Opportunity Mapping

The Geography of Opportunity
Dayton, Ohio

February 2015
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 the 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

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

Rate per 1,000 live births

- Low and Very Low: 15.3
- Moderate: 5.4
- High and Very High: 7.5

Opportunity and Low Birth Weight

Percent of all births

- Low and Very Low: 14.6
- Moderate: 11.4
- High and Very High: 8.6

Opportunity and Teen Births

Percent of all births

- Low and Very Low: 5.9
- Moderate: 4.5
- High and Very High: 2.6
Health Opportunity

Dayton, Ohio

- Low Birth Weight
- Teen Pregnancy
- Infant Mortality Rate
- Health Insurance Coverage
- Cancer Mortality Rate
- Heart Disease Mortality Rate
- Life Expectancy

Health Opportunity Score
- Very Low
- Low
- Moderate
- High
- Very High

Sources: Ohio Department of Health Birth and Death Certificates, 2008-2012; American Community Survey, 2009-2013
Education Opportunity

- Math Proficiency (4th grade)
- Teacher Qualifications (Master's degree)
- Reading Proficiency (3rd grade)
- Elementary School Attendance
**How is Education related to Opportunity?**

- In low and very low opportunity communities, 50% of 3rd 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 4th 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 4th 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.
**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
Opportunity and Educational Attainment
(High School Graduate or Equivalent)

<table>
<thead>
<tr>
<th>Opportunity Score</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low and Very Low</td>
<td>76.6</td>
</tr>
<tr>
<td>Moderate</td>
<td>78.3</td>
</tr>
<tr>
<td>High and Very High</td>
<td>87.4</td>
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</table>

Opportunity and Educational Attainment
(Bachelor's Degree or Higher)

<table>
<thead>
<tr>
<th>Opportunity Score</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low and Very Low</td>
<td>10.1</td>
</tr>
<tr>
<td>Moderate</td>
<td>13.7</td>
</tr>
<tr>
<td>High and Very High</td>
<td>23.1</td>
</tr>
</tbody>
</table>
Housing & Neighborhood Quality Opportunity

- Housing Vacancy
- Foreclosures
- Housing Condition
- Toxic Waste Release
- Proximity to Parks
- Access to Food
- Crime Rates (property and violent)
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

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

### Opportunity and Property Vacancy

<table>
<thead>
<tr>
<th>Opportunity Score</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low and Very Low</td>
<td>29.5</td>
</tr>
<tr>
<td>Moderate</td>
<td>19.0</td>
</tr>
<tr>
<td>High and Very High</td>
<td>11.3</td>
</tr>
</tbody>
</table>

### Opportunity and Property Crime Rate

<table>
<thead>
<tr>
<th>Opportunity Score</th>
<th>Rate per 1,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low and Very Low</td>
<td>88.5</td>
</tr>
<tr>
<td>Moderate</td>
<td>58.8</td>
</tr>
<tr>
<td>High and Very High</td>
<td>41.4</td>
</tr>
</tbody>
</table>

### Opportunity and Violent Crime Rate

<table>
<thead>
<tr>
<th>Opportunity Score</th>
<th>Rate per 1,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low and Very Low</td>
<td>52.8</td>
</tr>
<tr>
<td>Moderate</td>
<td>31.0</td>
</tr>
<tr>
<td>High and Very High</td>
<td>14.1</td>
</tr>
</tbody>
</table>

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)
Overall Opportunity & Food Deserts

Dayton, Ohio

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

Overall Opportunity Score
- Very Low
- Low
- Moderate
- High
- Very High

Food Desert

Transportation & Mobility Opportunity

- Access to Public Transit
- Travel Time to Work
- Vehicle Availability
**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.
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 3rd 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 3rd 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 4th 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 4th 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 schools 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.

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

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