



# Opportunity Mapping

---

The Geography of Opportunity  
Dayton, Ohio



**Public Health**  
Prevent. Promote. Protect.  
Dayton & Montgomery County

February 2015

Prepared by

Epidemiology Section of Public Health - Dayton & Montgomery County  
Dawn L. Ebron, MS, MPH, CPH

For comments and information requests

Public Health - Dayton & Montgomery County  
Epidemiology Section  
117 South Main Street  
Dayton, OH 45422-1280

Phone: (937) 496-6533

Email: [epi@phdmc.org](mailto:epi@phdmc.org)

For more information on Opportunity Mapping

The Kirwan Institute for the Study of Race and Ethnicity at Ohio State University  
<http://kirwaninstitute.osu.edu/>



## Introduction

Opportunity is defined as a situation or condition favorable for attainment of a goal. Opportunity is also a good position, chance, or prospect for advancement or success. Ideally, everyone should have an equal opportunity to be successful in life, but research has established that neighborhood conditions and access to opportunities can have a profound impact on an individual's chances to succeed.

The Kirwan Institute's Communities of Opportunity framework proposes that there are complex and interconnected opportunity structures that have a significant role in shaping an individual's quality of life. These structures include housing, education, health care, employment, transportation, and civic engagement. Communities with high opportunity have quality schools, low crime rates, and affordable housing. Additionally, the environment of these communities promotes healthy lifestyles with such advantages as access to parks and fresh, healthy foods.

Improving opportunity requires an investment in both the people and the community as well as the supporting linkages between the community and areas of opportunity. Opportunities can be brought back to neglected communities through strong neighborhood development initiatives, higher quality local services, and infrastructure and public health investments. The growth of human capital can be stimulated by investing in education, developing and training the labor force, creating asset and wealth building strategies, and encouraging social and political empowerment within the community. Through the investment in people, place, and linkages, the landscape of low opportunity communities can begin to transform.

## What is Opportunity Mapping?

The identification of communities with poor access to opportunity can be accomplished through Opportunity Mapping. Opportunity Mapping allows for the visualization of varying levels of access to opportunities that exist within a region. Based on a methodology developed by the Kirwan Institute, indicators representing the opportunity structures (housing, education, health care, employment, and transportation) are statistically combined to create an opportunity score. Additional data, such as population and public assistance, are used to highlight differences in opportunity based on race, ethnicity, and poverty. The data for all indicators were aggregated to the Census tract level. Census tracts were given an opportunity score of very high, high, moderate, low, or very low.

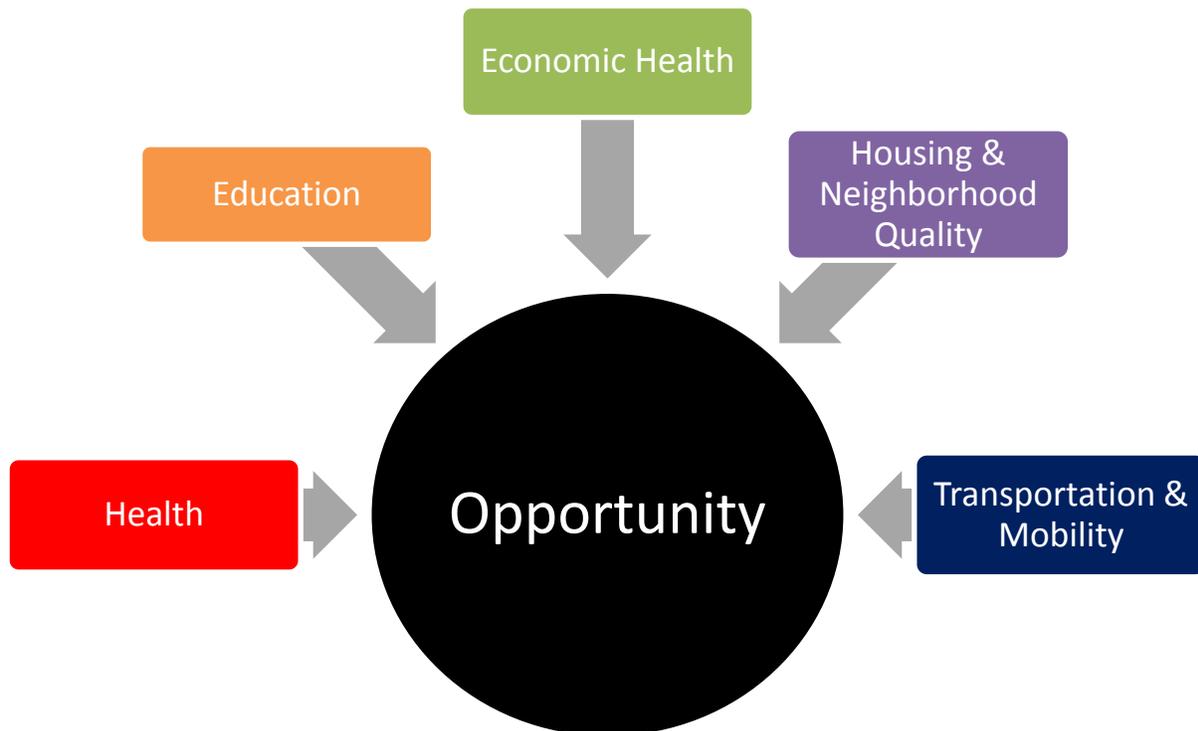
Table 1 Indicators

Health	Education	Housing & Neighborhood Quality	Economic Health	Transportation & Mobility	Additional Data
Low Birth Weight	Reading proficiency (3rd grade)	Housing Vacancy	Unemployment Rate	Access to Public Transit	Dayton Neighborhoods
Teen Pregnancy	Math Proficiency (4th grade)	Foreclosure Rate	Poverty	Vehicle Availability	Population (Race and Ethnicity)
Infant Mortality Rate	Teacher Qualifications (Master's Degree)	Housing Condition (Incomplete plumbing)	Median Income	Travel Time to Work	Subsidized Housing
Health Insurance Coverage	Elementary School Attendance Rate	Proximity to Parks	Educational Attainment (HS or equivalent)		Supplemental Nutrition Program (SNAP)
Cancer Mortality Rate		Proximity to Toxic Waste Release Sites			Cash Assistance
Heart Disease Mortality Rate		Access to Food (Food Deserts)			Educational Attainment (Bachelor's or higher)
Life Expectancy		Crime Rate (Property and Violent)			Bikeways

### ***How can Opportunity Maps be used?***

Opportunity Maps can be used as a tool for community engagement, planning, and development. These maps can begin a dialogue between community members, leaders, and stakeholders as to the challenges facing their community. Additionally, they can impact policy decisions and aid in community planning and development in the areas of transportation and housing.

As it pertains to public health, opportunity mapping is a tool that can be used to help address the social determinants of health. The health of an individual is impacted by where they are born, live, learn, work, play, and age and the quality of life outcomes and risks that may be associated with these environments. These maps can be used to highlight health disparities, influence coalition decisions, and target and design upstream health interventions that address the social determinants of health.



# Overall Opportunity



Dayton &  
Montgomery  
County

Public Health  
Prevent. Promote. Protect.

## Dayton, Ohio

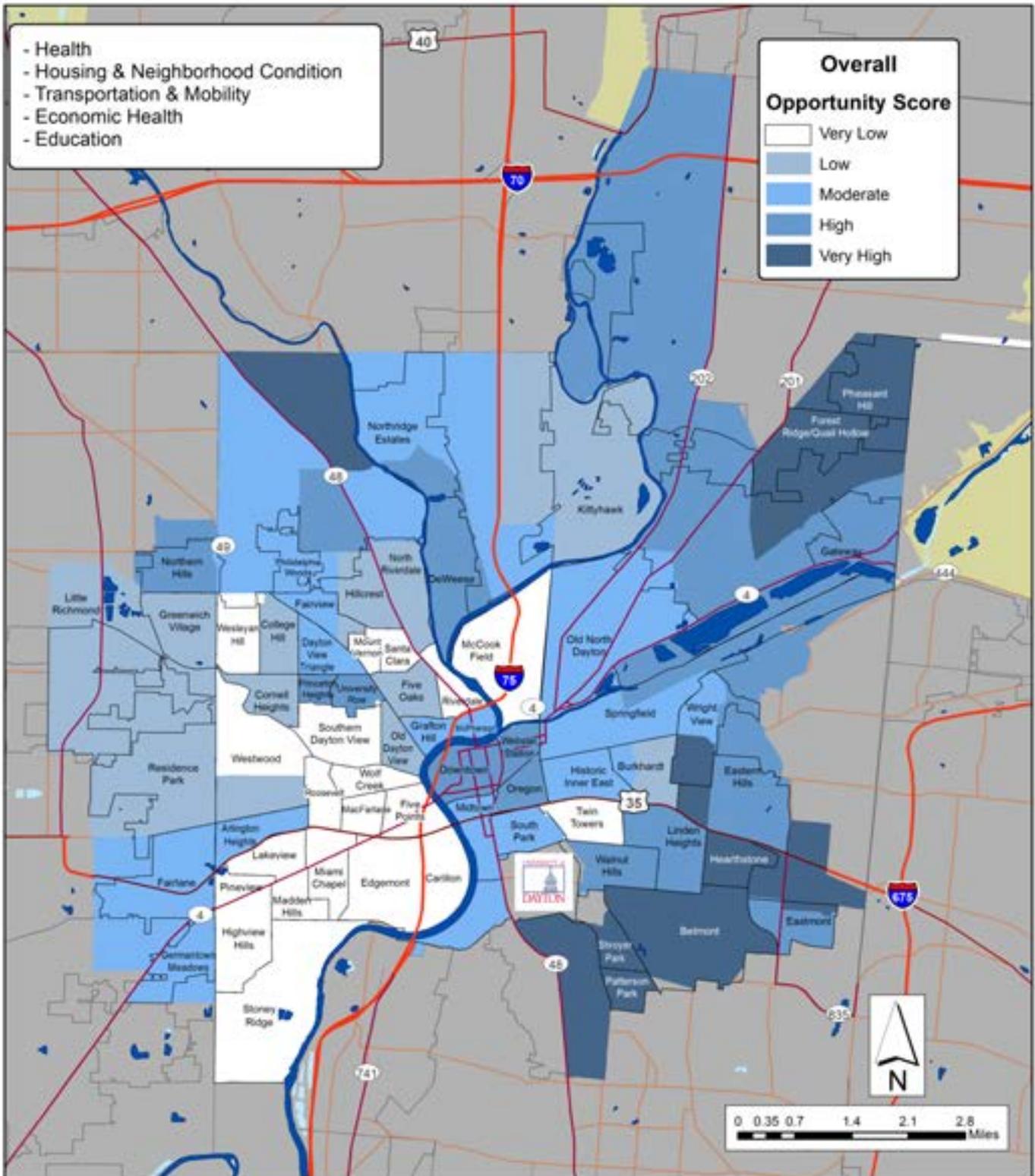
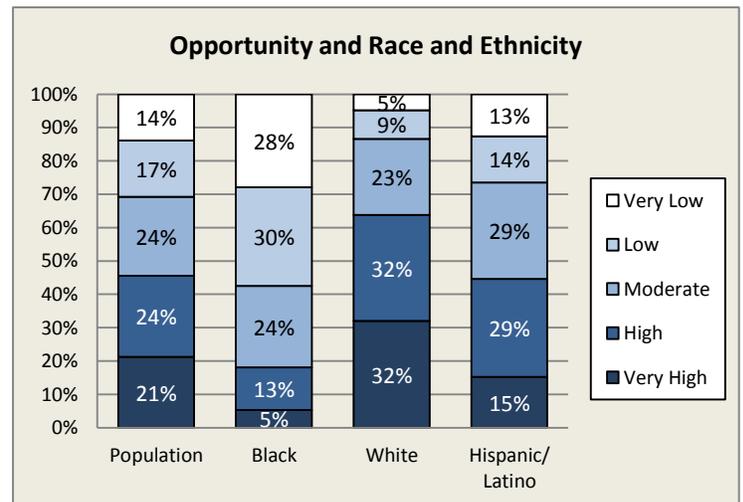
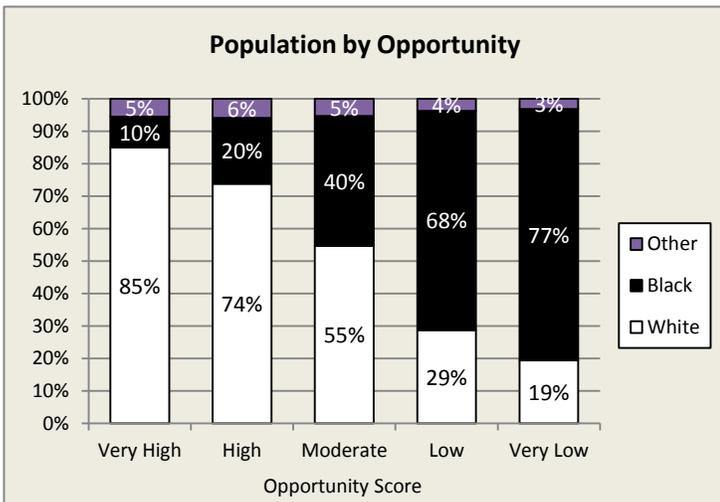


Table 2 Opportunity Score by Neighborhood

Very High	High	Moderate	Low	Very Low
Belmont	DeWeese	Arlington Heights	Burkhardt	Carrillon
Forest Ridge/Quail Hollow	Downtown	Dayton View Triangle	College Hill	Edgemont
Hearthstone	Eastern Hills	Fairlane	Cornell Heights	Five Points
Patterson Park	Eastmont	Fairview	Five Oaks	Highview Hills
Pheasant Hill	Gateway	Germantown Meadows	Greenwich Village	Lakeview
Shroyer Park	Linden Heights	Grafton Hill	Hillcrest	MacFarlane
Wright View Southern half)	Northern Hills	Historic Inner East	Kittyhawk	Madden Hills
	Oregon	McPherson	Little Richard	McCook Field
	Princeton Heights	Midtown	North Riverdale	Miami Chapel
	University Row	Northridge Estates	Old Dayton View	Mount Vernon
	Walnut Hills	Old North Dayton	Residence Park	Pineview
	Webster Station	Philadelphia Woods		Riverdale
		South Park		Roosevelt
		Springfield		Santa Clara
		Wright View (Northern half)		Southern Dayton View
				Stoney Ridge
				Twin Towers
				Wesleyan Hill
				Westwood
				Wolf Creek

**How are Race and Ethnicity related to Opportunity?**

- Within the communities with low and very low opportunity, the residents are predominately Black (68% and 77%). This accounts for 58% of the Black population.
- Almost two-thirds (64%) of the White population live in communities of high or very high opportunity.
- In the communities with the highest opportunity, the population is 85% White and 10% Black.
- More Hispanics or Latinos live in high and very high opportunity communities (44%) than in lower opportunity communities (27%).

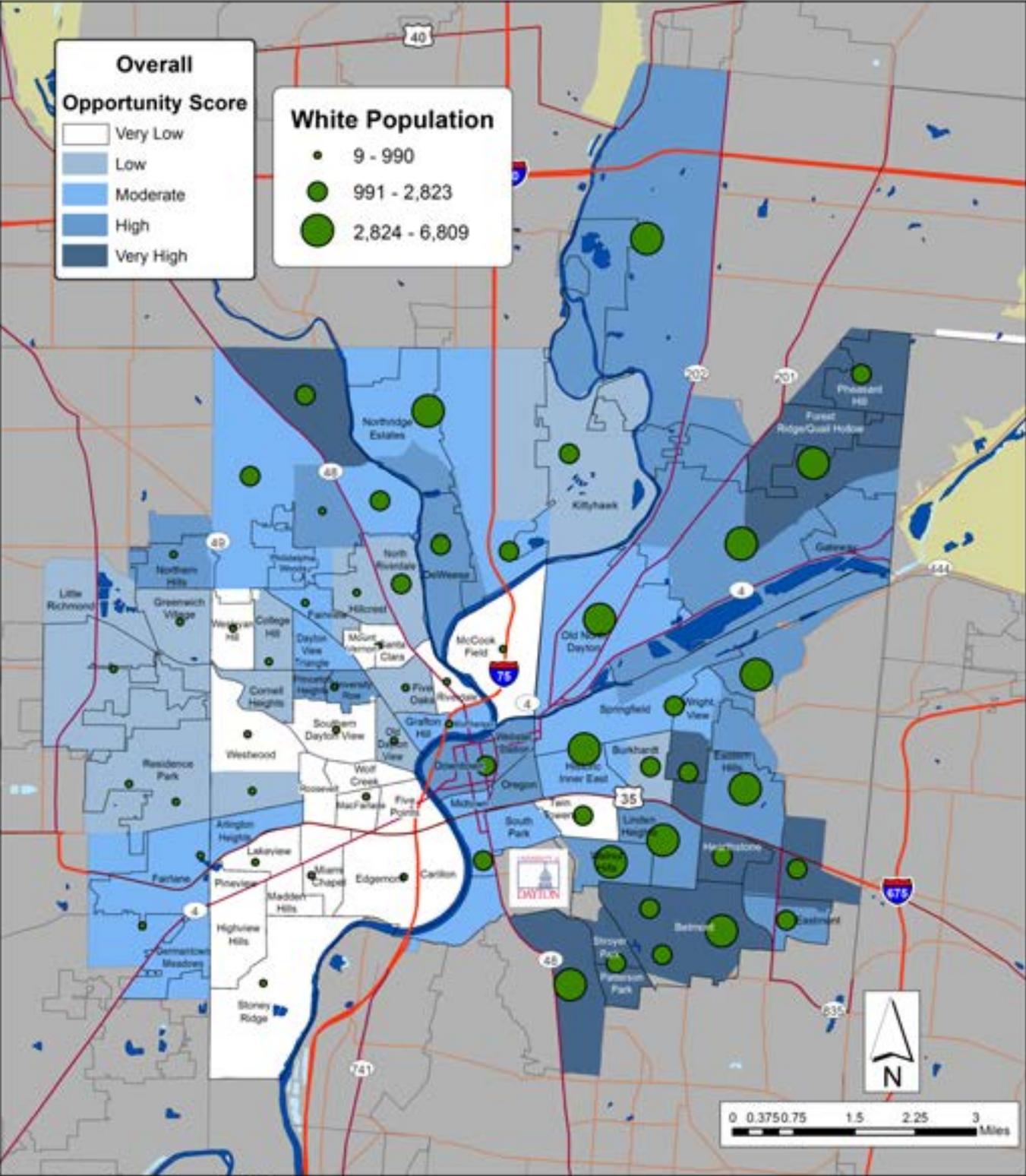






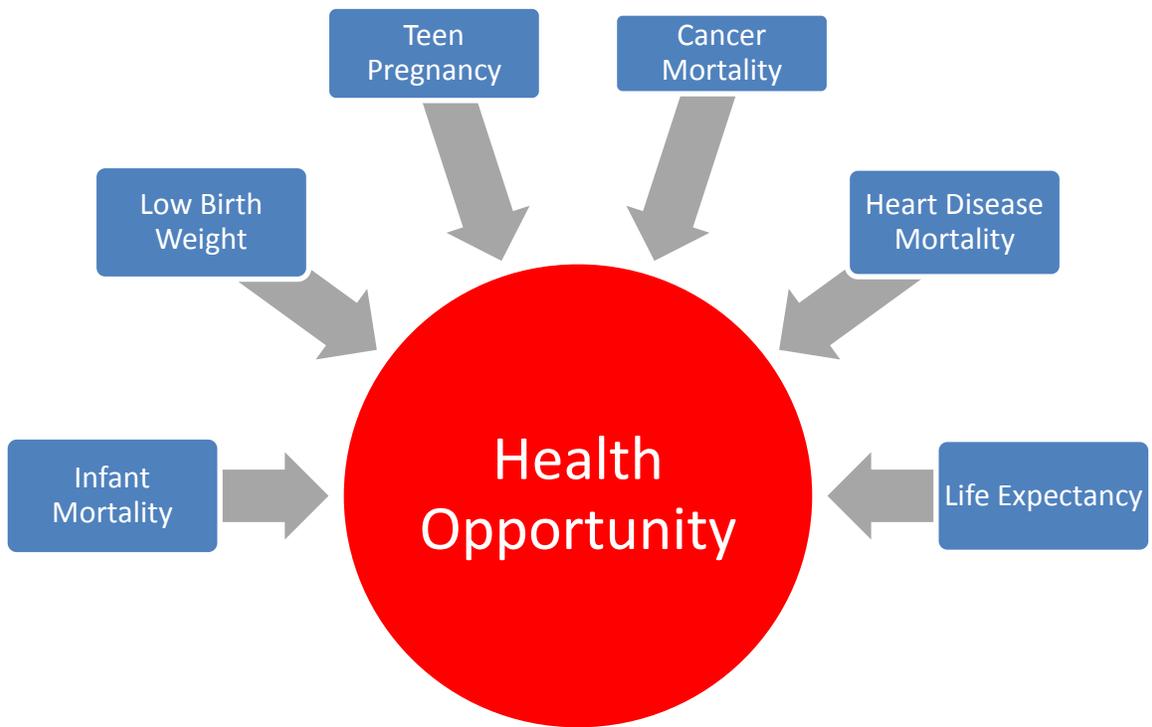
# Overall Opportunity & White Population

## Dayton, Ohio



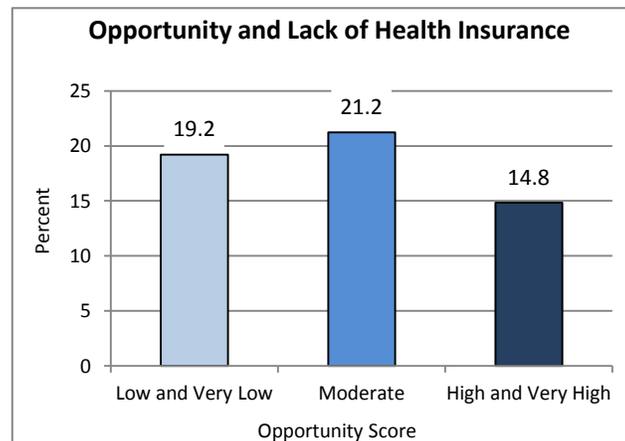
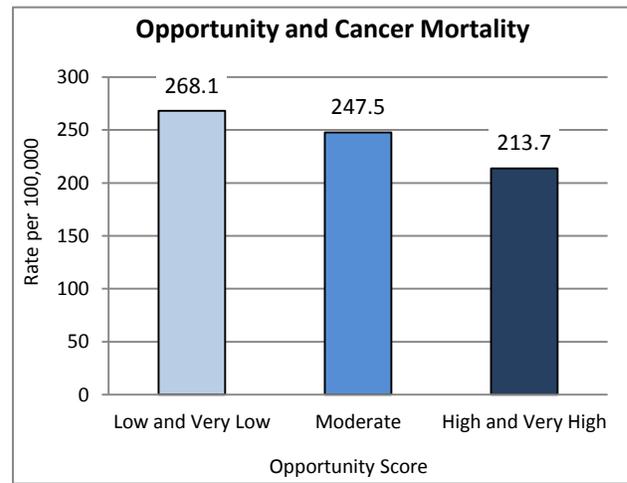
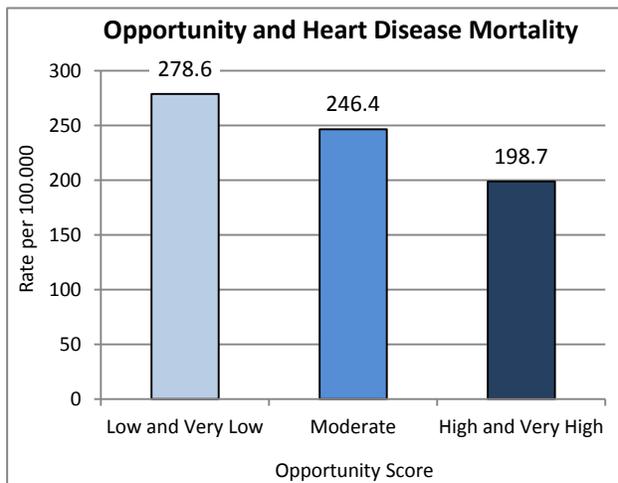
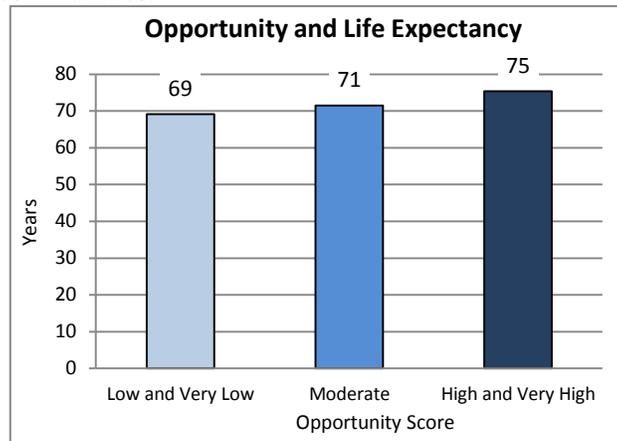
Source: American Community Survey, 2009-2013

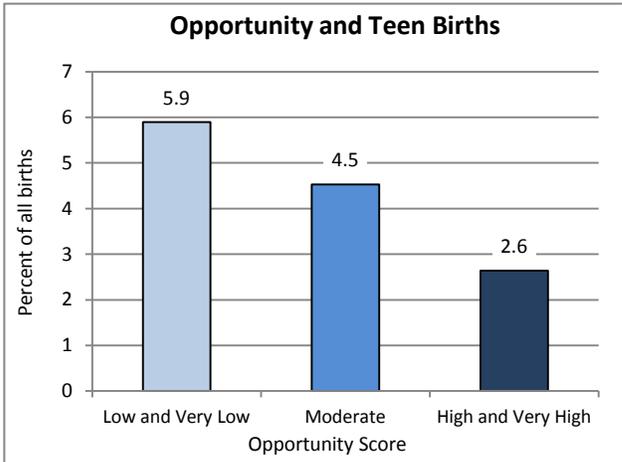
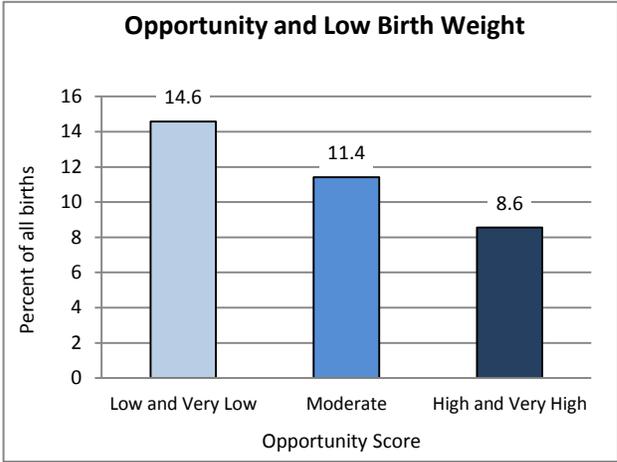
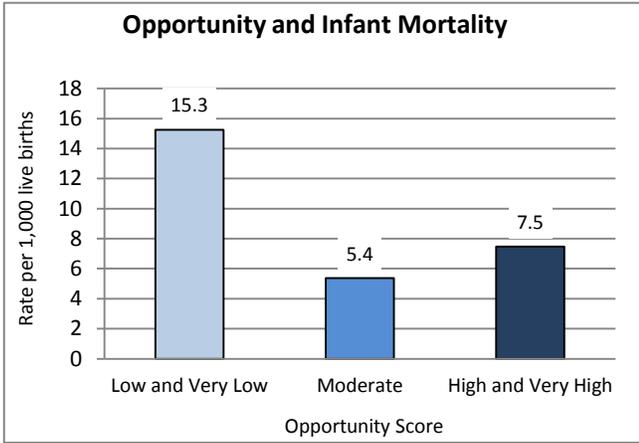




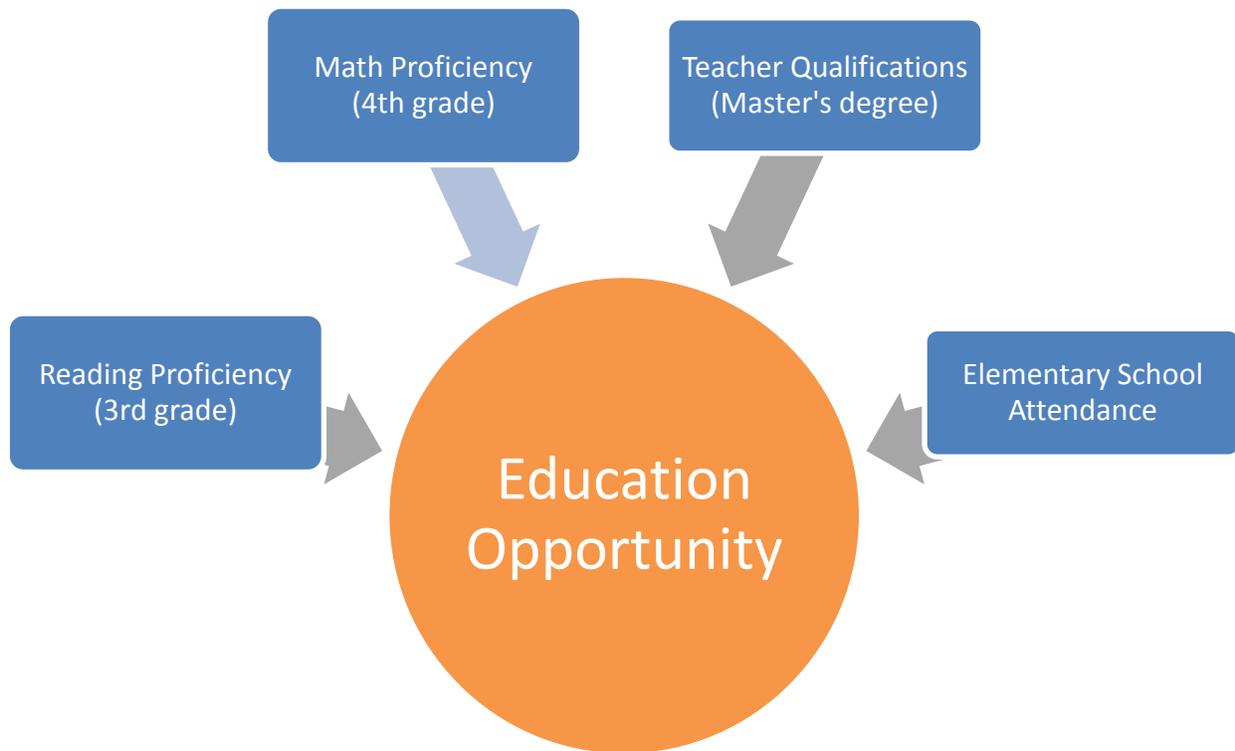
## How is Health related to Opportunity?

- Life expectancy in communities with low or very low access to opportunity is 6 years less than in communities with high or very high opportunity (69 years versus 75 years).
- The age-adjusted death rate for cancer and heart disease, the two leading causes of death, are highest in the communities with the low and very low opportunity.
- The highest percent of people who do not have health insurance coverage live in communities with moderate opportunity, 21.2%.
- In the communities with low and very low opportunity, there are 13.2 infant deaths for every 1,000 births. This is 71% higher than infant mortality in communities with high and very high opportunity.
- Both the percentage of births born with low birth weight (<2,500 g) and born to teenagers (15-17 years) are lowest in high and very high opportunity communities.



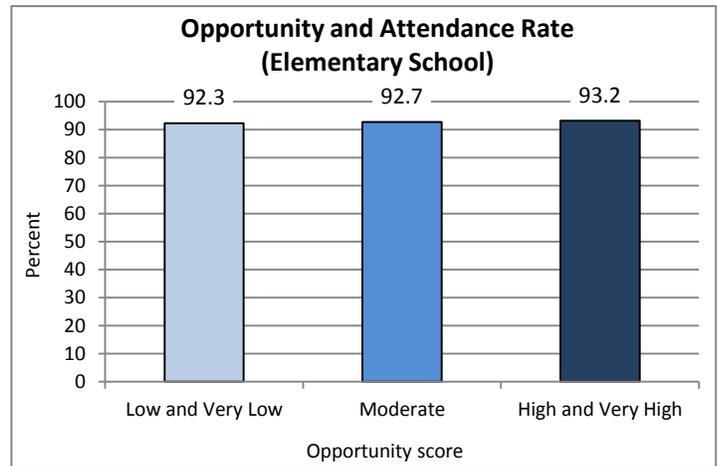
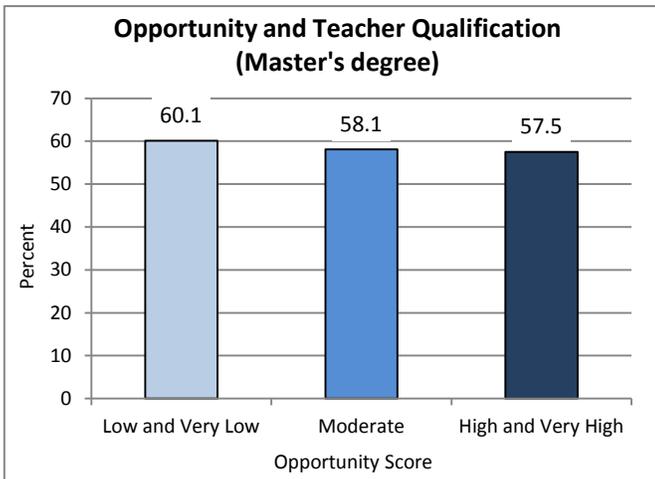
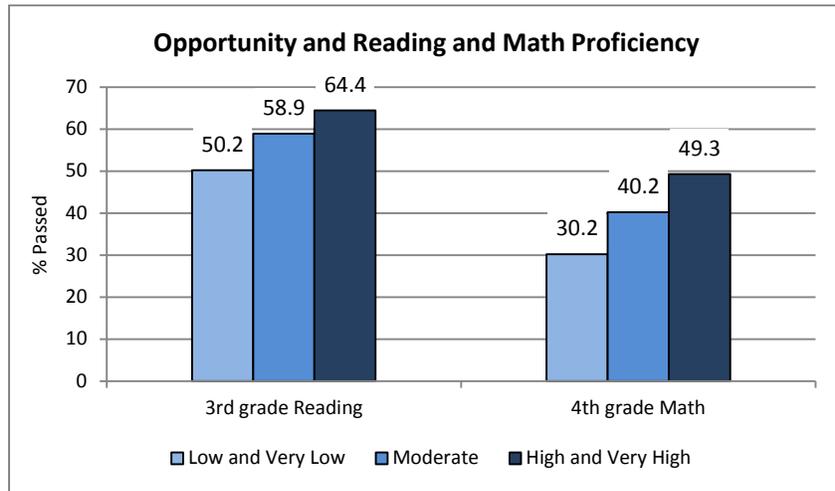






## How is Education related to Opportunity?

- In low and very low opportunity communities, 50% of 3<sup>rd</sup> graders passed the Reading section of the Ohio Achievement Assessment (OAA) compared to 64% in neighborhoods with high or very high opportunity.
- A little less than half of 4<sup>th</sup> graders in high and very high opportunity communities passed the Math portion of the OAA. In the low and very low opportunity communities, 30% of 4<sup>th</sup> graders passed the Math section of the state test.
- There is not a significant difference between percent of Elementary teachers who hold a Master's degree and the attendance rate in elementary schools between communities with varying levels of opportunity.



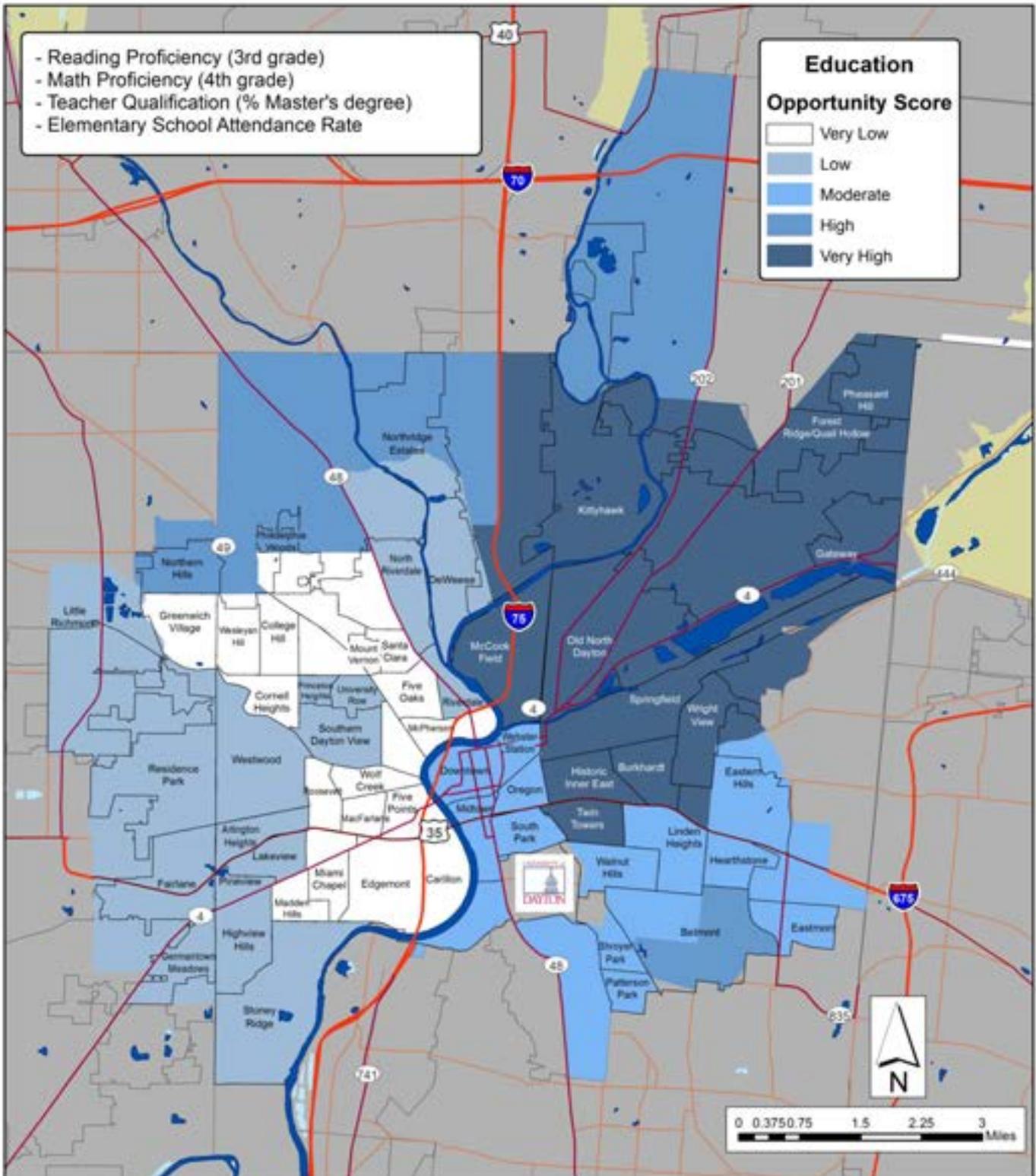
# Education Opportunity



Dayton & Montgomery County

Public Health  
Prevent. Promote. Protect.

## Dayton, Ohio



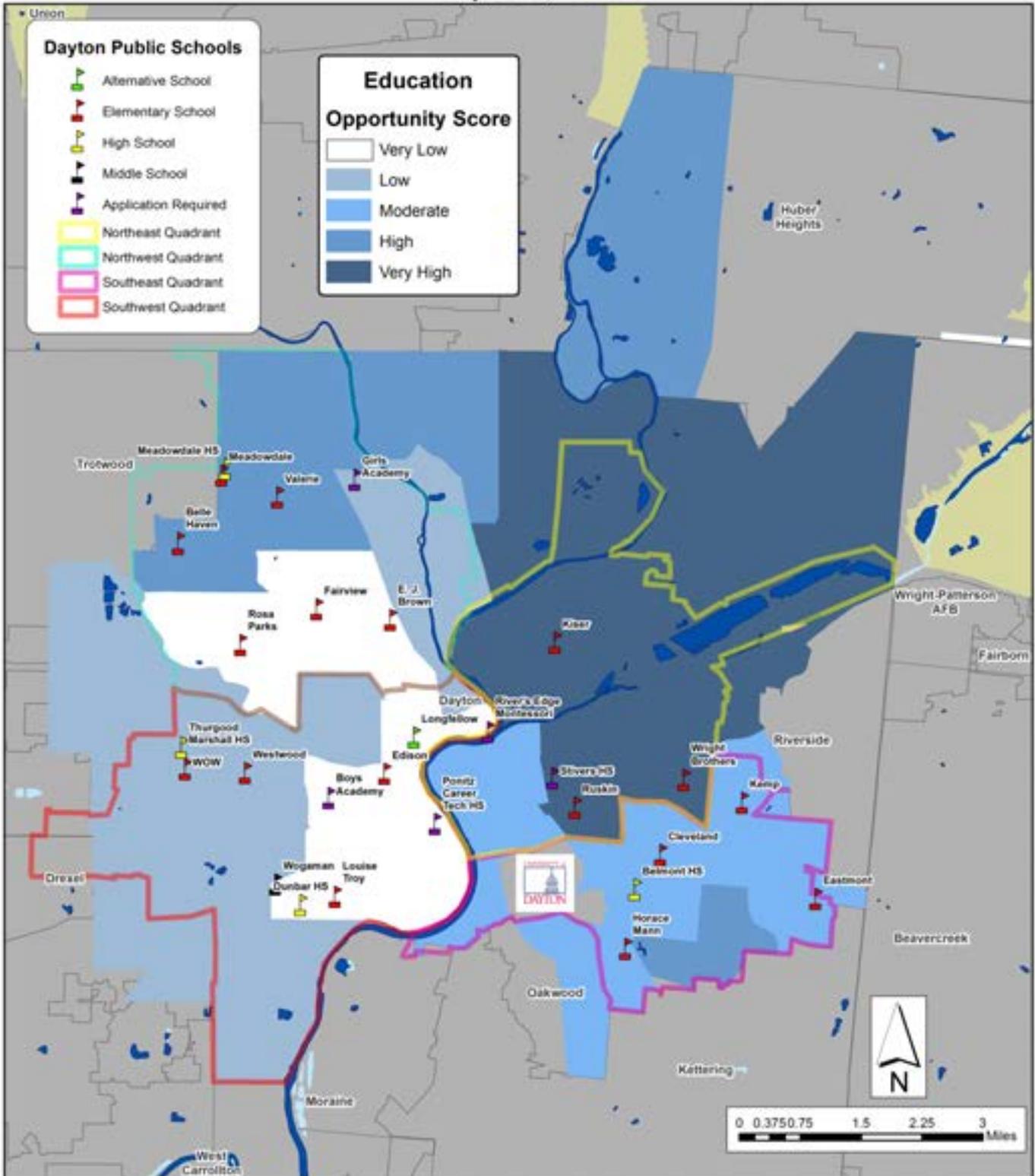
Sources: Ohio Department of Education, 2013-2014

# Education Opportunity & Dayton Public Schools

Dayton, Ohio



Dayton & Montgomery County



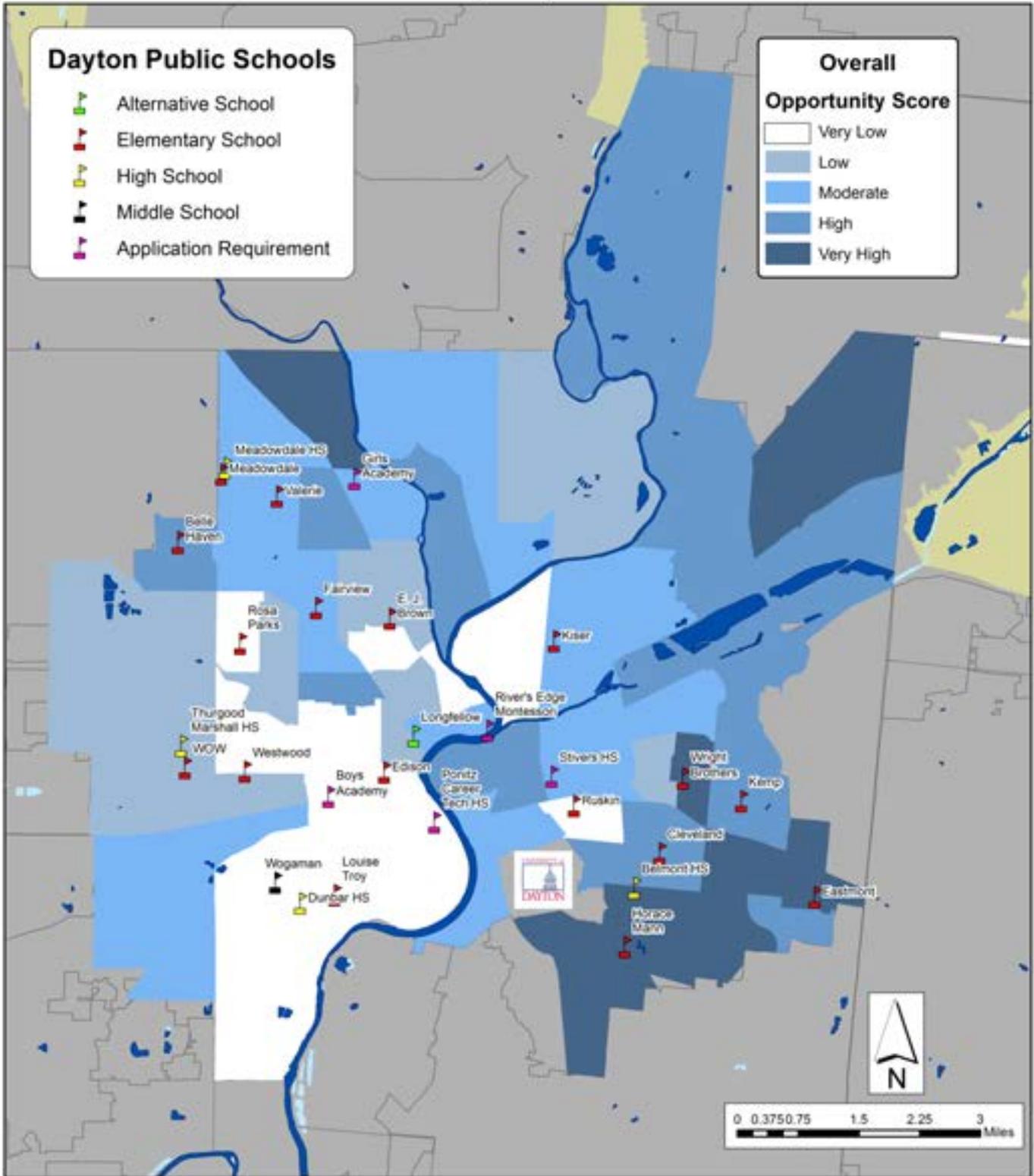
Sources: Ohio Department of Education, 2013-2014

# Overall Opportunity & Dayton Public Schools

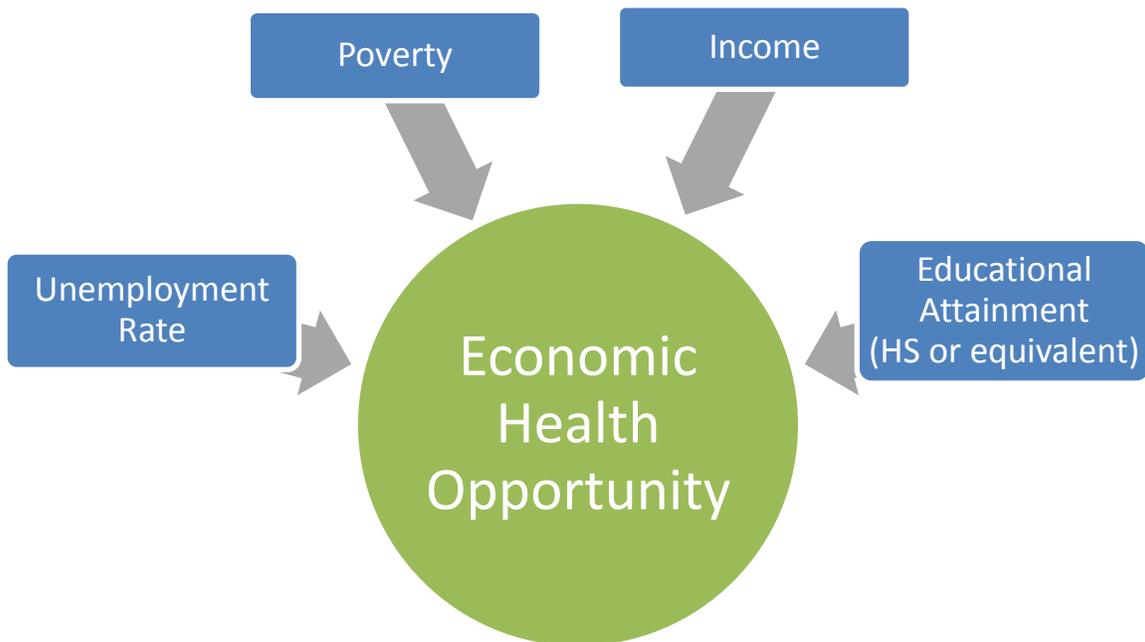
Dayton, Ohio



Dayton & Montgomery County

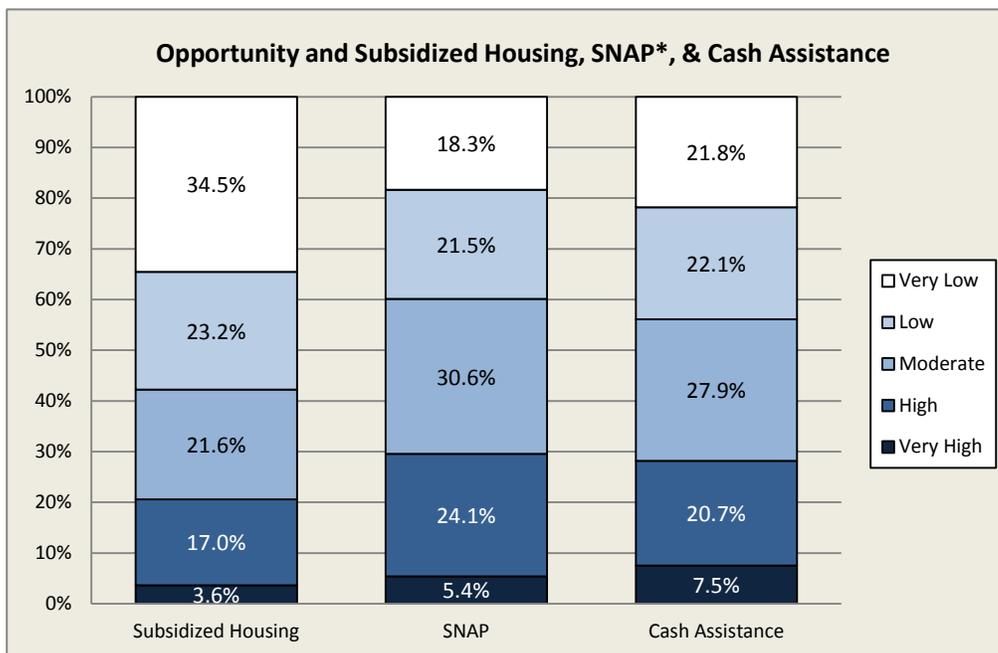
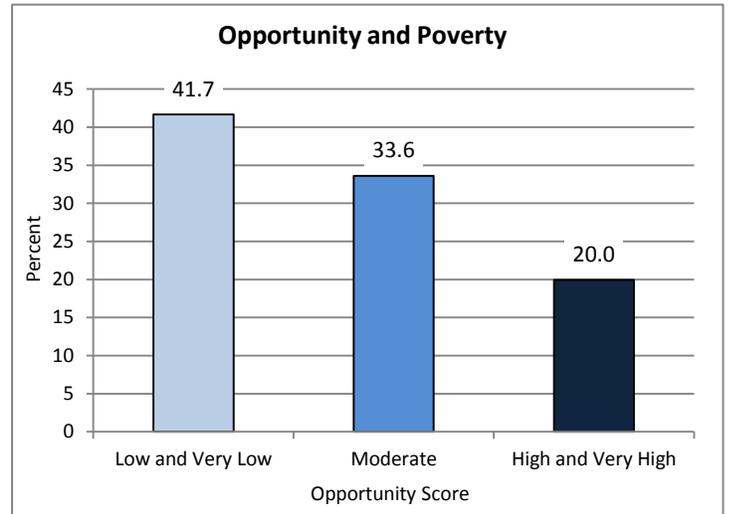
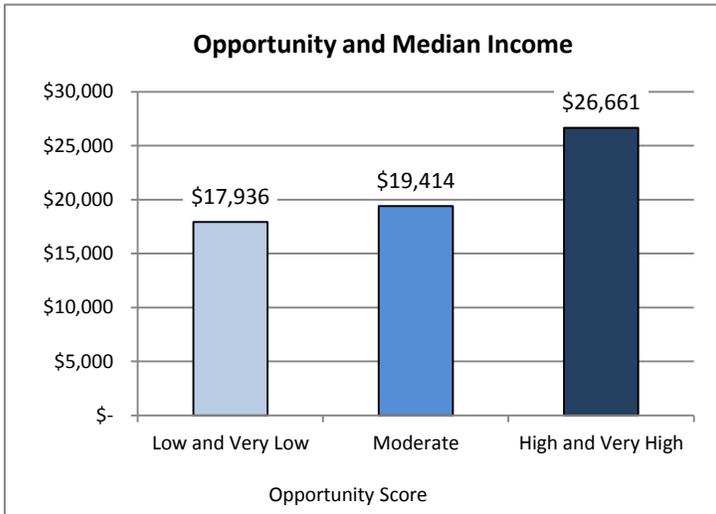


Sources: Ohio Department of Education, 2013-2014

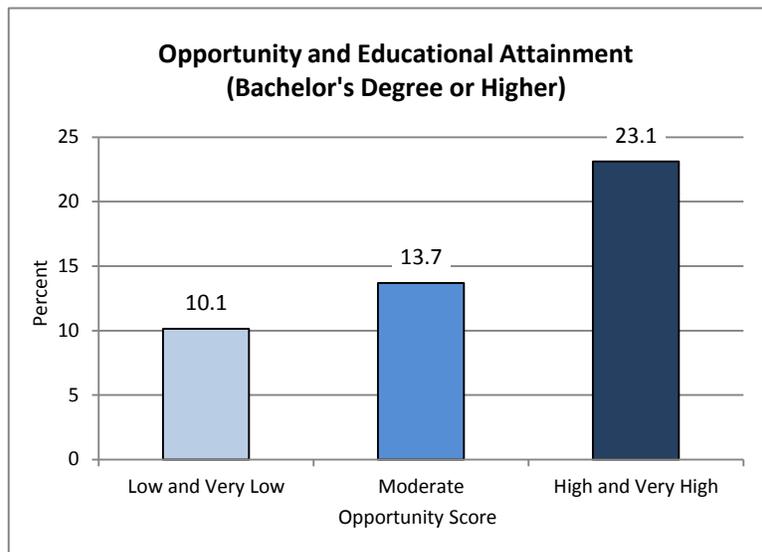
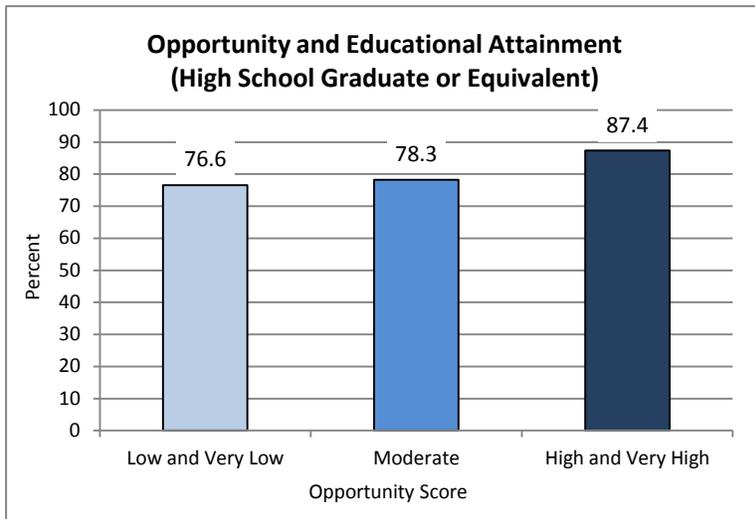


## How is Economic Health related to Opportunity?

- The median income in communities of high and very high opportunity is approximately \$8,700 more than in the low and very low opportunity communities.
- The percent of people living in poverty is twice as high in low and very low opportunity communities than it is in communities with high and very high opportunity.
- SNAP and cash assistance is received most by individuals in moderate opportunity communities.
- The majority of subsidized housing is located in low and very low opportunity communities.
- 12.4% more individuals received a high school diploma or equivalent and 128.7% more have attained a Bachelor's degree or higher in high and very high opportunity communities as compared to low and very low opportunity communities.



\* Supplemental Nutrition Assistance Program

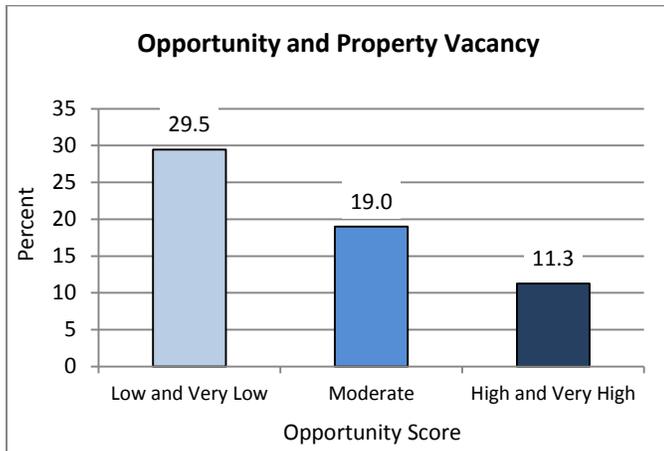






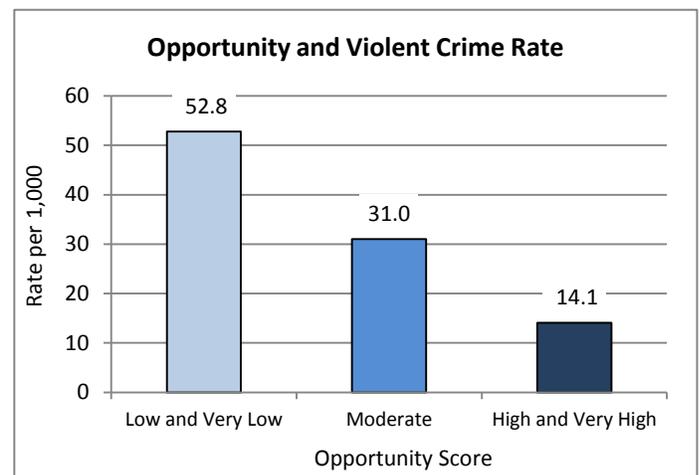
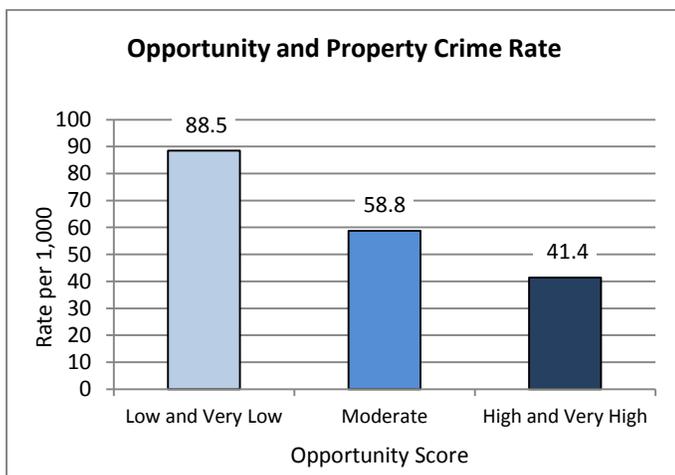
## How is Neighborhood and Housing Quality related to Opportunity?

- There is more than two and half times more vacant home in low and very low opportunity communities than in communities with high and very high opportunity.
- A food desert is defined as a low income census tract where a significant number of residents are more than one mile from the nearest supermarket. More than half of the food deserts in this area are in very low and low opportunity communities. Another 32% of food deserts are in moderate opportunity communities.
- The property crime rate is more than double and the violent crime rate is over three and a half times more in low and very low opportunity communities compared to high and very high opportunity communities.
- There are parks located in communities of all levels of opportunity, but the condition and the safety of these parks is unknown.



Opportunity and Food Deserts

Total Census Tracts (CT) - 59		
	# of CTs	Percent
<b>Food Desert CTs</b>	<b>19</b>	<b>32.2%</b>
Very Low	6	31.6%
Low	4	21.1%
Moderate	6	31.6%
High	2	10.5%
Very High	1	5.3%



### Property Crimes

- Arson
- Counterfeiting/Forgery
- Writing Bad Checks
- Extortion/Blackmail
- Bribery
- Breaking & Entering
- Vandalism/Destruction of Property
- Fraud
- Larceny/Theft
- Motor Vehicle Theft
- Stolen Property

### Violent Crimes

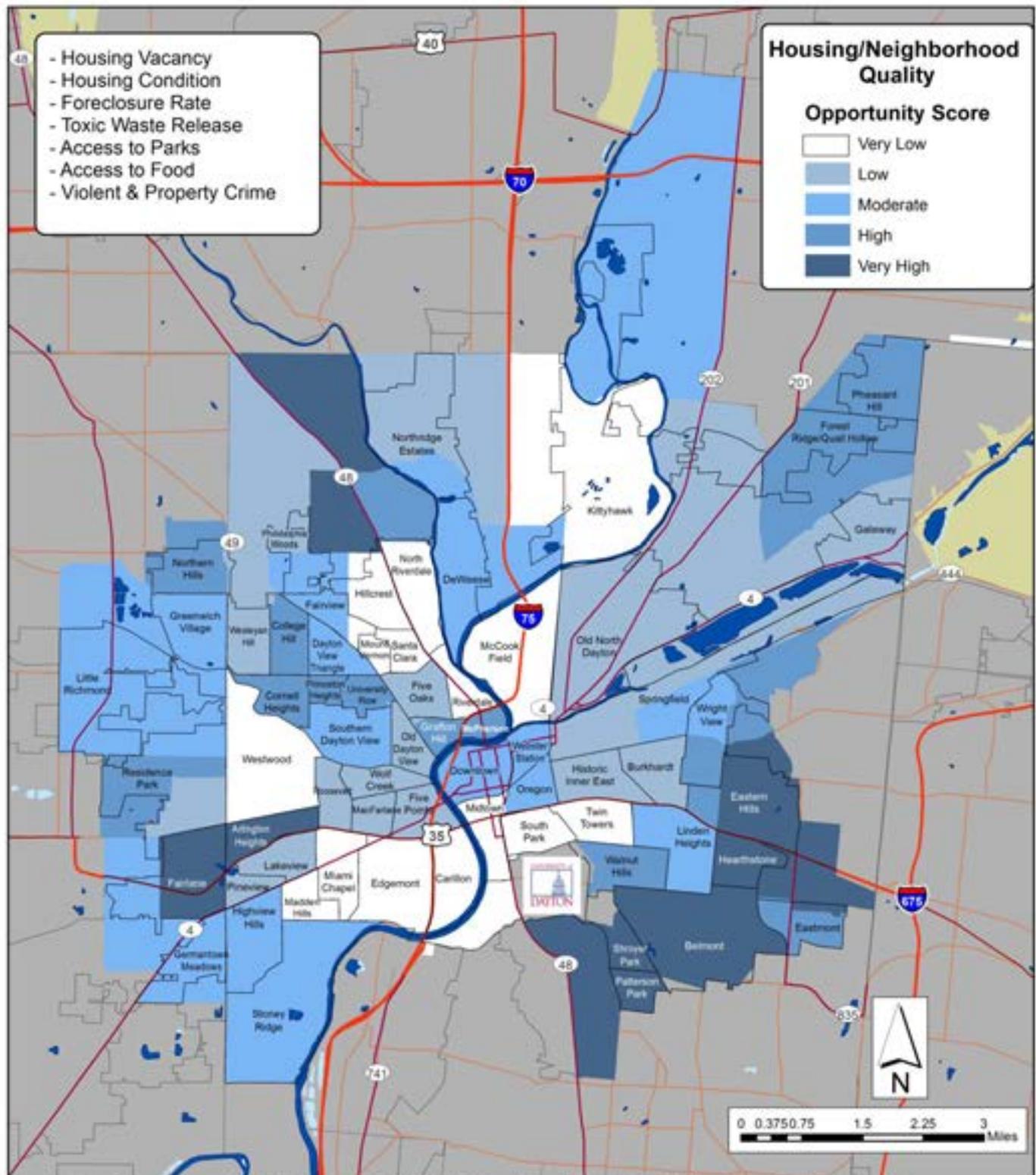
- Assault
- Homicide
- Kidnapping/Abduction
- Robbery
- Sex Offenses (Forcible/Non-forcible)

# Housing & Neighborhood Quality Opportunity

Dayton, Ohio



Dayton & Montgomery County

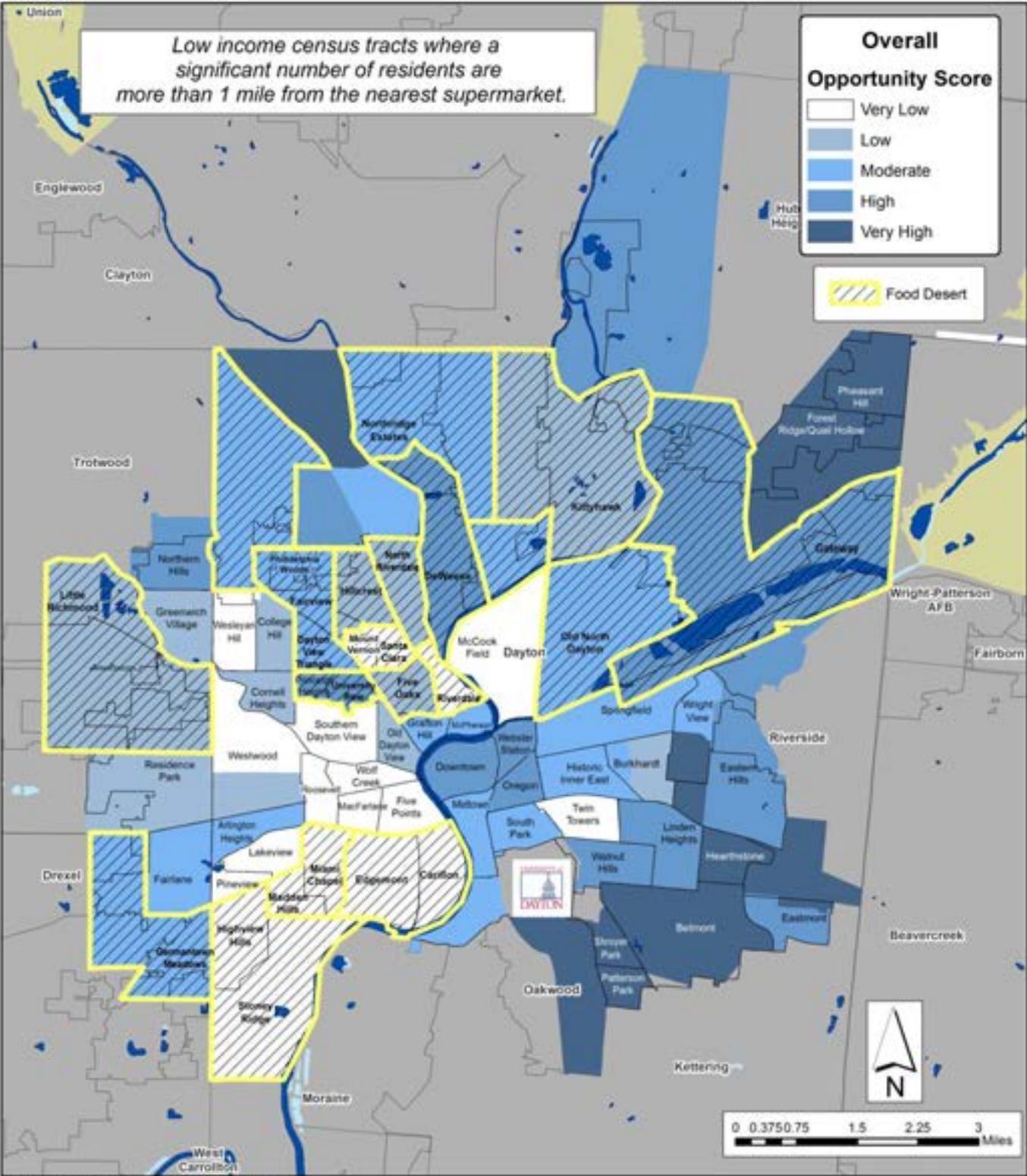


Sources: American Community Survey, 2009-2013; HUD User 2010; EPA, 2013; USDA Food Access Research Atlas, 2014; City of Dayton Police Department, 2014

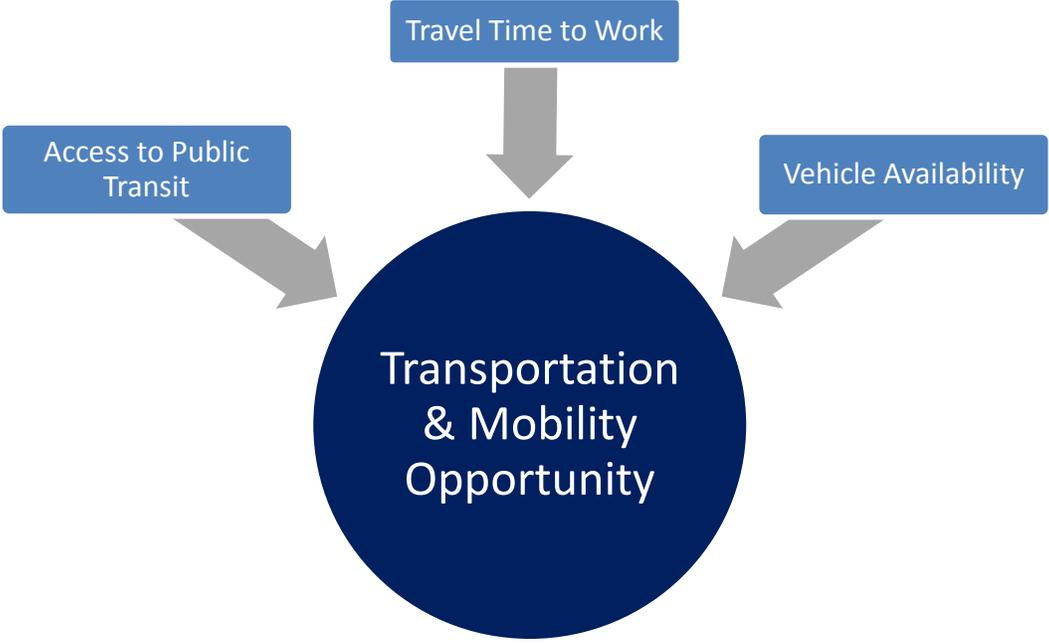


# Overall Opportunity & Food Deserts

Dayton, Ohio

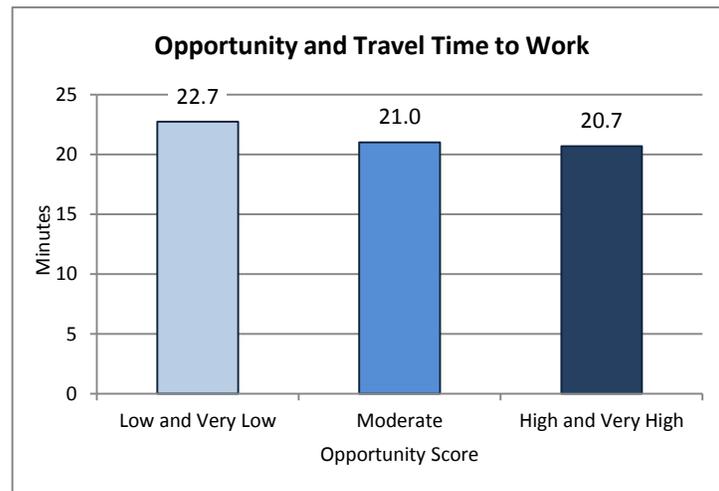
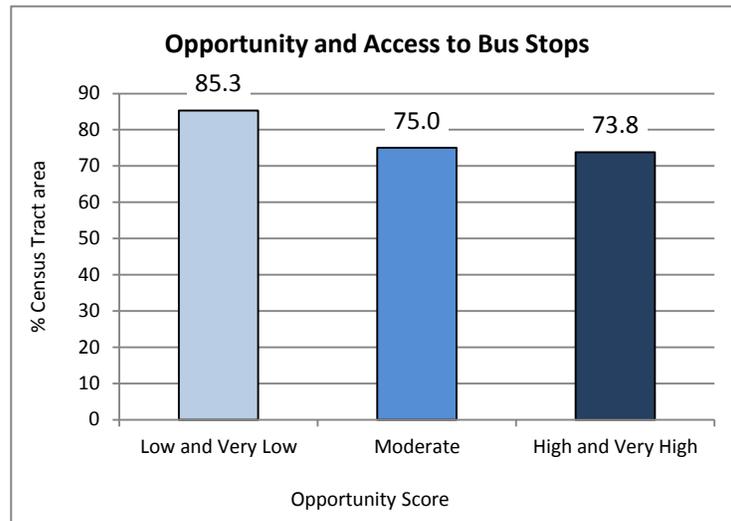
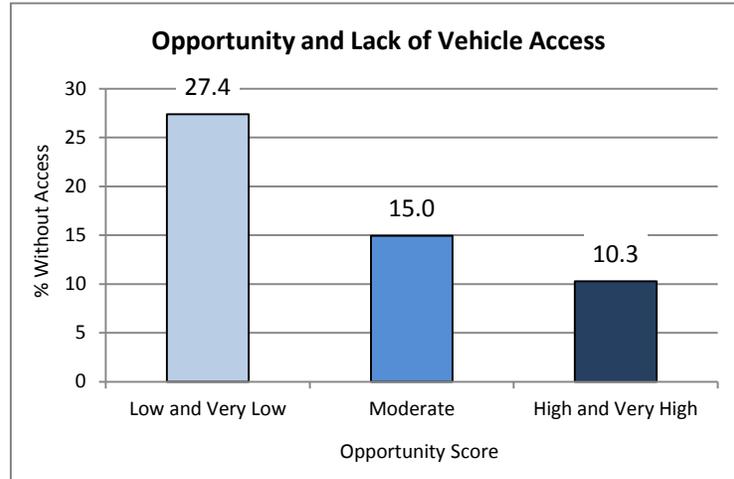


Source: Food Access Research Atlas, USDA, 2014



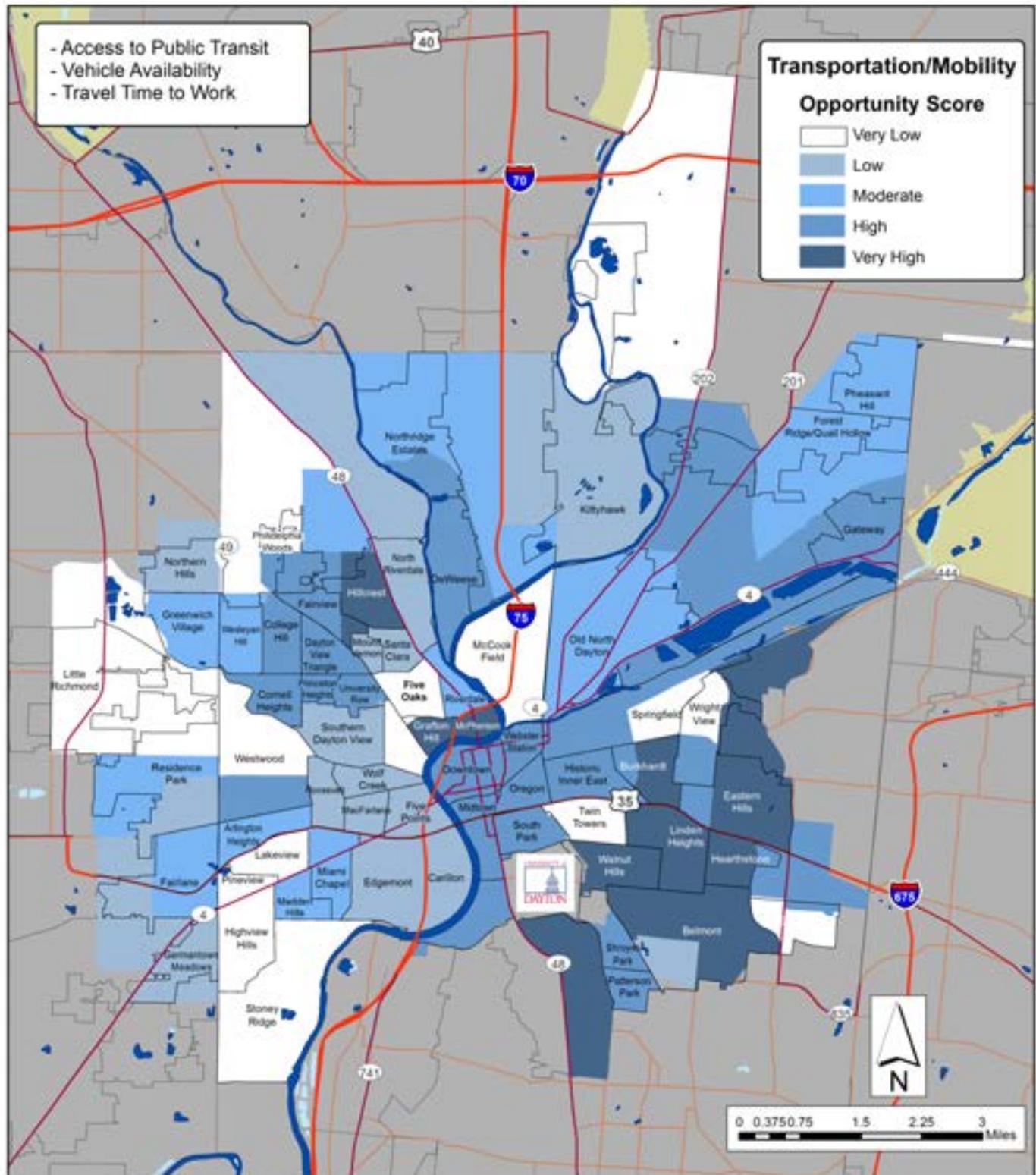
## How are Transportation and Mobility related to Opportunity?

- 27.4% of households in low and very low opportunity communities do not have a vehicle compared to 10.3% in high and very high opportunity communities.
- Compared to the higher opportunity communities, RTA bus stops are concentrated in low and very low opportunity communities than in high and very high opportunity communities.
- There is a difference of two additional minutes between the time it takes individuals to travel to work in low and very low opportunity communities than in high and very high opportunity communities.



# Transportation & Mobility Opportunity

Dayton, Ohio



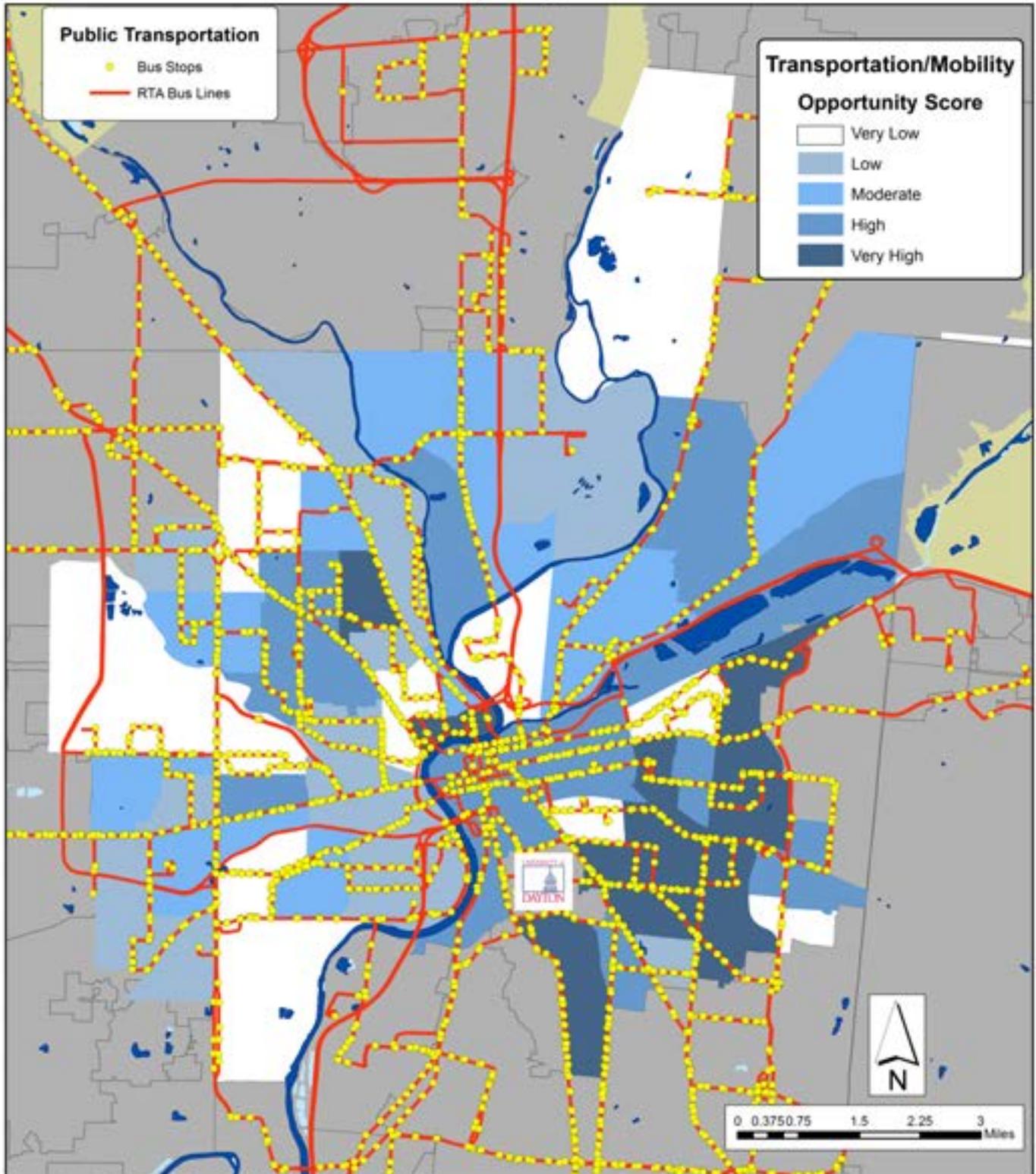
Sources: American Community Survey, 2009-2013; Greater Dayton RTA, 2015

# Transportation & Mobility & Public Transportation

Dayton, Ohio



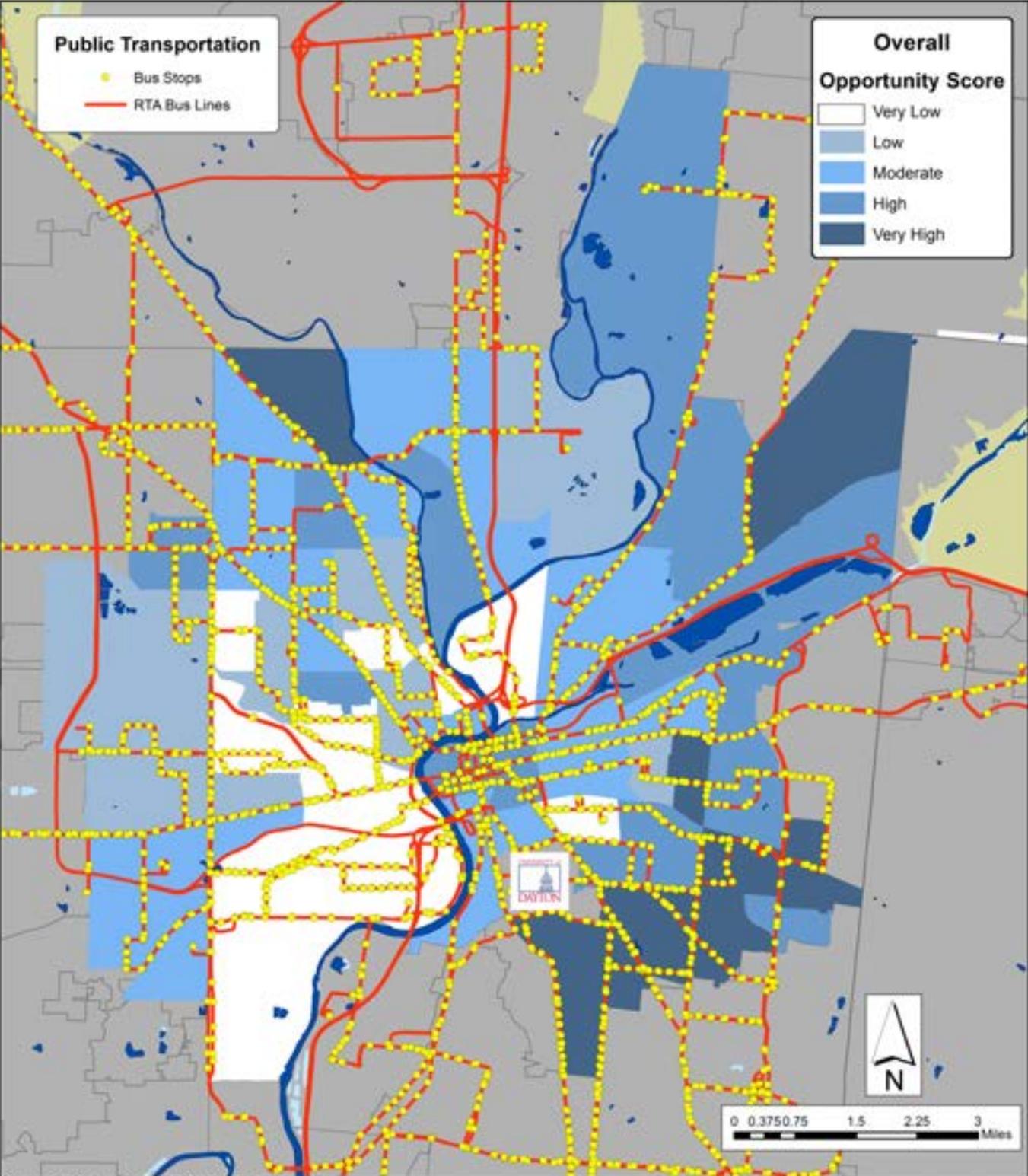
Dayton &  
Montgomery  
County



Sources: American Community Survey, 2009-2013; Greater Dayton RTA, 2015

# Overall Opportunity & Public Transportation

Dayton, Ohio



Source: Greater Dayton RTA, 2015

# **APPENDIX**

## HEALTH INDICATORS

### Low Birth Weight

Description: The percent of babies born with a low birth weight (< 2500g)

Data Source: Ohio Department of Health, Birth Certificate Data

Date: 2010 - 2012

### Teen Pregnancy

Description: The percent of babies born to women 15 to 17 years of age

Data Source: Ohio Department of Health, Birth Certificate Data

Date: 2010 - 2012

### Infant Mortality Rate

Description: The number of infant deaths (less than 1 year of age) for every 1,000 live births

Data Source: Ohio Department of Health, Birth Certificate and Death Certificate Data

Date: 2010 - 2012

### Health Insurance Coverage

Description: The percentage of the civilian noninstitutionalized population without health insurance coverage

Data Source: American Community Survey, U.S. Census

Date: 2009-2013 5-year estimates

### Cancer Mortality Rate

Description: The age-adjusted cancer mortality rate

Data Source: Ohio Department of Health, Death Certificate Data

Date: 2008 - 2012

### Heart Disease Mortality Rate

Description: The age-adjusted heart disease mortality rate

Data Source: Ohio Department of Health, Death Certificate Data

Date: 2008 - 2012

### Life Expectancy

Description: The number of years that a person is expected to live from birth

Data Source: Ohio Department of Health, Death and Birth Certificate Data

Date: 2008 - 2012

## EDUCATION INDICATORS

*Indicators related to high school performance were not included due to the fact that a student can select the high school they would like to attend regardless of a school's proximity to their home.*

### School Reading Proficiency

Description: The percent of 3<sup>rd</sup> graders who passed the reading section of the state test

Source: Ohio Department of Education, Ohio School Report Cards

Date: 2013 - 2014 School Year

Methodology: Each tract was assigned the average of the percentage of 3<sup>rd</sup> graders who passed the reading section of the state test of the three elementary schools nearest the tract centroid. This process also considered the quadrant in which the tract resides.

### School Math Proficiency

Description: The percent of 4<sup>th</sup> graders who passed the mathematics section of the state test

Data Source: Ohio Department of Education, Ohio School Report Cards

Date: 2013 - 2014 School Year

Methodology: Each tract was assigned the average of the percentage of 4<sup>th</sup> graders who passed the reading section of the state test of the three elementary schools nearest the tract centroid. This process also considered the quadrant in which the tract resides.

### Teacher Qualifications

Description: The percent of teachers who have obtained a Master's degree or more

Data Source: Ohio Department of Education, Ohio School Report Cards

Date: 2013 - 2014 School Year

Methodology: Each tract was assigned average percentage based on the teacher qualifications of the three elementary schools nearest the tract centroid. This process also considered the quadrant in which the tract resides.

### Attendance Rate

Description: The percent of elementary school students that attended school

Data Source: Ohio Department of Education, Ohio School Report Cards

Date: 2013 - 2014 School Year

Methodology: Each tract was assigned average rate based on the attendance records of the three elementary nearest the tract centroid. This process also considered the quadrant in which the tract resides.

## **ECONOMIC HEALTH INDICATORS**

### Unemployment Rate

Description: The percentage of the civilian labor force who are unemployed

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

### Poverty

Description: Percent of people whose income in the past 12 months is below the poverty level

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

### Income

Description: Median earnings for workers (in 2013 inflation-adjusted dollars)

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

### Educational Attainment

Description: The percent of population 25 and over that have attained at least a high school diploma (or equivalent)

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

## HOUSING AND NEIGHBORHOOD QUALITY INDICATORS

### Housing Vacancy

Description: The percent of all housing units which are vacant

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

### Foreclosure Rate

Description: The estimated percent of mortgages to start foreclosure process or be seriously delinquent in the past 2 years

Data Source: HUD User

Date: 2010 Second Quarter

### Housing Condition

Description: The percentage of housing units lacking complete plumbing facilities

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

### Toxic Waste Release

Description: Pounds of toxic release emitted from toxic waste sites

Data Source: Environmental Protection Agency (EPA)

Date: 2014

Methodology: Each tract was given a value based on the pounds of toxic release emitted from toxic waste sites that were within a 2 mile buffer zone

### Proximity to Parks

Description: Distance to the nearest park

Data Source: Environmental Protection Agency (EPA)

Date: 2013

Methodology: Each tract was given a value based on the distance between the tract's centroid and the nearest park

### Access to Food

Description: Low income census tracts where a significant number of residents are more than 1 mile from the nearest supermarket

Data Source: Food Access Research Atlas, USDA

Date: 2014

### Violent Crime Rate

Description: The number of violent crimes committed per 1,000 people

Data Source: City of Dayton Police Department

Date: 2014

### Property Crime Rate

Description: The number of property crimes committed per 1,000 people

Data Source: City of Dayton Police Department

Date: 2014

## **TRANSPORTATION AND MOBILITY INDICATORS**

### **Access to Public Transit**

Description: The percentage of the total area that is within ¼ miles of a RTA bus stop

Data Source: Greater Dayton RTA

Date: 2015

Methodology: Each tract was assigned a value based on the percentage of the tract's total area that is within a 0.25 mile buffer of a RTA bus stop

### **Travel Time to Work**

Description: Mean travel time to work (minutes) among workers 16 years and over

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

### **Vehicle Availability**

Description: The percentage of housing units without access to a vehicle

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

## **ADDITIONAL DATA**

### **Dayton Neighborhoods**

Description: Neighborhoods within the city of Dayton.

Data Source: The neighborhood shapefile was created based on maps from the City of Dayton, Department of Planning and Community Development and the City of Dayton Police Department.

Date: 2015

### **Subsidized Housing**

Description: The number of housing vouchers and public housing units

Data Source: HUD USER

Date: 2013

### **Population Count**

Description: The number of individuals by race and ethnicity

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

### **Food Stamp/SNAP**

Description: The percent of individuals receiving SNAP benefits in the past 12 months

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

### **Cash Public Assistance**

Description: The percent of individuals receiving cash public assistance income

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

### **Bachelor's Degree or higher**

Description: The percent of population 25 and over that have attained a Bachelor's degree or higher

Data Source: American Community Survey

Date: 2009-2013 5-year estimates

## METHODOLOGY

### Calculating Opportunity Scores

Data related to the five categories (health, education, economic health, housing and neighborhood quality, and transportation and mobility) were collected and analyzed by the census tracts in the Dayton, Ohio area. The census tract level data for an indicator was then standardized through the use of “z-scores.” A z-score is a statistical measure that quantifies the distance (measured in standard deviations) a data point is from the mean (or average) of a data set. A positive z-score indicates that the data is above the mean while a negative z-score indicates the data falls below the mean. A z-score of zero would indicate that the data is equal to the mean.

An opportunity score for each category can be obtained by averaging the z-scores of each indicator. A final overall opportunity score for each census tract is based on the average z-score for all the indicators in all five categories. A level of opportunity (very low, low, moderate, high, and very high) is assigned to each census tract by sorting the opportunity scores into quintiles. Census tracts that have very high opportunity represent the top 20% of scores, and the very low opportunity census tracts represent the lowest 20% of scores.

### Calculating z-scores

In order to calculate a z-score, you must first determine the average and standard deviation of your data. In the example below, the average cancer mortality rate is 219.7 with a standard deviation of 26.3. The z-score is calculated using the formula:

$$\text{z-score} = \frac{\text{Raw score} - \text{Average}}{\text{Standard deviation}}$$

In the case of negative indicators, just as cancer mortality, the final z-score must be multiplied by “-1” so that all indicators are compatible.

Census Tract	Cancer Mortality Rate	z-score	Final z-score (multiply by -1)
1	167.5	-1.9856555	1.98565551
2	228.1	0.3182067	-0.31820671
3	193.0	-1.0162085	1.016208535
4	208.8	-0.4155316	0.415531586
5	251.3	1.2002134	-1.20021337
6	236.9	0.6527610	-0.65276096
7	215.4	-0.1646159	0.164615898
8.01	233.1	0.5082944	-0.50829436
8.02	211.3	-0.3204878	0.320487765
9	251.9	1.2230239	-1.22302389

No weight was applied to the various indicators; all indicators were treated as equal in importance.