and transportation choices that millennials will make will translate into hundreds of billions of dollars in economic activity.

According to DVRPC, approximately one-third of young adults (32.1%) currently live at home with their parents or other relatives<sup>1</sup>. Many of these factors are a result of a sluggish economy during the recession, low starting wages out of college, student debt, high cost of housing and the fact that young adults are marrying and having children later. Despite these factors, the millennial generation represents the largest share of recent homebuyers according to a 2015 study conducted by the National Association of Realtors (NAR)<sup>2</sup>. That means that over 24 million millennials will likely move out on their own over the next several years as they enter the work force, marry, or save enough to purchase a home. According to the 2015 NAR study, the millennial generation already represents the largest share of recent homebuyers and will only grow larger over the next few years.

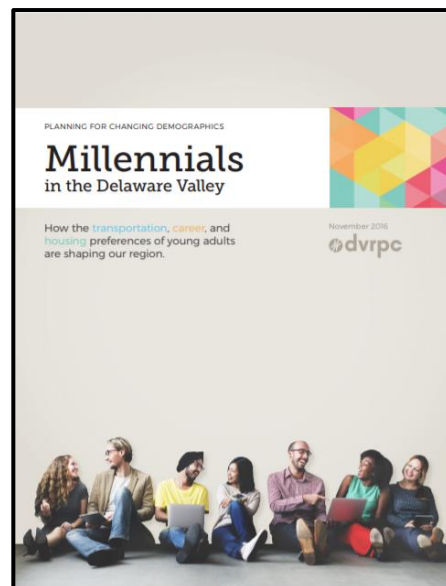


<sup>1</sup> Delaware Valley Regional Planning Commission, "Millennials in the Delaware Valley," November 2016. <https://www.dvrpc.org/Reports/16035.pdf>

<sup>2</sup> National Association of Realtors and Portland State University, "2015 Community Preference Survey," July 28, 2015, [www.realtor.org/reports/nar-2015-community-preference-survey](http://www.realtor.org/reports/nar-2015-community-preference-survey).

In Mercer County, millennials make up a significant portion of certain municipalities' populations. Ewing Township and Princeton rank #10 and #11 respectively out of 352 municipalities in the Greater Philadelphia DVRPC region (9 County Region) for millennials as a proportion of their total population. Lawrence Township, Hightstown and the City of Trenton also have significant population proportions of millennials.

Where they choose to live will have momentous implications for communities not only in Mercer County but the region and state. Even a small percentage of this generation exhibiting any preference or behavior can translate into large investments. Clearly, this generation will shape our economy and drive our land use and transportation investments for decades to come. Communities unprepared or unwilling to accommodate this new generation will lose a large market segment and consumer class. Doing so will also impact existing residents and may have a cascading effect on the success of existing and future economic development as well as municipal budgets.



## Existing Demographics

In addition to preparing for significant demographic changes, we must look at our current demographic profile in order to understand how to best serve our public. With an estimated population of 373,362 persons calling Mercer County home as of 2017, there are varying needs for different demographic segments of the County<sup>3</sup>. Demographics subgroups will all have different priorities and as such, finding common ground in determining facility choices and improvements is critical.

Bicycle demand is influenced by a variety of factors, including the locations of population centers, jobs, key destinations, and demographic factors. In terms of bicycle planning, there are several key demographic indicators called out in this plan due to their interconnected role in determining demand and need. Factors such as percent of households living below poverty level, number of households with no vehicles, populations of persons over 62 and under 18, as well as commuting mode choice all play a significant role in determining need and demand for bicycle improvements. Though all County roads are considered for improvements, these demographics will help influence which roads require prioritization over others when funding is limited. Populations living in poverty and with no vehicles have a greater need for bicycle facilities over wealthy residents or those with multiple vehicles. Younger or older residents who cannot drive also have a greater need, as do people who commute via bicycles to work or school.

The following pages discuss demographics as well as the various benefits of bicycle improvements on the County.

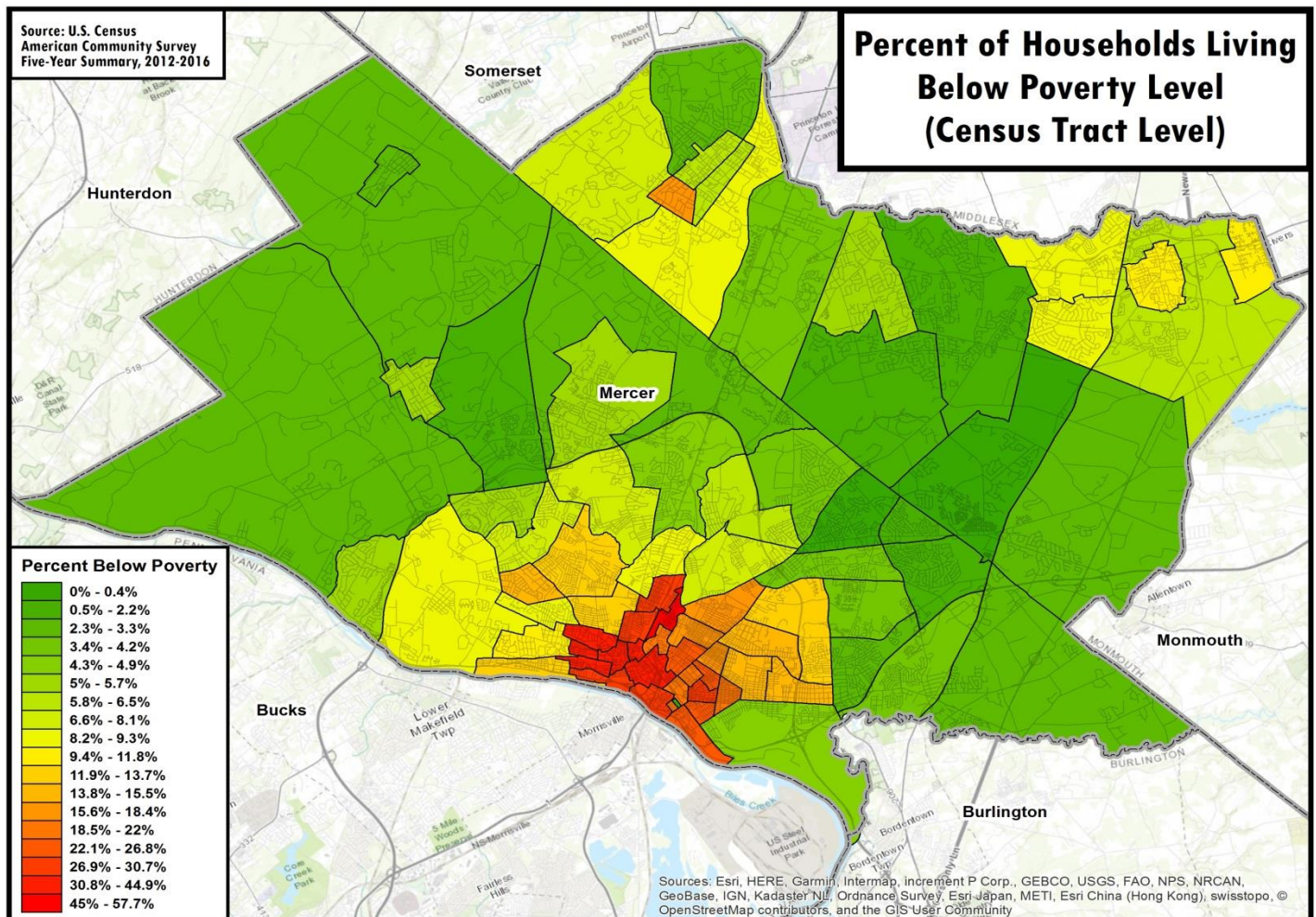
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<sup>3</sup> AMERICAN COMMUNITY SURVEY 2013-2017 5-YEAR ESTIMATES

# Households Living Below Poverty Line

Cycling is an important alternative transportation choice for many low income households. Unlike high income households who typically choose to commute by bike for health or environmental reasons, low-income households often have no choice. Low income populations may often not be able to afford the costs associated with car ownership, and may rely more frequently on walking, bicycling, and transit options. Those that do own a vehicle may only have one, which is shared among many family members and not always available or may have broken down, and the costs of repair must compete with things like rent, mortgages, groceries or the electric bill. As a result, a majority of people walking and bicycling to work are of low-income backgrounds (with the second highest majority those of very high-income who do so out of choice).

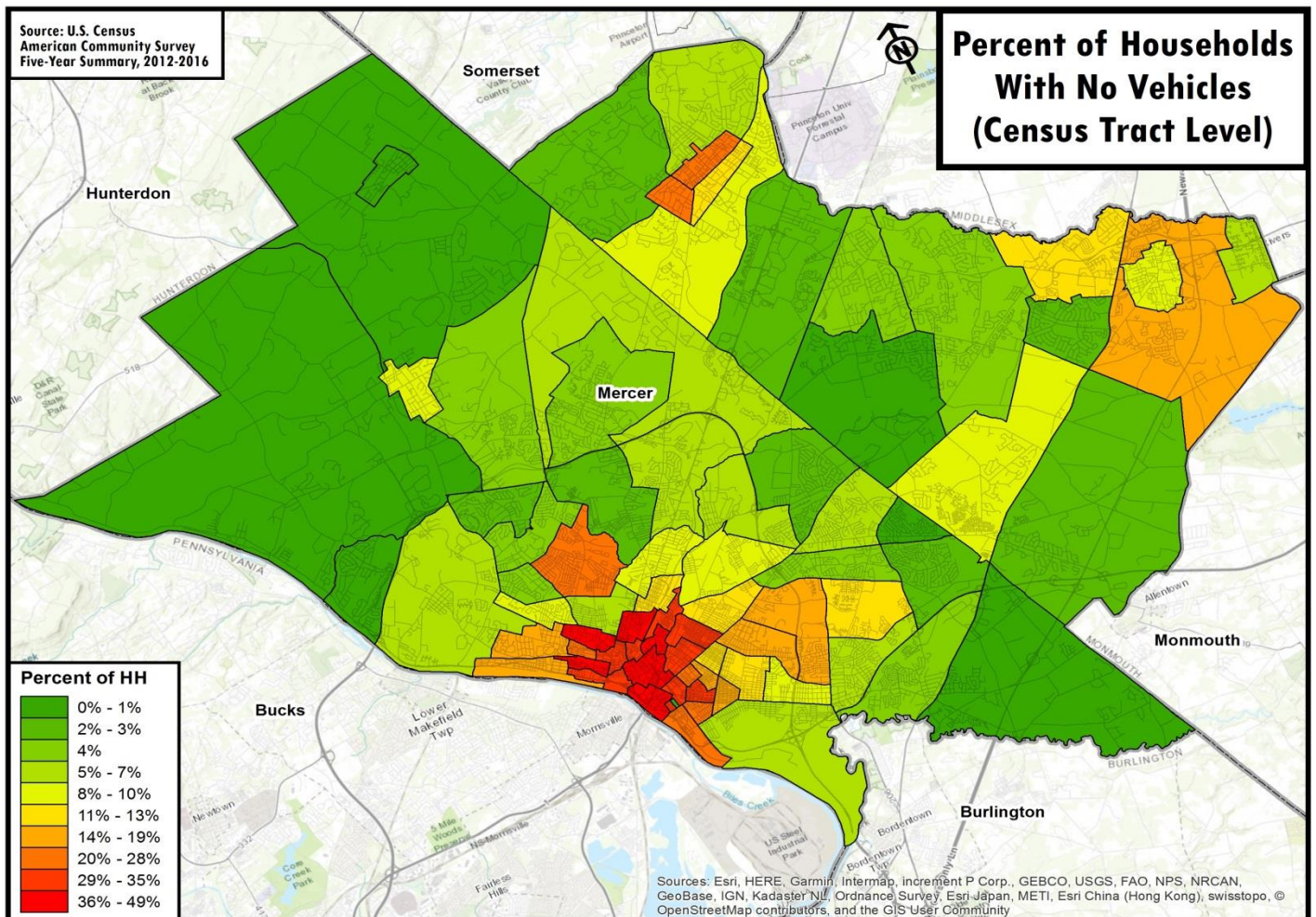
While the median household income in Mercer County was approximately \$77,650 in 2016, approximately 11.4% of people live below the poverty line. Much of the County's poverty is concentrated in the City of Trenton but high percentages also exist in Princeton, Hightstown, Ewing, and Hamilton. With a little over 1 in 10 people living in poverty in Mercer County, having alternative travel modes is essential for prosperity and equity of all Mercer County residents.



# Households with No Vehicles

Zero car households are becoming more common in the United States as we continue to urbanize and technology keeps advancing alternative options. According to the 2017 American Community Survey, approximately 5.2% of people in Mercer County had no vehicle available and nearly 22% had only one vehicle in their household. These are people who oftentimes either cannot afford to own and operate a vehicle or simply choose to live a car free lifestyle. Concentrations of zero car households can be found in the Trenton-Ewing-Hamilton area as well as parts of East Windsor, Princeton, and Hightstown. Many of these areas are of greater density and oftentimes can offer simple amenities such as sidewalk, bike lanes or sidepaths to allow people to walk or bike around.

In the City of Trenton, there are census tracts and neighborhoods where nearly half of all households own no car. These are households that contribute to municipal and County taxes, yet use a much smaller portion of the transportation network. It is important to ensure all constituents are given equitable access to safe and efficient mobility, whether it be walking, biking, using transit, or driving.



# Population Under-18 and Over-62

**M**ercer County residents have a median age of 38.6 years. Mercer County has approximately 80,409 persons under the age of 18 out of a total 373,362 persons or approximately 21.5% of our population. The County also has approximately 65,952 persons over the age of 62 which is approximately 17.7% of the population. These two groups represent a significant population of individuals who are significant users in need of safe bicycle and pedestrian facilities.

Young children and the elderly who need special assistance need safe crossings, ADA compliant wheelchair ramps, and dedicated facilities such as sidewalks, bike lanes or multi-use paths. Different subgroups of children also have different needs. Very young children and their parents need special facilities because they need a separation from vehicular traffic and dangerous and unpredictable conditions. Older children, though more aware of their surrounds, also need safer facilities and separations. As children enter adolescence and become young adults searching for freedom, walking or bicycling is oftentimes their only means of transportation. To these kids, who are too young to have a driver's permit or license but old enough to travel by themselves, these continuous, connected and safe facilities are critical to their growth and independence.

Multimodal facilities are just as critical for seniors entering retirement. In order to have a vibrant multi-generational society where our elderly can age in place, they need safe facilities to get them from place to place. As some seniors begin to abandon vehicles, out of choice or health necessities, alternative transportation such as walking, biking or taking public transit is the only method to move around. Additionally, some seniors may want to remain in their current neighborhoods and communities but would also like to engage in a more active lifestyle now that they have time. Simple things like walking to the store, senior center, friend or family member's house is oftentimes impossible due to the lack of connections and facilities.

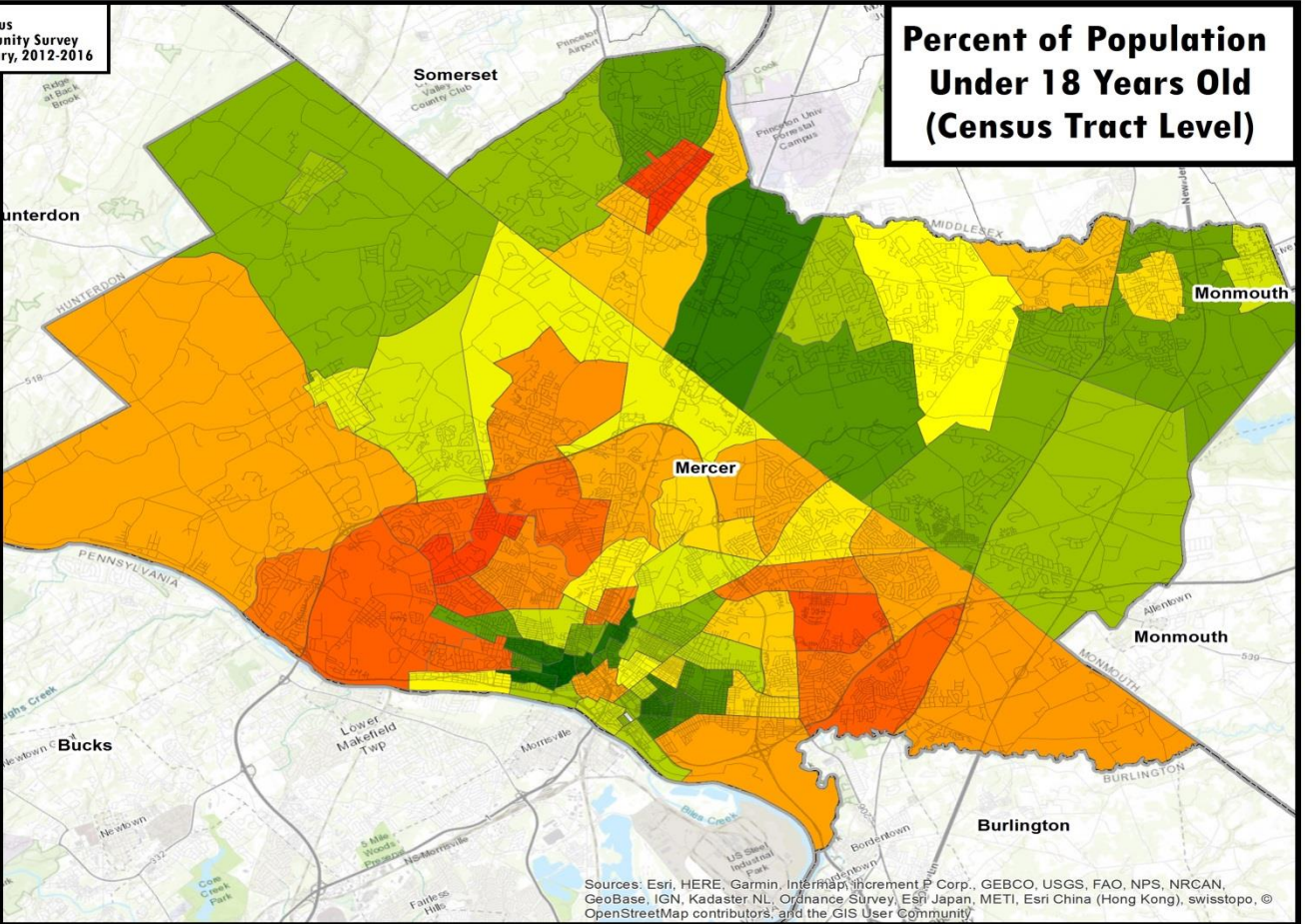
The maps on the following page show census tracts within Mercer County with the percentage of seniors and persons under 18 out of the total population. Within Mercer County, we have places of high senior concentrations in parts of Princeton, Lawrence and Hamilton. One census tract in Princeton has seniors consisting of 40.4% of the population and one in Hamilton has nearly 33.5% of its population consisting of seniors. We also have areas with very significant concentrations of young children under 18 in certain census tracts within Trenton where children under 18 comprise 35.8% and 34.2% of the population. Overall there are 20 tracts in Mercer County where children under 18 represent 25% of the population.

Source: U.S. Census  
American Community Survey  
Five-Year Summary, 2012-2016

Percent Under 18

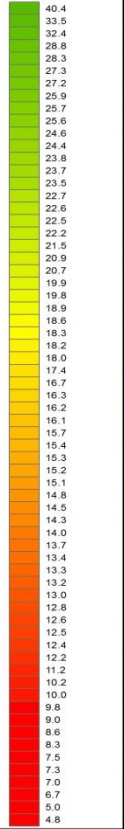


### Percent of Population Under 18 Years Old (Census Tract Level)

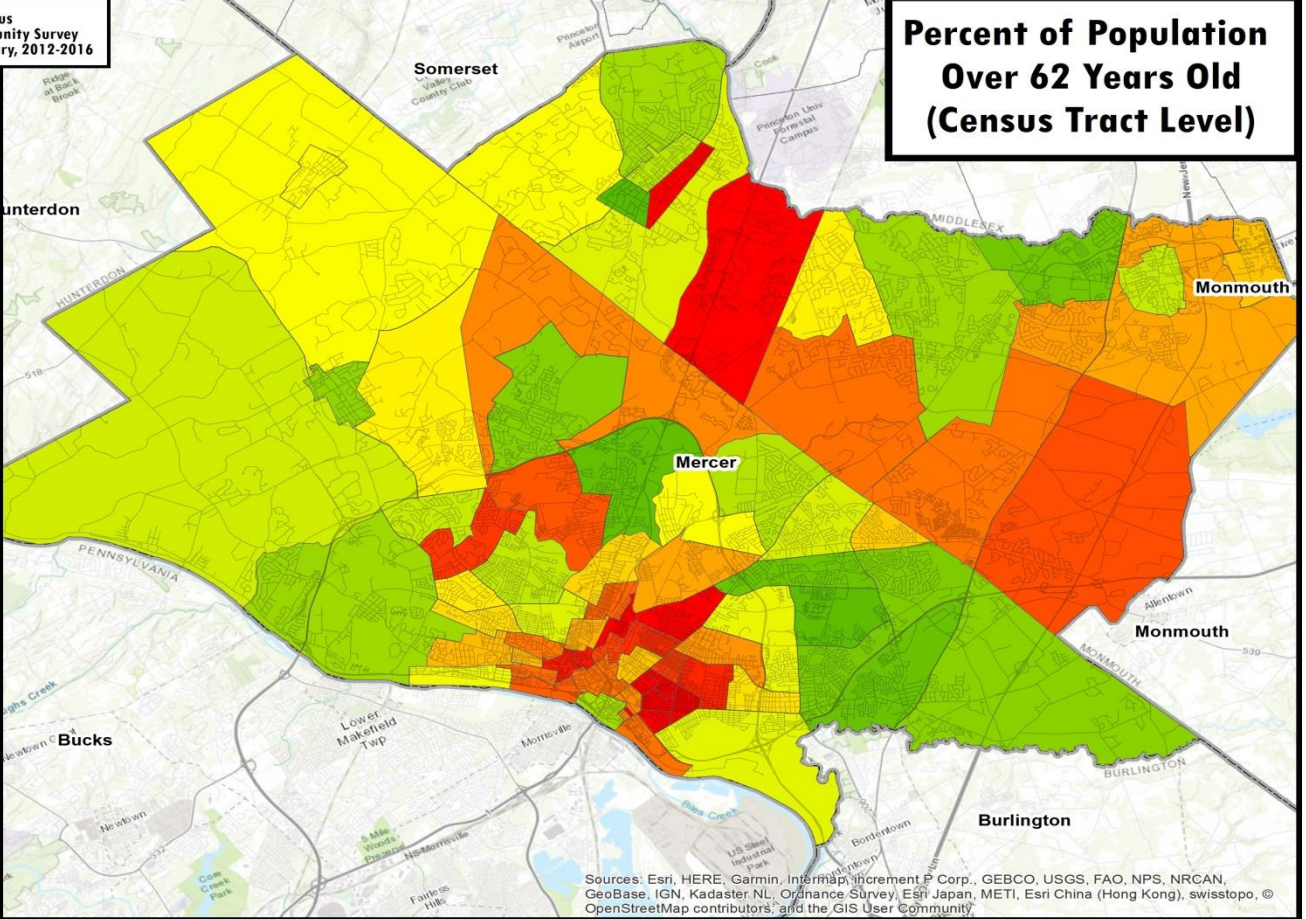


Source: U.S. Census  
American Community Survey  
Five-Year Summary, 2012-2016

Percent Over 62



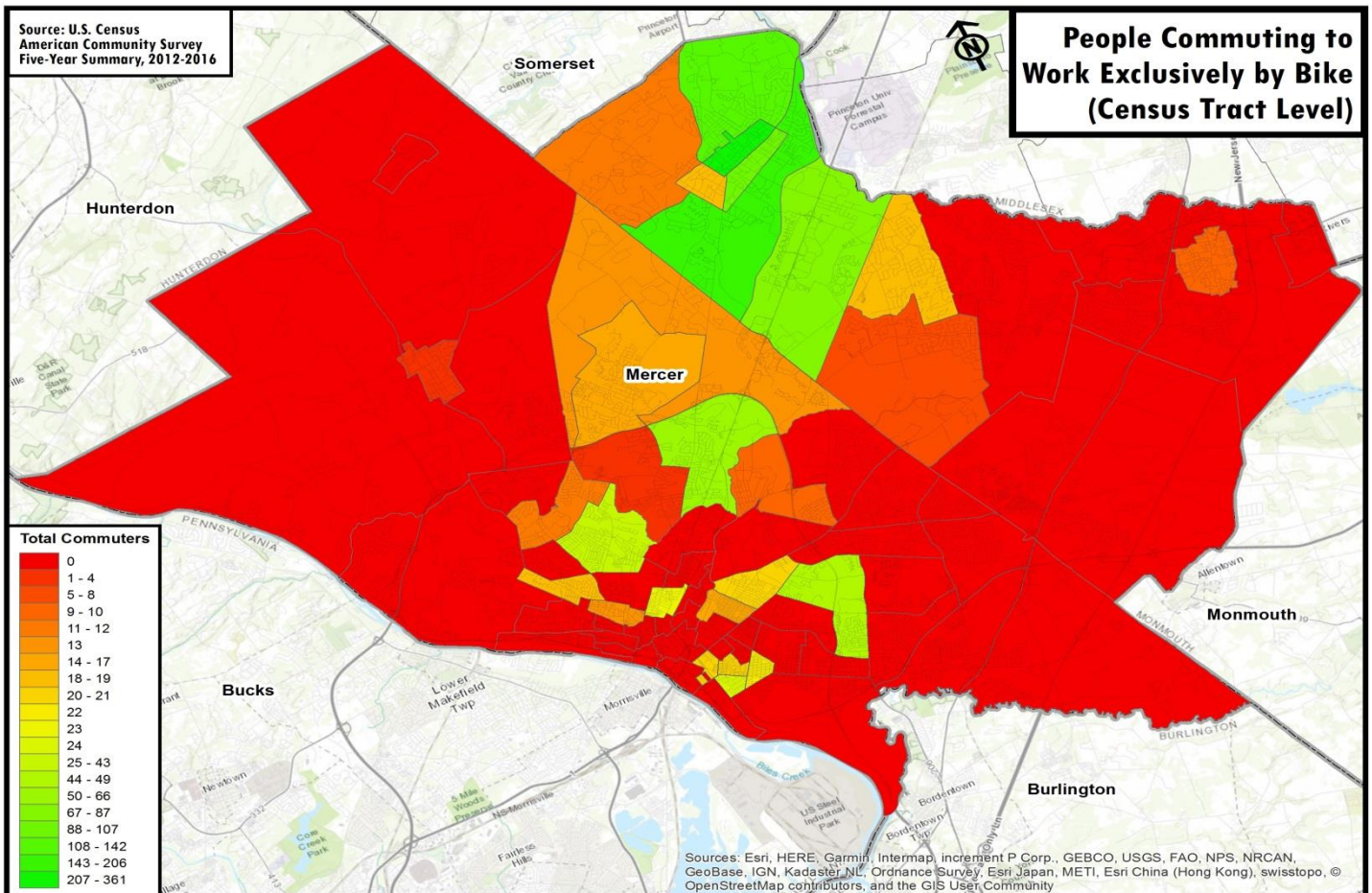
### Percent of Population Over 62 Years Old (Census Tract Level)



# Bicycle and Walking Commuters

Within Mercer County, even though most people drive alone due to the nature of our built environment, there are several places within the County where people do commute via bicycle to work. In the Princeton and West Windsor area, there is a significant bicycle commuter population with a smaller commuter group in parts of Trenton, Ewing, Lawrence and Hamilton. Even though these numbers are small in relation to the entire population, they are not insignificant. These commuters are die hard cyclists who are often not riding in dedicated bike lanes but instead riding in travel lanes along with fast moving vehicles, trucks and busses. They represent a small percentage of the population who will ride regardless of facilities being available.

The rest of the population is more careful and will only ride if a bike lane or sidepath is present, regardless of how close they may be to their destination. Though not represented in this dataset and map, schoolchildren who live within a quarter mile of a school oftentimes cannot walk or bike to school because of a lack of sidewalk, bike lanes or crossings. The same issue exists for commuters who live near their job or nearest transit station but have to drive because no alternative exists.





## Real Estate Impacts

With the construction of bike and trail facilities, real estate values oftentimes see positive gains. While the valuation of real estate is based on a multitude of factors, research shows that people positively value things such as parks, trails, bicycle facilities, farmland, walkable communities, wilderness areas, beaches, lakes and preserved open space. Neighborhoods that offer these amenities become more desirable and in turn increase the selling point of homes and the land they sit on.

A 2017 survey by the National Association of Realtors found that millennials and Gen Xers are more likely to live in at least

somewhat walkable neighborhoods, and are more likely to have sidewalks, public transit, and parks nearby. Those characteristics were noted as being VERY important in determining where millennials and Gen Xers prefer to live. Of those surveyed, approximately 80% responded that they liked walking and about half like to ride their bikes. The number of people who responded that bike lanes or paths are very important or somewhat important in deciding where to live is nearby has been slightly increasing over the years. In the short time from the last 2015 survey to the 2017 survey, the number rose from 52% to 54% of respondents. Of all respondents who were asked what keeps them from walking, they mentioned that there are too few sidewalks or trails available to them.<sup>4</sup>

This preference for complete street communities translates indirectly to demand and real estate valuations. In our region, there are several examples of direct impact. In nearby Radnor Township, PA, a study found that properties within a quarter-mile (0.4 km) of the Radnor Trail, a 2.4-mile (3.9 km) trail which sees an estimated 200 to 600 users per day, were valued on average \$69,000 higher than other area properties further away. Real estate listings in Radnor frequently mention trail access in their advertisements, and for-sale signs often appear on the trail side of properties.<sup>5</sup>

Another 2009 nationwide study by CEOs for Cities, a cross-sector organization that develops ideas to make U.S. cities more economically successful, found that “houses located in areas with above-average walkability or bikability are worth up to \$34,000 more than similar houses in areas with average walkability levels.”<sup>6</sup> Nationally, residential developers have increasingly built properties with features that support use of trails with facilities such as bike parking, trail connections, bike repair stations and more. Overall, homes near walkable, and often bikable, trails enjoy premiums of between 5% to 10%, according to an analysis by



Photo courtesy of flickr: Dimitry B.

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<sup>4</sup> National Association of Realtors, “National Community and Transportation Preferences Survey” September 2017.

<https://www.nar.realtor/sites/default/files/documents/2017%20Analysis%20and%20slides.pdf>

<sup>5</sup> DVRPC & GreenSpace Alliance, “Return on Environment: The Economic Value of Open Space in Southeastern Pennsylvania” January 2011 <https://www.dvrpc.org/reports/11033A.pdf>

<sup>6</sup> CEOs For Cities, “Walking the Walk: How Walkability Raises Home Values in US Cities” August 2009, [http://blog.walkscore.com/wp-content/uploads/2009/08/WalkingTheWalk\\_CEOsforCities.pdf](http://blog.walkscore.com/wp-content/uploads/2009/08/WalkingTheWalk_CEOsforCities.pdf)

Headwaters Economics, a research group focused on community development and land management issues.<sup>7</sup> Other surveys have put that percentage even higher.

Within the region, residential developers have built properties with features that support use of trails with facilities such as bike parking, trail connections, bike repair stations and more. These facilities not only serve to promote good community relations but have a direct benefit to developers as their sites become more desirable to homebuyers and tenants. Just as community rooms, pools and gyms are amenities that multi-family developers can often include for residents, bicycle lanes and trails are oftentimes just as appealing if not more so.

In Philadelphia, Brandywine Realty Trust is developing trailside properties, including the FMC Tower, a 49-story, 730 foot tall mixed-use skyscraper recently completed. Access to the Schuylkill River Trail is touted in advertisements for the tower. Gerard H. Sweeney, Brandywine's president and chief executive officer, expressed his company's support for connecting regional trails in a 2013 letter to the city of Philadelphia, stating, "When fully complete, the Circuit Trails network will help connect people to jobs, recreational opportunities, public transportation, and other neighborhoods, and will serve as a gateway to open green space."<sup>8</sup>

New research from Portland State University finds that proximity to a network of high-quality bike facilities such as protected bike lanes, buffered bike lanes, and bike boulevards, is associated with an increase in property values. Through the separate estimation of ordinary least squares hedonic pricing models and spatial autoregressive hedonic models of single and multifamily properties, it was found that proximity to advanced bike facilities (measured by distance) had significant and positive effects on all property values, which highlighted household preferences for high-quality bike infrastructure. Furthermore, the study showed that the extensiveness of the bike network (measured by density) was a positive and statistically significant contributor to the prices for all property types, even after proximity was controlled for with respect to bike facilities and other property, neighborhood, and transaction characteristics. Finally, estimated coefficients were applied to assess the property value impacts of the Green Loop (i.e., the proposed Portland, Oregon, signature bike infrastructure concept), which illustrated the importance of considering the accessibility and the extensiveness of bike facility networks.<sup>9</sup>

In 2013, REMAX Realty in Atlanta explained that homes near the BeltLine— a transit and trail loop around the city that will include a planned total of 33 miles (53 km) of pedestrian and bicycle trails—were selling within 24 hours. Before the Atlanta BeltLine project began, homes along the corridor had typically stayed on the market for 60 to 90 days. Furthermore, real estate listings near trails and bike facilities frequently mention trail access in their advertisements and for-sale signs often appear on the trail side of properties.

<sup>7</sup> Headwater Economics, "Measuring Trail Benefits: Property Value" Spring 2016. <http://headwaterseconomics.org/wp-content/uploads/trails-library-property-value-overview.pdf>

<sup>8</sup> Urban Land Institute, "Active Transportation and Real Estate: The Next Frontier" March 2016. <http://uli.org/wp-content/uploads/ULI-Documents/Active-Transportation-and-Real-Estate-The-Next-Frontier.pdf>

<sup>9</sup> Liu, Jenny & Shi, Wei., 2016 - *Impact of Bike Facilities on Residential Property Prices*

## Retail, Tourism and Economic Development Impacts

Bicycle infrastructure is playing an increasing role in local economic development and has the potential to promote and strengthen a local community's tourism sector. According to a 2009 report by the League of American Bicyclists, the national bicycle industry contributes approximately \$133 billion annually to the U.S. economy by supporting over 1 million jobs, generating nearly \$18 billion in federal, state, and local taxes, and providing nearly \$47 billion for meals, transportation, and lodging purchases during bike trips and tours. Economic development impacts range from higher value rents and property prices, more retail sales, more aesthetically pleasing neighborhoods and commercial corridors, better tourist and recreational transportation options, and more. Jobs relating to bike infrastructure range from sale and maintenance of bikes and bike facilities to ancillary jobs such as those that are tied to increased tourism.<sup>10</sup>



Local stores particularly benefit more than others. Local bike and service shops keep money in their communities on a much larger scale than multi-national firms that often send money overseas or to national firms which send money to investors and shareholders across the nation. Numerous studies of businesses across the nation show that cyclists are competitive consumers, spending similar amounts or more, on average, than their counterparts using automobiles. On average, though cyclists spent less per trip, they made more trips and more trips to local stores rather than to national chain big box stores.

A study by the Salt Lake City DOT found that “replacing parking with protected bike lanes increased retail sales.” A general street upgrade on Broadway Avenue removed 30% of on-street parking from nine blocks of the major commercial street, but improved crosswalks and sidewalks and added protected bike lanes. In the first six months of the next year, retail sales were up 8.8% over the first six months of the previous year, compared with a citywide increase of only 7%. After the changes, 59% of business owners said they supported the street improvements, 23% were neutral and only 18% opposed them.<sup>11</sup>

**“Business is up 20% since last year. I’m excited about the changes to the neighborhood. The bike lanes and lower speed limits help to calm car traffic and increase pedestrian traffic – all positives for my business.” - Paradise Palm. John Mueller, Owner**

<sup>10</sup> League of American Bicyclists, “The Economic Benefits of Bicycle Infrastructure Investments” June 2009. [https://bikeleague.org/sites/default/files/Bicycling\\_and\\_the\\_Economy-Econ\\_Impact\\_Studies\\_web.pdf](https://bikeleague.org/sites/default/files/Bicycling_and_the_Economy-Econ_Impact_Studies_web.pdf)

<sup>11</sup> Salt Lake City DOT, “300 South Progress Report” Sept. 2015,

A study of the Pinellas Trail in Florida found that the downtown area of Dunedin, Florida was suffering a 35 percent storefront vacancy rate in the early 1990's until the Pinellas Trail came into town. Now, storefront occupancy is 100 percent and business is booming. New businesses included several restaurants, a bike shop, an outdoor equipment supplier, a bed-and-breakfast operation, and a coffee shop.<sup>12</sup>



The Rails-to-Trails Conservancy found that the Schuylkill River Trail, a popular Circuit route, generated \$7.3 million in direct economic impact along its route in 2009, and the Delaware & Lehigh Trail, a 165-mile (265 km) rail-trail through eastern Pennsylvania, was found to have generated an annual economic impact exceeding \$19 million in 2012. As part of the study, a survey was conducted and found that 77% of respondents indicated they had purchased some hard-durable goods during the past year because of their use of the trail, with the average expenditure amounting to more than \$400 per user on top of an average of \$9.07 per visit.<sup>13</sup>

## Tourism in Mercer County and New Jersey

Tourism and recreation plays a significant role in the Mercer County economy. According to a recent New Jersey Tourism study, expenditures in Mercer County were \$1.311 billion in 2016, a 5.5% increase from 2015 and accounts for nearly 12,833 positions or 4.5% of all employment. State and local tourism-related tax receipts for Mercer County increased by 4.1% to \$166.0 million. In 2016, total tourism demand in the State of New Jersey grew to \$44.1 billion, a 2.9% increase from 2015. In 2016, the tourism industry directly supported 321,231 jobs in New Jersey and sustained 517,559 jobs including indirect and induced jobs. These jobs represent 9.8% of total employment or 1-in-10 jobs in New Jersey. Without the tourism industry, New Jersey households would need pay an additional \$1,525 each in order to maintain the current level of state and local government services.<sup>14</sup>

Though domestic visitor (NJ residents) markets comprise the majority (88.4%) of tourism sales in New Jersey, there are some national and international visitors to NJ that come to enjoy our rich education, arts and history assets. Unlocking Mercer County to more of the national and international community would vastly help our tourism industry. Mercer County has well developed local and regional trail network of existing trails as well as trails under construction or in the planning stages. Trails such as the Lawrence Hopewell Trail, Delaware and Raritan Canal State Park Trails, not to mention many other smaller trail networks provide the backbone to our system. The County highway network provides a significant opportunity to connect these networks and their missing segments. As County highways connect our

<sup>12</sup> WMTH Corporation, "Economic Impact of Biking" 2009

<sup>13</sup> Rails to Trails Conservancy, "Schuylkill River Trail 2009 User Survey and Economic Impact Analysis" Nov. 2009

<sup>14</sup> Tourism Economics, An Oxford Economics Company, "The Economic Impact of Tourism in New Jersey" 2016  
<https://www.visitnj.org/sites/default/master/files/2016-nj-economic-impact.pdf>

municipalities, they provide the long connections required for a continuous and connected bicycle network that other trails or bike lanes can connect into.

More specifically within the tourism industry, active transportation is a growing industry in the region and state. According to a Rutgers report on “The Economic Impacts of Active Transportation in New Jersey, in total, active transportation-related infrastructure, businesses, and events were estimated to have contributed \$497.46 million to the NJ economy in 2011 or \$565.15 million in 2019 dollars and

supported 4,018 jobs. Active transportation also added \$153.17 million in compensation (\$174.01 million in 2019 dollars), added \$278.12 million to state GDP (\$315.97 million in 2019 dollars), and generated an estimated \$49 million in total tax revenue (\$55.67 million in 2019 dollars).<sup>15</sup>



Above: Rutgers model and report estimated that participation of persons in NJ run and walk events totaled 197,930 and bicycling events 44,408, for a total of 242,338 participants in 2011. The map above shows where these participants traveled from to attend events.

## Other Key VTC Study Results

- In 2011, it was estimated through surveys on revenues from bicycling, running, or walking related equipment and services that 317 independent businesses received \$267.5 million in annual revenue. This provided 2,253 full and part-time jobs, paying out \$37 million in salaries and wages.
- Participation in run and walk events was estimated to total 197,930 in 2011, with 44,408 participating in bicycling events for an overall total of 242,338. Some 19% of participants were estimated to have traveled from outside of New Jersey to attend, with 6.7% of respondents indicating that their trip required an overnight stay. Participants were estimated to spend over \$35 million annually in the state as part of their trips to events, with over \$10 million of that spending deriving from visitors traveling from outside NJ.
- The model output estimated that these active transportation-related events generated \$57.82 million in economic activity in 2011. This resulted in an estimated 369 jobs at New Jersey businesses, with compensation amounting to \$17.79 million. The total estimated tax contribution in 2011 as a result of event participant spending was \$6.45 million, with a contribution of \$31.2 million to the state's GDP.

<sup>15</sup> Brown and Hawkins, Alan M. Voorhees Transportation Center, Rutgers University, “The Economic Impacts of Active Transportation in New Jersey” May 2013, <http://vtc.rutgers.edu/the-economic-impacts-of-active-transportation-in-nj-2013/>

## Bicycle, Pedestrian & Trail Facility Employment Impacts

Though not a factor for making improvements, bicycle facility construction helps stimulate and support local employment. Construction of facilities benefits the local economy as it requires local labor to go out and physically construct improvements. Once constructed, businesses often benefit from these facilities and employ workers to service the facility patrons. In 2011, The Political Economy Research Institute released a study of 58 separate bicycle and pedestrian projects across the United States. Impacts studied in the report are specific to the design and construction of roads, bicycle, and pedestrian facilities. They do not consider the ongoing maintenance and use of these facilities nor do they account for additional economic development or potential ancillary effects in regards to job creation.

In the table below, it can be seen that on average, every \$1 million spent on the design and construction of bicycle and pedestrian specific projects results in approximately 8.42 jobs (4.2 direct, 2.2 indirect, 2.02 induced). The greatest job generation is produced for infrastructure projects specific to bicycling (11.41 jobs created for every \$1 million spent) while the lowest job creation is for road-only projects such as repaving or widening (7.75 jobs per \$1 million spent).

### Sample Calculation of Job Creation within Mercer County:

- 149 miles of on-road bike facilities @ \$37.1 Million Construction Cost x 11.41 jobs = 423 total jobs
- 25 miles of off-road bike facilities @ \$23.7 Million Construction Cost x 9.57 jobs= 227 total jobs

### **For a total of 650 total jobs (direct, indirect and induced) with a full network buildout**

\*The above total is a rough estimate for planning purposes, as exact costs cannot be quantified at this time.

Project Type	Road	Bicycle	Pedestrian	Off Street Multi-Use Trail	Direct Jobs per \$1 Million	Indirect Jobs per \$1 Million	Induced Jobs per \$1 Million	Total Jobs per \$1 Million
Bicycle Infrastructure Only		✓			6	2.4	3.01	11.41
Pedestrian Infrastructure Only			✓		5.18	2.33	2.4	9.91
Off Street Multi-Use Trails				✓	5.09	2.21	2.27	9.57
Road Infrastructure with Bicycle and Ped Facilities	✓	✓	✓		4.32	2.21	2	8.53
On-Street Bicycle and Ped Facilities (without road construction)		✓	✓		4.2	2.2	2.02	8.42
Road Infrastructure with Pedestrian Facilities	✓		✓		4.58	1.82	2.01	8.42
Road Infrastructure Only (No Bike or Ped Components)	✓				4.06	1.86	1.83	7.75
<b>AVERAGE (All Projects)</b>					<b>4.78</b>	<b>2.15</b>	<b>2.22</b>	<b>9.14</b>

Original Data Source: Garrett-Peltier, Bicycle and Bicycle Infrastructure: A National Study of Employment Impacts, Political Economy Research Institute, 2011

## Public Health Benefits

Regular exercise, such as cycling and walking is important to good health. Health professionals recommend at least 30 minutes of moderate-intensity physical activity each day. This is enough to maintain good health, even if the exercise is broken up into short 10 minute bursts. Riding a bike to work, school, college, or taking neighborhood trips is a convenient and practical way to incorporate regular exercise into your busy day.

New Jersey's adult obesity rate is approximately 27.4%, up from 17% in 2000 and from 12.3% in 1995.<sup>16</sup> By comparison, in 2016 approximately 33.7% of Mercer residents reported a BMI  $\geq$ 30. According to a Greater Mercer Public Health Partnership study of Mercer County residents, the percent of Mercer County residents reporting diabetes increased from 8.3% in 2011 to 12.2% in 2016. Also in 2016, Mercer County had the second highest percentage of patients reporting diabetes among comparison counties in the State. In addition to obesity and diabetes, it was found that in 2012, the leading causes of mortality in Mercer County were heart disease (159.9 per 100,000 persons) and cancer (156.5 per 100,000 persons).<sup>17</sup>

A 2008 national study found that obesity-related employment absenteeism annual cost is between \$79 and \$132, per obese individual, in productivity costs.<sup>18</sup> With 94,335 considered obese in Mercer County, this translates into between \$7.45 million and \$12.45 million in annual obesity-related absenteeism costs or \$8.84 and \$14.78 million in 2019 dollars.

According to 2014 County Health Rankings data (based on the CDC's, The National Diabetes Surveillance System), 22% of adults over 20 years of age or some 60,987 persons, in Mercer County had not participated in a leisure-time physical activity. This inactivity is not only hurting our health but is also impacting us financially. A 2004 national study found that the annual individual medical cost of inactivity is approximately \$622 or with 60,987 physically inactive adults currently living in Mercer County, this translates to approximately \$51,351,054 in medical costs per year in 2019 dollars (equivalent to \$842 per person). That same report found that this cost of inactivity is more than 2 ½ times the annual cost per user of bike and pedestrian trails (\$318 in 2019 dollars).<sup>19</sup>

For individuals with heart disease, the savings are even greater. According to an analysis of 26,239 men and women published in the Journal of the American Heart Association, patients with heart disease who met weekly guidelines for moderate to vigorous exercise saved on average more than \$2,500 in annual

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<sup>16</sup> Robert Wood Johnson Foundation, "The State of Obesity: Better Policies for a Healthier America," 2017. Reproduced with permission of the Robert Wood Johnson Foundation, Princeton, N.J. <https://www.stateofobesity.org/states/nj/>

<sup>17</sup> Greater Mercer Public Health Partnership, "Mercer County 2015 Community Health Assessment" 2015. & "Mercer County 2018 Community Health Assessment" 2018. [https://health.montgomery.nj.us/wp-content/uploads/2018/10/GMPHP-CHA-DRAFT\\_092118.pdf](https://health.montgomery.nj.us/wp-content/uploads/2018/10/GMPHP-CHA-DRAFT_092118.pdf)

<sup>18</sup> Trogon JG, Finkelstein EA, Hylands T, Dellea PS, Kamal-Bahl., "Indirect costs of obesity: a review of the current literature." 2008. <https://www.cdc.gov/obesity/adult/causes.html>

<sup>19</sup> Wang, G., et al., "Cost Analysis of the Built Environment: The Case of Bike and Pedestrian Trails in Lincoln, Neb" 2004. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1448293/>

healthcare costs. Healthy patients, and those with cardiovascular risk factors, who exercised as recommended also had lower average medical costs.<sup>20</sup>

The new study examined data from a 2012 national survey sample of more than 26,000 Americans age 18 or older, excluding people who were underweight, pregnant, or unable to walk up to 10 steps. People in the study who already had cardiovascular disease — specifically coronary artery disease, stroke, heart attack, arrhythmias or peripheral artery disease — had higher healthcare costs. But those patients who regularly exercised at recommended levels logged average healthcare costs more than \$2,500 lower than those who didn't meet exercise guidelines. The research suggests that even if just 20 percent of patients with cardiovascular disease who are not getting enough physical activity would meet exercise goals, the nation could save several billion dollars in healthcare costs annually.

Residents of Mercer County would benefit from additional exercise and providing a space for them to do so may allow more people to live more health conscious lifestyles. For those with busy schedules, incorporating exercise into their daily work/ school commute may be an attractive alternative. In a research study by the University of Glasgow in which 263,450 people and their travel to work was tracked for five years, commuters who cycled to work had a 41% lower risk of dying from all causes than people who drove or took public transport. They also had a 46% lower risk of developing and a 52% lower risk of dying from cardiovascular disease, and a 45% lower risk of developing and a 40% lower risk of dying from cancer.

There are many factors that affect cancer and cardiovascular disease in addition to how a person travels to work and researchers went to great lengths to control many of these factors. The analyses were carried out controlling for sex, age, ethnicity, deprivation (measured as a combination of household unemployment and overcrowding, and non-ownership of a car or home), other illnesses such as diabetes, hypertension and depression, body mass index, smoking, diet (alcohol, fruits and vegetables, red meat, oily fish, poultry, and processed meat), time spent walking for pleasure or engaged in strenuous sport, level of occupational physical activity, and sedentary behavior.<sup>21</sup>

Locally, the trails of “The Circuit” (which the Lawrence-Hopewell Trail, Johnson Trolley Line, Delaware & Raritan Canal State Park Trail, and many others are a part) also contribute to the health of Mercer County and Greater Philadelphia. A 2011 study by the GreenSpace Alliance and the Delaware Valley Regional Planning Commission found that residents' use of southeastern Pennsylvania's parks and trails, including the Circuit, avoids \$199 million per year in direct medical costs and \$596 million in indirect costs.

<sup>20</sup> Javier Valero-Elizondo, et al., “Economic Impact of Moderate-Vigorous Physical Activity Among Those With and Without Established Cardiovascular Disease” 2016 <https://www.ahajournals.org/doi/10.1161/JAHA.116.003614>

<sup>21</sup> University of Glasgow, Association Between Active Commuting and Incident Cardiovascular Disease, Cancer, and Mortality: Prospective Cohort Study” 2017, <https://www.bmj.com/content/357/bmj.j1456>



## Transportation & Social Equity

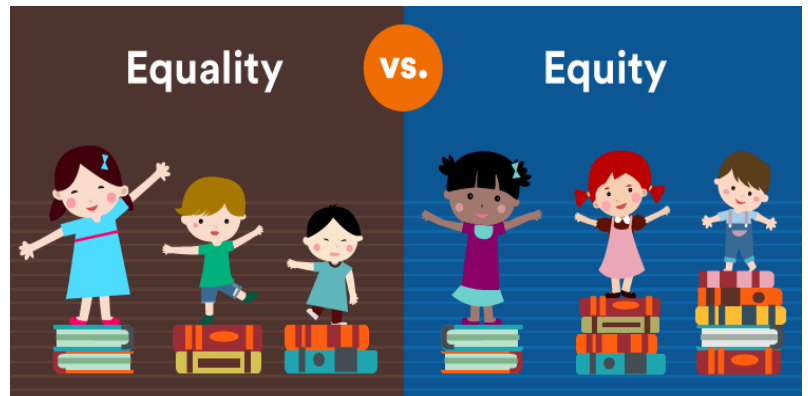
Mercer County is committed to promoting equality and equity within all of our planning endeavors and initiatives. We aim to this high standard by convening the widest array of partners to inform and facilitate data-driven decision-making. In doing an analysis of potential facility choice in the following

chapter, Mercer County used a data driven method that looks at AADT, posted speeds, cartway widths, bus routes, truck routes and overall road geometry. By doing an analysis of the entire Mercer County owned highway network, Mercer County is providing equal resources to all of our towns and neighborhoods and allows us to move forward to provide for greater equity.

To understand the County's road network, one must understand that the Mercer County Road system is one of the oldest in the nation, with some routes predating the United States itself, having originated with Native American trails and roads. As a result, we do not have the wide cartways and organized grid patterns that many newer cities and states enjoy. In the City of Trenton, Princeton, Hightstown and other older communities, roads were oftentimes built to accommodate livestock and took winding turns based on ownership and natural geography. Homes and especially businesses were often built up close to the edge of roadways, leaving little room for any further widening. Much of our older urban fabric illustrates this and as a result, many older urban roadways have limited cartways to this day.

In the post WWII period, Mercer County as well as countless other communities throughout the USA, evolved rapidly in an auto centric fashion where automobile traffic dominated over all other modes. No direct democratic vote, referendum or debate was given to this transition of public ROW and as a result, the network evolved at the discretion business and developer interests under the guise of economic development. Today, though we cannot correct decades of auto-centric market design, we can strive to have an accessible road network for all and to distribute County right-of-way in such a way that accommodates "Complete Streets" and all modes of travel.

Communities designed exclusively for motor vehicles impose a major financial penalty on those who are compelled to take on the expense of driving. Less affluent household and especially those living below the poverty line are most affected by the auto-centric market design of our urban fabric. From 2016-2017, The New Jersey-New York Metro Area saw households spent 11.7% of their budgets on transportation while the Philadelphia Metro Area spent 14.5%. This is in comparison to the 15.9% national average.<sup>22</sup> According to AAA's "Your Driving Cost" Study in 2018, owning and operating a new vehicle in 2018 will cost a driver an average of \$8,849 annually and roughly \$10,215 for a pickup truck, based on 15,000 miles



<sup>22</sup> Bureau of Labor Statistics, US Department of Labor, "Consumer Expenditure Surveys" <https://www.bls.gov/cex/>

driven annually.<sup>23</sup> According to another recent study by the personal finance website Bankrate, just the average annual cost of repairs, insurance and gasoline in 2014 for New Jersey was approximately \$2,421.<sup>24</sup> This makes NJ the 5th most expensive state to own a car in the United States. This financial burden is imposed on many residents of auto centric communities and furthers economic inequality.

Being able to thrive without a car is essential to many African-Americans, 22% of who have no access to a car, and Latinos, 14% of who are carless, according to a report by the Leadership Conference Education Fund.<sup>25</sup> For individuals who don't own a car or have access to one, alternative transportation such as bicycling represents important pathways to opportunity. For a 3 car family switching to 2 cars or 2 car family switching to 1 would save them on average \$7,500 - \$13,000 per vehicle dropped. According to estimates by Transportation Alternatives, an advocacy organization devoted to environmentally-friendly transportation, bicycle riding costs the frequent cyclist only one-quarter as much as driving, assuming cyclists replace their bicycles every three years. Additionally, safe bicycling conditions provide low-income Americans with an opportunity to get to jobs, education, stores and transit so they don't have to spend their limited capital or go into debt to buy a vehicle.

Cycling also provides economic and independent travel for those who might otherwise have their travel options restricted. Over one-third of Americans do not drive, a figure increasing with our aging population, and transportation choice and accessibility are critical issues of social equity. Cycling offers increased mobility to many groups of the population with low rates of car ownership, such as low income earners, minorities, unemployed persons, the elderly and those under 18 years of age as well as urban residents. These populations are disproportionately affected to have limited transportation choices, especially when the affordable transportation options of biking, walking and transit are not sufficiently safe, effective or available. This in turn leads to significant social and economic isolation and decline, with frequent poor health outcomes.

Mercer County, as many Central New Jersey communities has recently seen a significant influx of warehouse and light manufacturing employment along the NJ Turnpike. These jobs often do not require higher education and many of the employees working at these facilities rely on hourly wages. As these warehouses and manufacturers are located far from urban areas or older and smaller housing stock that low income earners can afford, they must travel considerable distances to the nearest affordable housing. Living such a considerable distance away from these employment centers disproportionally affects these residents and has a direct effect on social equity for our residents and labor productivity for our businesses. This disconnect between employment centers, housing and limited transportation choices hinders our ability for economic development and promotion of social equity.

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<sup>23</sup> AAA's "Your Driving Cost" 2018. <https://newsroom.aaa.com/auto/your-driving-costs/>

<sup>24</sup> Bankrate "Best and Worst States for Drivers" <https://www.bankrate.com/auto/best-and-worst-states-for-drivers-ranked/>

<sup>25</sup> Leadership Conference Education Fund <http://civilrightsdocs.info/pdf/testimony/Statement-for-House-Ways-and-Means-Hearing-6-17-2015.pdf>

## Equity and Cost of On-Street Parking

Free parking serves as a powerful market and government subsidy to cars and car trips in which legally mandated parking, via zoning requirements, lowers the market price of parking spaces, often to zero. A generalized system of zoning and development restrictions often require a large number of parking spaces attached to a store or a smaller number of spaces attached to a house or apartment block, many of

which are only used a few times a year during peak holiday shopping demand. This requirement not only takes up valuable urban land and destroys the concept of a “Main Street” type streetscape but also adds a financial burden on developers, residents and tenants. If developers were allowed to face directly the high land costs of providing so much parking, the number of spaces would be a result of a careful economic calculation rather than a matter of satisfying a legal requirement. Money saved could be then used for other amenities such as sidewalk, bicycle facilitates, lighting, landscaping, façades or other treatments.

Today, many suburbanites take free parking for granted. Whether it’s in the lot of a big-box store or at home in the driveway, people expect free parking wherever they go. Over the past century, we’ve come to regard parking as a basic public good that should be freely shared but in reality, free parking isn’t a public good and isn’t used by everyone. While roadways are used by and benefit all in one form or another, whether it is for travel, commerce, or goods movements, parking is not used by all. The cost of land, pavement, street cleaning, and other services related to free on-street parking spots come directly out of tax dollars (usually municipal or state funding sources). Each on-street parking space is estimated to cost around \$1,750 to build and \$400 to maintain annually.<sup>26</sup> Residents who do not own or use a car are in turn subsidizing car owner’s parking spaces. As a third of the nation does not drive, that one third in turn theoretically helps subsidizes the other 2/3 of the population who do not use these services and provide no social benefits like other necessary services (transportation, fire, police, education, healthcare) provide.

In urban areas such as Trenton, Princeton, Hightstown, Pennington and Hopewell, carless residents must not only subsidize parking but also give up valuable public right-of-way to allow for street parking. Mercer County holds that to promote economic equality and equity, parking shall be held as a secondary benefit of a roadway, second to bicycle and pedestrian facilities which promote safety and mobility for residents. This is especially true for disenfranchised and low-income residents who may not be able to afford and maintain a vehicle but have the same right as all other residents to travel in a safe marked lane. Free parking is a luxury that comes second to providing a safe way for our residents to get to their jobs, homes, schools, doctors, and other destinations.

“Suppose cities required all fast-food restaurants to include french fries with every hamburger. The fries would appear free, but they would have a high cost in money and health.

Those who don’t eat the fries pay higher prices for their hamburgers but receive no benefit. Those who eat the fries they wouldn’t have ordered separately are also worse off, because they eat unhealthy food they wouldn’t otherwise buy. Even those who would order the fries if they weren’t included free are no better off, because the price of a hamburger would increase to cover the cost of the fries. How are minimum parking requirements different?”

Shoup- The Cost of Free Parking

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<sup>26</sup> Metropolitan Area Planning Council, “Financing Public Parking” <https://www.mapc.org/resources/parking-toolkit/parking-issues-questions/financing-public-parking>

## Pavement Management and Maintenance

This current generation of young adults has the most to gain and lose from the transportation investments that we make today because they and their children will be impacted by our investments for decades to come. According to DVRPC, the millennial generation is driving less, getting driver's licenses later (if at all), and are less interested in car ownership compared to previous generations. Almost half of more than 1,000 consumers surveyed do not enjoy most of the time they spend driving, said a study by Arity, a Chicago-based transportation technology and data company created by Allstate. The numbers are starkest for millennials. More than half of adults between the ages of 22 and 37 say a car is not worth the money spent on maintenance, and that they would rather be doing something other than driving.<sup>27</sup>

The daily wear and tear of vehicles on our road system has significant maintenance implications and requires the County to repave every single County Road every few years depending on use and other variables. This requires a vast expenditure of County funds to maintain our roads in a state of good repair. A study by the U.S. General Accounting Office (GAO) determined that the road damage caused by a single 18-wheeler was equivalent to the damage caused by 9,600 cars.<sup>28</sup> The study found that road damage was exponentially worse with more weight. If one vehicle carries a load of 1,500 pounds per axle and another carries a load of 3,000 pounds on each axle, the road damage caused by the heavier vehicle is then not twice as much, but 2 to the 4th power as much ( $2 \times 2 \times 2 \times 2 = 16$  times as much road damage as the lighter vehicle). Looking at this from alternative travel modes, bicycles do nearly no damage to our road surface. Comparing a passenger car and a bicycle, say a bike and its rider weigh in at 200 pounds, and the car at 4,000 pounds. The weight of the car is also 20 times greater than the bike and rider, and the road damage caused would be 160,000 times greater. It would take 700 trips by a bicycle to equal the damage caused by one Smart Car. It would take 17,059 trips by bike to equal the damage caused by an average car. And it would take 364,520 bike trips to equal the damage caused by just one Hummer H2.

In a hypothetical scenario, if every 1,000 miles traveled in an average sized car equals \$1 worth of damage to the road that will have to come out of County budget for repair work, a bicyclist would have to travel over 17 million miles to cause the same \$1's worth of damage. Or another way to look at that, for the \$1's worth of damage that a car does to a road, a bicycle, traveling the same distance on the same road, would perpetrate \$0.0005862 worth of damage. A Hummer on the other hand would cause \$21.37 worth of damage for the same distance as a bicycle. Since car weight is an unpriced external cost within the transportation sector for all but freight trucks and toll roads, we do not price these additional costs into our County tax structure. By increasing bike lanes (as well as multi-modal travel and carpooling), we can extend pavement life and in turn save taxpayer money that otherwise would need to go towards more frequent resurfacing and repaving.

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<sup>27</sup> Arity, LLC. November 2018 <https://www.arity.com/>

<sup>28</sup> U.S. General Accounting Office "Excessive Truck Weight: An Expensive Burden We Can No Longer Afford" <https://www.gao.gov/products/CED-79-94>

## Facility Design and Crash Safety

Bike facilities also provide for many transportation safety improvements, not just for bicyclists but also to drivers. Foremost, the most cited safety benefit of dedicated facilities such as bike lanes, buffered lanes, protected lanes and multi-use paths is the fact that bikes have a reduced need to travel in a vehicle lane. Marked facilities send a message to drivers that bicyclists can and should be expected and the physical lane markings separate their expected travel behavior from expected rider behavior.

A comprehensive study looking at 13 years of crash and street design data from 12 cities found that roads with protected bike lanes make both cycling and driving safer. The authors amassed a huge data set: 17,000 fatalities and 77,000 severe injuries between 2000-2012 in cities like Minneapolis, Seattle, Denver, Portland, Dallas, Houston, Austin, Kansas City, and Chicago. All these cities have experienced a rise in cycling's popularity, have added bike amenities at various levels of investment, and have seen a range of safety outcomes. The study found that where cycle tracks were most abundant on a citywide basis, fatal crash rates dropped by 44% compared to the average city, and injury rates were halved.<sup>29</sup>

Design of bicycle facilities can also incorporate features that improve both driver and cyclist safety. According to the FHWA, run-off-the-road crashes account for approximately one-third of the deaths and serious injuries each year on the Nation's highways. Drift-off crashes, caused by drowsy, distracted, or otherwise inattentive driving, are a subset of run-off-road crashes. As part of the County's typical buffered bicycle lane design, items such as rumble strips and raised reflective pavement markers (RPMs) will be considered. FHWA states that studies of milled freeway shoulder rumble strips in Michigan and New York documented drift-off-road crash reductions of 38 and 79% while NCHRP Report 641 documents milled shoulder and edge rumble strips to provide statistically significant reductions in single-vehicle run-off-road injury crashes: 10- 24% on rural freeways, and 26- 46% on two-lane rural roads.<sup>30 31</sup>

Shoulder and edge line rumble strips may also serve as an effective means of locating the travel lane during inclement weather such as fog, snow, or rain as these conditions often obscure pavement markings. The vibration provided by rumble strips can assist drivers from unintentionally leaving the roadway in these conditions or if the driver is inattentive. There are also potential visibility benefits as even a light rain can seriously reduce the retroreflective capacity of pavement markings. When the edge line marking is placed within the rumble strip, the vertical component will often still be visible under these adverse conditions. Bike facilities intrinsically provide for an additional 4'-10' of cartway outside of travel lanes and can be designed with rumble strips as well as RPMs that have a dual purpose of keeping cyclists safe and motorists in their lanes.

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<sup>29</sup> Wesley E. Marshall & Nicholas N. Ferenchak, "Why cities with high bicycling rates are safer for all road users" June 2019.

<https://www.sciencedirect.com/science/article/pii/S2214140518301488?via%3Dihub>

<sup>30</sup> FHWA "Shoulder and Edge Line Rumble Strips: T 5040.39, REVISION 1" November 2011.

[https://safety.fhwa.dot.gov/roadway\\_dept/pavement/rumble\\_strips/t504039/](https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/t504039/)

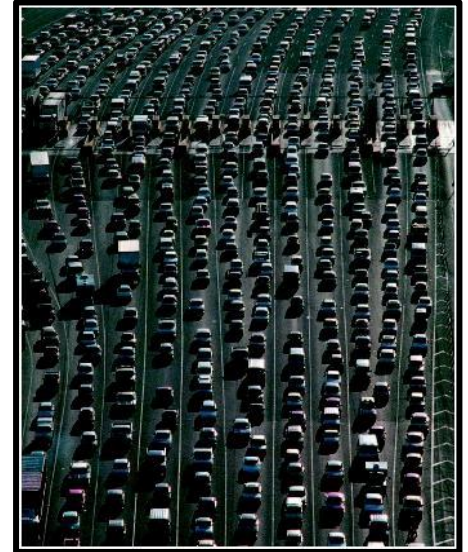
<sup>31</sup> NCHRP "Report 641: Guidance for the Design and Application of Shoulder and Centerline Rumble Strips" 2009.

[http://www.cmfclearinghouse.org/studydocs/nchrp\\_rpt\\_641-GuidanceRumbleStrips.pdf](http://www.cmfclearinghouse.org/studydocs/nchrp_rpt_641-GuidanceRumbleStrips.pdf)

Though not a primary function of bicycle facilities, this additional space can be used in extreme emergencies by motorists to stop in the event of a mechanical difficulty, health emergency, or to escape or reduce their severity of a potential crashes. Emergency vehicles also have the ability to use this space to maneuver in the roadways if they temporarily need to utilize the bike lane to bypass debris or motorists. Since bike lanes are supposed to be free of debris, parked cars and other large items, they provide the added benefit of greater sight distances for motorists.

## Congestion

A common reason for opposition to bike lanes is that, according to the rules of traffic engineering, they lead to congestion. Evidence and studies however prove counter to this argument. In a 2014 study by New York City DOT of roadways with new bicycle facilities, congestion went down on those roads. Rather than increase delay for cars, the protected bike lanes on Columbus Avenue actually improved travel times in the corridor. According to city figures, the average car took about four-and-a-half minutes to go from 96th to 77th before the bike lanes were installed, and three minutes afterward—a 35 percent decrease in travel time. This was true even as total vehicle volume on the road remained fairly consistent.



Over on Eighth Avenue, where bike lanes were installed in 2008 and 2009, DOT figures show a 14 percent overall decline in daytime travel times in the corridor from 23rd to 34th streets once the protected bike lanes were installed. That quicker ride was consistent throughout the day: travel time decreased during morning peak (13 percent), midday (21 percent), and evening peak (13 percent) alike.<sup>32</sup> To repeat: a street that became safer for bikes saw a reduction in travel time for motorists.

County highways by their nature are designed to be inter-municipal and inter-county routes of travel. They often provide the most direct and common ways of travel and in conjunction with State and US routes and act as the arteries for our County. Designing them to accommodate all modes of travel, especially bike facilities can help reduce the number of single-occupancy cars on our roadways which benefits all users.

A major form of congestion known to many residents is school traffic during morning peak hours. Parents and residents driving past schools know all too well that our society has increasingly been relying on dropping students off in single-occupancy vehicles and that walking to school or riding a bike is becoming a relic of the past in many communities. In 1969, half of American schoolchildren walked or rode their bikes to school but by 2009; just 13 percent of kids walked or biked to school. Despite many schools being constructed further from where people live, the majority of car trips to school are still within walking distance, though direct and safe routes are often unavailable in auto-centric communities. Developing bike

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<sup>32</sup> NYCDOT “Protected Bike Lane Analysis” September 2014. <http://www.nyc.gov/html/dot/downloads/pdf/2014-09-03-bicycle-path-data-analysis.pdf>

facilities for students would allow them to walk or bike to school and reduce the number of vehicles arriving at schools, thus reducing congestion.

The community of Lakewood, Ohio can prove that alternative transportation is possible as the city does not and never has bused its students. The city of 52,000 only runs a small transportation program for students with special needs — about 100 students use it, out of 5,800. To this day, nearly every student walks to school. Not only does this help reduce peak hour congestion, but as an added benefit, it helps kids stay focused and be generally healthier. According to a Danish "Mass Experiment 2012" project study, 20,000 participating kids who walked or biked to school had performed better on tasks requiring concentration than those who were driven to school or took public transit.<sup>33</sup> Researchers found that the lift in concentration lasts for about four hours into the school day. Other benefits of biking to school include a stronger connection to the community, a taste of independence, numerous health benefits, family bonding time and of course – exercise.

Overall, in order to reduce congestion, we need to take a multi-modal approach to see real progress. This applies to not only long distance trips but especially to last mile connections. Mercer County is one of the most densely populated places in the United States with approximately 1,615 persons per square mile. In order to provide for an efficient transportation system, we need to work together with municipal and State partners to provide a complete network of sidewalk, bicycle facilities and transit routes as reduce single occupancy vehicle trips. In order to do so, our citizens need facilities to make that happen. In the image below, we can see the space requirements for 70 people walking, taking transit, riding their bikes or driving solo (regardless of vehicle type).



<sup>33</sup> Niels Egelund; Aarhus University. <http://scienordic.com/children-who-walk-school-concentrate-better>

## Environmental Considerations

The transportation sector is a significant source of our nation's pollution and the effects of automobile pollution are especially widespread, affecting air, soil and water quality. Air pollutants such as that of Nitrous Oxide, contributes to the depletion of the ozone layer, which shields the Earth from harmful ultraviolet radiation from the sun. Sulfur dioxide and nitrogen dioxide mix with rainwater to create acid rain, which damages crops, forests and other vegetation and buildings (especially historic buildings and monuments of marble and sandstone). Carbon monoxide, another exhaust gas, is particularly dangerous to infants and people suffering from heart disease because it interferes with the blood's ability to transport oxygen.<sup>34 35</sup>

Other car pollutants that harm human health include Benzene, Formaldehyde and many more volatile organic compounds and particulate matter. Some 24,000 vulnerable people die prematurely each year and similar numbers are admitted to hospital because of exposure to air pollution from particulates, ozone, and sulfur dioxide, much of which is related to road traffic.

Air quality is often worse in more deprived areas and affects vulnerable populations more,

exacerbating the symptoms of people with asthma, for example.<sup>36</sup> Particulate matter, hydrocarbons, carbon monoxide and other car pollutants harm human health. Diesel engines emit high levels of particulate matter, which are airborne particles of soot and metal. These cause skin and eye irritation and allergies, and very fine particles lodge deep in lungs, where they cause respiratory problems. Hydrocarbons react with nitrogen dioxide and sunlight and form ozone, which is beneficial in the upper atmosphere but harmful at ground level. Ozone inflames lungs, causing chest pains and coughing and making it difficult to breathe.

Vehicles also significantly contribute to the poor nature of our nation's water quality. Vehicles leave oil, antifreeze, grease, nitrogen and phosphorous from washing detergents, metals and various chemicals on streets and driveways. Water pollution in the form of oil and fuel spills from cars and trucks oftentimes seeps into the soil near highways, and discarded fuel and particulates from vehicle emissions contaminates lakes, rivers and wetlands. Americans dump enough oil to contaminate about 1.5 trillion



Above: Vehicle soot has significant health implications for humans, especially developing young children, the elderly and those with respiratory impairments.

<sup>34</sup> Union of Concerned Scientists "Cars, Trucks, Buses and Air Pollution" <https://www.ucsusa.org/clean-vehicles/vehicles-air-pollution-and-human-health/cars-trucks-air-pollution>

<sup>35</sup> EPA "Transportation, Air Pollution, and Climate Change" <https://www.epa.gov/transportation-air-pollution-and-climate-change>

<sup>36</sup> World Health Organization "How Air Pollution is Destroying our Health" <https://www.who.int/air-pollution/news-and-events/how-air-pollution-is-destroying-our-health>



gallons of water every year. Nearly all of our storm sewers drain directly to creeks, rivers, lakes or our oceans with no water-quality treatment.<sup>37</sup>

These toxins then settle in our waters and kill fish, plants, aquatic life and even people. One quart of oil will contaminate thousands of gallons of water because it cannot dissolve and break down. These toxins as well as trace metals and degreasing agents used on automobiles can also contaminate drinking water and can cause major illness.



Some of these toxins and metals are absorbed in various aquatic life and cause medical problems to people when eaten. Phosphorus and nitrogen cause explosive growth of algae, which depletes water of oxygen, killing fish and aquatic life. This has a direct impact on our recreational and commercial fishing viability within our region.<sup>38</sup>

There is also the issues of noise pollution as vehicles in rush hour traffic can reach noise levels of 70 decibels or higher in intensity, where prolonged exposure to noises above 85 decibels can damage hearing. Exposure to prolonged exposure can cause annoyance, stress, sleep disturbance, psychological conditions, and cardiovascular diseases.<sup>39</sup> This in turn exerts a higher burden on the cost of health care. It results in lost productivity and leads to a diminished quality of life.

Cycling on the other hand uses minimal fossil fuels, is nearly silent and is a pollution-free mode of transport. Bicycles reduce the need to build, service and dispose of cars (regardless of fuel type) and the need for vast lithium, cobalt, oil, gas or hydrogen operations to fuel them. The carbon footprint of making a car is immensely complex and though bicycles also must be manufactured, they require much less complex input. Ores have to be dug out of the ground and the metals extracted. These have to be turned into components that then have to be brought together: rubber tires, plastic dashboards, paint, and so on. All of this involves transporting components around the world where environmental regulations are often much more lax. The whole automobile then has to be assembled, and every stage in the process requires energy. The companies that make cars have offices and other infrastructure with their own carbon footprints, which we need to somehow allocate proportionately to the cars that are made. For a given journey, the energy consumed by a driver is at least 42 times more than by a cyclist, a bus passenger uses 34 times as much, and a train passenger 27 times as much. The cyclist requires less space than all but the train passenger and pedestrian.<sup>40</sup>

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<sup>37</sup> Hilary Nixon and Jean-Daniel Saphores, UC Irvine "Impacts of Motor Vehicle Operation on Water Quality: Clean-up Costs and Policies" 2007. <https://escholarship.org/uc/item/8tn1w17s>

<sup>38</sup> EPA, "Polluted Runoff: Nonpoint Source (NPS) Pollution" <https://www.epa.gov/nps>

<sup>39</sup> National Institute on Deafness and Other Communication Disorders "Noise-Induced Hearing Loss" <https://www.nidcd.nih.gov/health/noise-induced-hearing-loss>

<sup>40</sup> Max Glaskin, "Cycling Science: How Rider and Machine Work Together" 2012. Print.

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