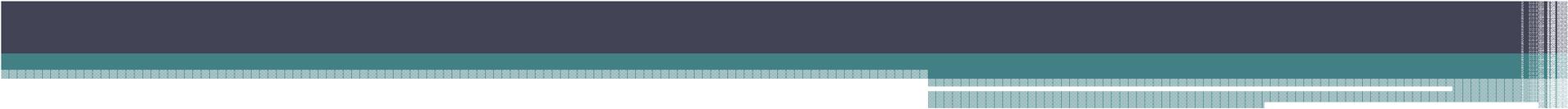


# Opportunity Mapping

An Objective Approach for  
Identifying Communities of  
Opportunity.



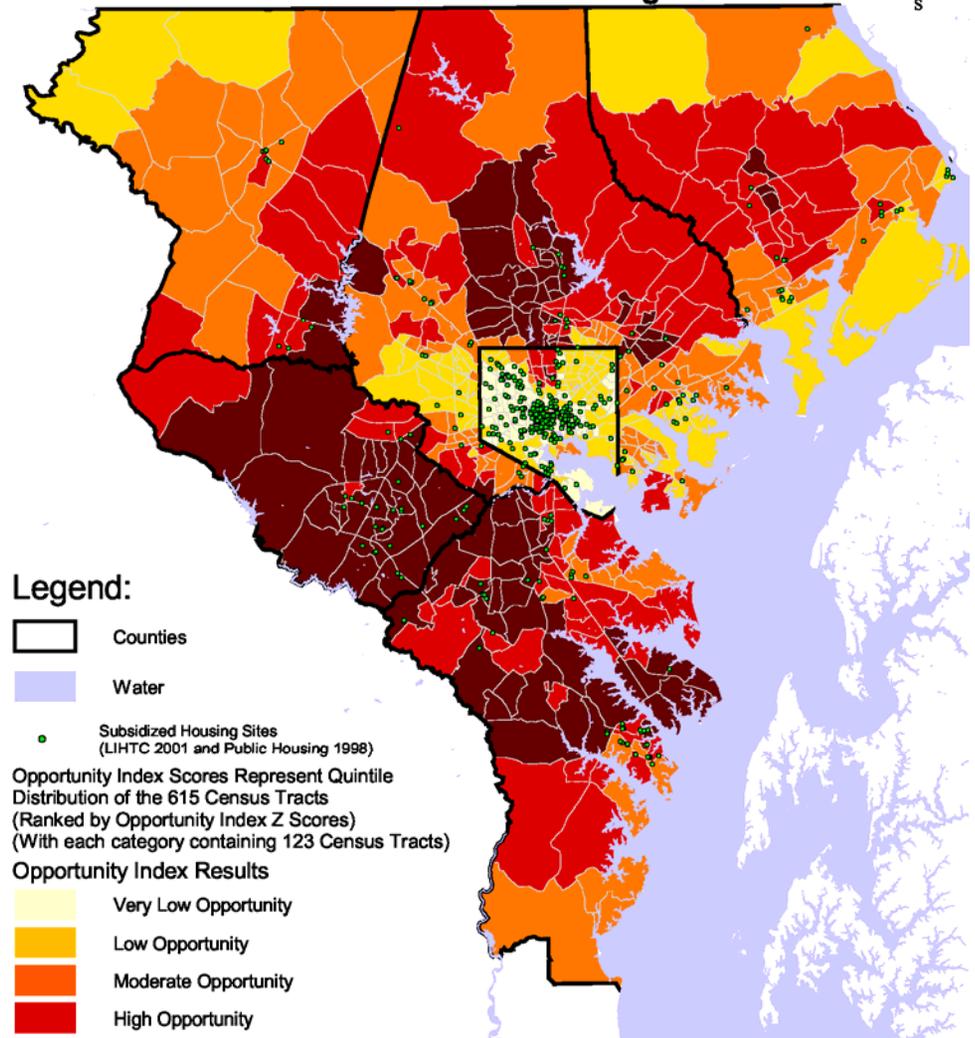
# Introduction

- Location appears to play a substantive role in the well-being and long-term life outcomes of individuals.
- Government agencies, and the social science community have begun to emphasize *place* as a significant indicator of income inequality, racial segregation, and relative potential for upward mobility.

# Introduction

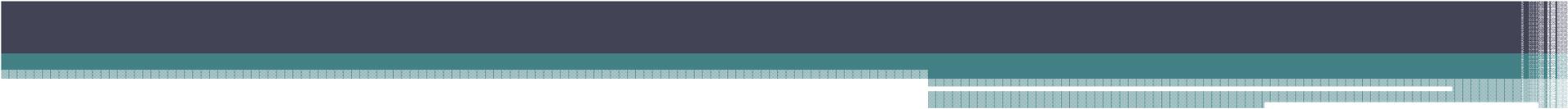
- The Opportunity Mapping model popularized by John Powell of the Kirwan Institute for the Study of Race and Ethnicity is recognized as the standard technique for identifying Communities of Opportunity.

**Map 14: Comprehensive Opportunity Index for the Baltimore Region Overlaid with Subsidized Housing**



Prepared by: Kirwan Institute for the Study of Race & Ethnicity  
Date Prepared: 06.29.2005  
Sources of Data: Opportunity Analysis (See Maps 9-12 and Appendix A).

5 0 5 10 Miles



# Introduction

- However, an examination of Powell's work, and the current state of practice of Opportunity Mapping suggests a high propensity for subjectivity with respect to model development and subsequent feedback.
- The following outlines objective approaches for Opportunity Mapping to improve the results of these models.

# State of Practice

An Evaluation of the Current  
Methods and Techniques for  
Modeling Communities of  
Opportunity

# Standard Approach

- Opportunity indicators are chosen, separated into groups, and scored relative to each neighborhood in the study area.

Group	Indicator & Score	
Economic Opportunity & Mobility	Number of estimated entry level and low skill employment	X
	Ratio of entry level and low skill employment opportunities per 1,000 residents	X
	Absolute change in employment from 1998 to 2002	X
	Access to Public Transit	X
	Median commute time	X
Neighborhood Health	Population change from 1990 to 2000	X
	Estimated crime rates in 2000	X
	Poverty rates for the general population in 2000	X
	Vacant property rates in 2000	X
	Median household value in 2000	X
Educational Opportunities	Proportion of FARM students of elementary and middle school	X
	Proportion of classes not taught by highly qualified teachers in 2004	X
	Proportion of elementary students proficient in reading	X
	Proportion of elementary students proficient in math	X

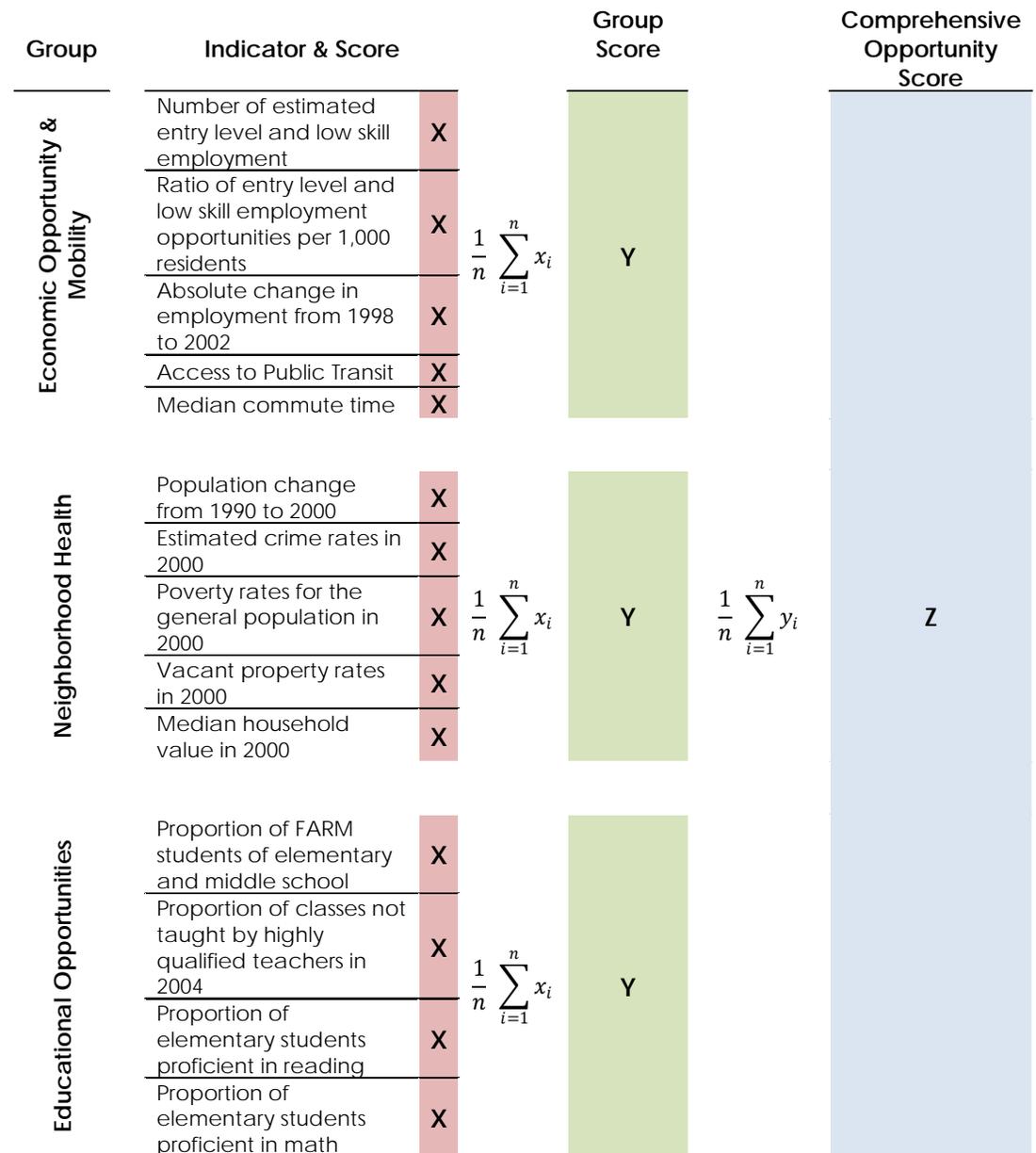
# Standard Approach

- Opportunity indicators are chosen, separated into groups, and scored relative to each neighborhood in the study area.
- Indicator scores for each neighborhood are averaged according to their respective group.

Group	Indicator & Score	Group Score
Economic Opportunity & Mobility	Number of estimated entry level and low skill employment <b>X</b>	$\frac{1}{n} \sum_{i=1}^n x_i$ <b>Y</b>
	Ratio of entry level and low skill employment opportunities per 1,000 residents <b>X</b>	
	Absolute change in employment from 1998 to 2002 <b>X</b>	
	Access to Public Transit <b>X</b>	
	Median commute time <b>X</b>	
Neighborhood Health	Population change from 1990 to 2000 <b>X</b>	$\frac{1}{n} \sum_{i=1}^n x_i$ <b>Y</b>
	Estimated crime rates in 2000 <b>X</b>	
	Poverty rates for the general population in 2000 <b>X</b>	
	Vacant property rates in 2000 <b>X</b>	
	Median household value in 2000 <b>X</b>	
Educational Opportunities	Proportion of FARM students of elementary and middle school <b>X</b>	$\frac{1}{n} \sum_{i=1}^n x_i$ <b>Y</b>
	Proportion of classes not taught by highly qualified teachers in 2004 <b>X</b>	
	Proportion of elementary students proficient in reading <b>X</b>	
	Proportion of elementary students proficient in math <b>X</b>	

# Standard Approach

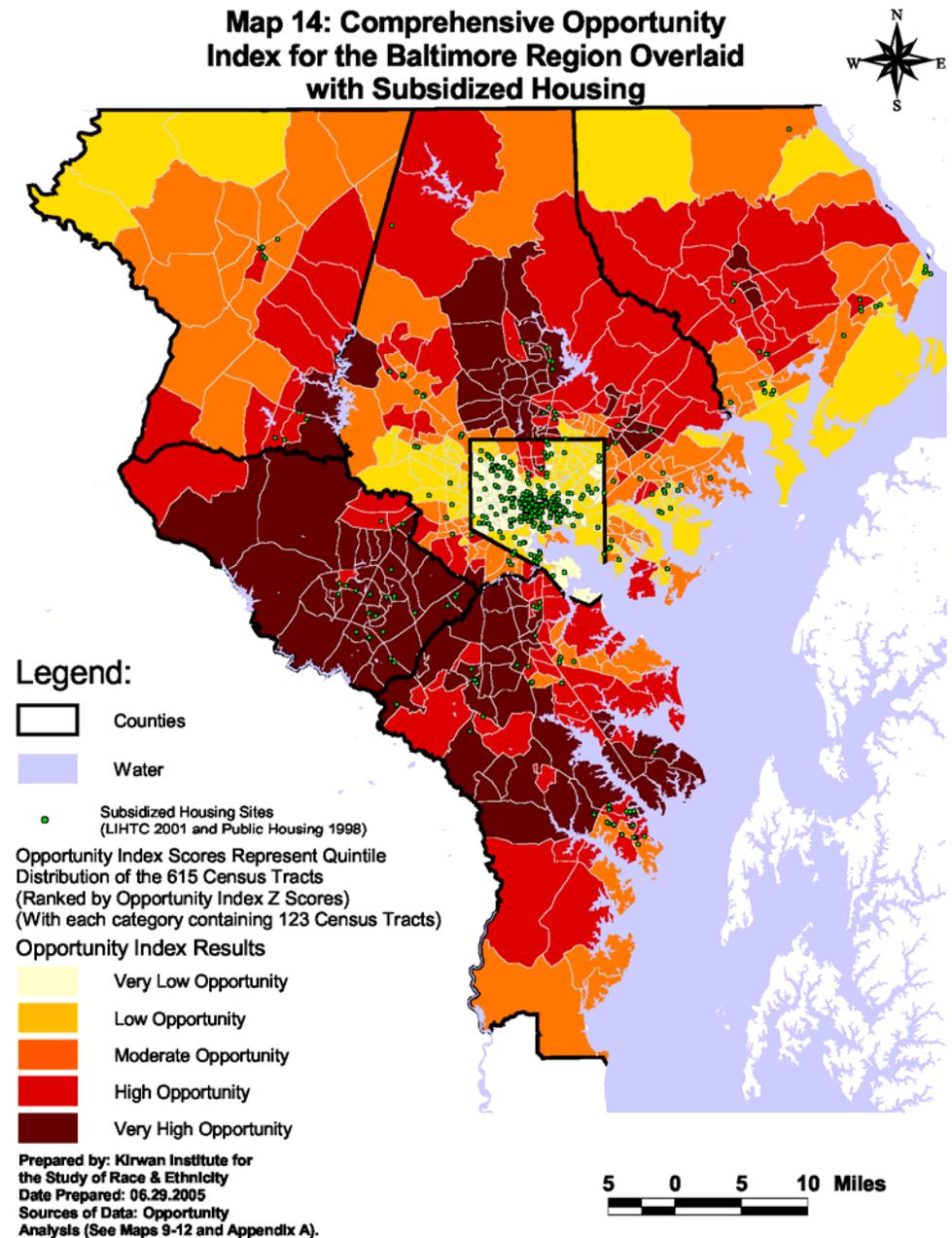
- Opportunity indicators are chosen, separated into groups, and scored relative to each neighborhood in the study area.
- Indicator scores for each neighborhood are averaged according to their respective group.
- Group scores for each neighborhood are averaged together to create a comprehensive opportunity score for each neighborhood.



# Standard Approach

- Neighborhood scores are evaluated, and classified.
- Neighborhoods (typically census tracts) are then mapped according to their corresponding opportunity scores.
- Additional data can be overlaid to evaluate the efficacy of programs and policies.

**Map 14: Comprehensive Opportunity Index for the Baltimore Region Overlaid with Subsidized Housing**

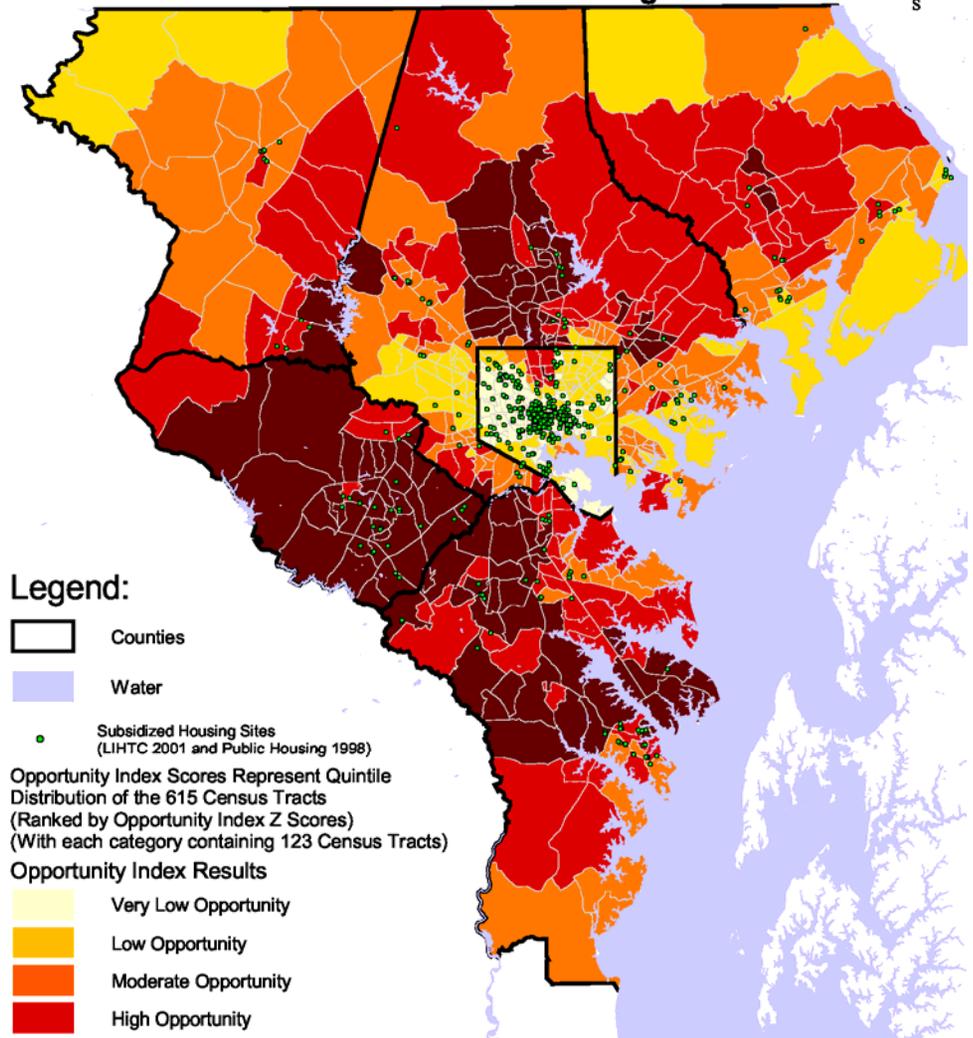


# Technical Shortcomings

## Arbitrary selection of opportunity indicators

- Selected indicators are typically chosen through stakeholder consensus, and not necessarily for proven causality.
- Resulting scores and maps serve more as a measure of community values, and reveal little regarding opportunity for upward mobility.

**Map 14: Comprehensive Opportunity Index for the Baltimore Region Overlaid with Subsidized Housing**



Prepared by: Kirwan Institute for the Study of Race & Ethnicity  
Date Prepared: 06.29.2005  
Sources of Data: Opportunity Analysis (See Maps 9-12 and Appendix A).

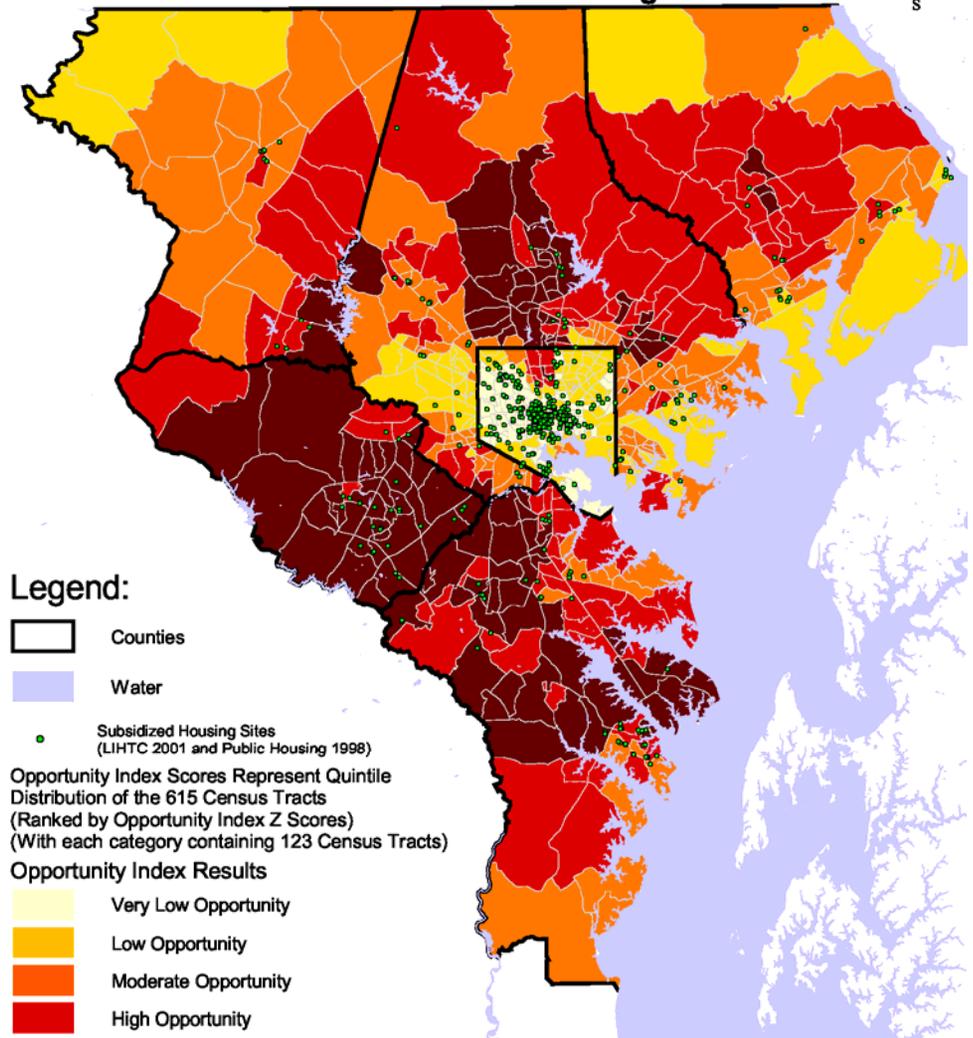
5 0 5 10 Miles

# Technical Shortcomings

## Arbitrary grouping of opportunity indicators

- Indicator groups are usually created capriciously.
- Subjective allocation of indicators among groups.

**Map 14: Comprehensive Opportunity Index for the Baltimore Region Overlaid with Subsidized Housing**



Prepared by: Kirwan Institute for the Study of Race & Ethnicity  
Date Prepared: 06.29.2005  
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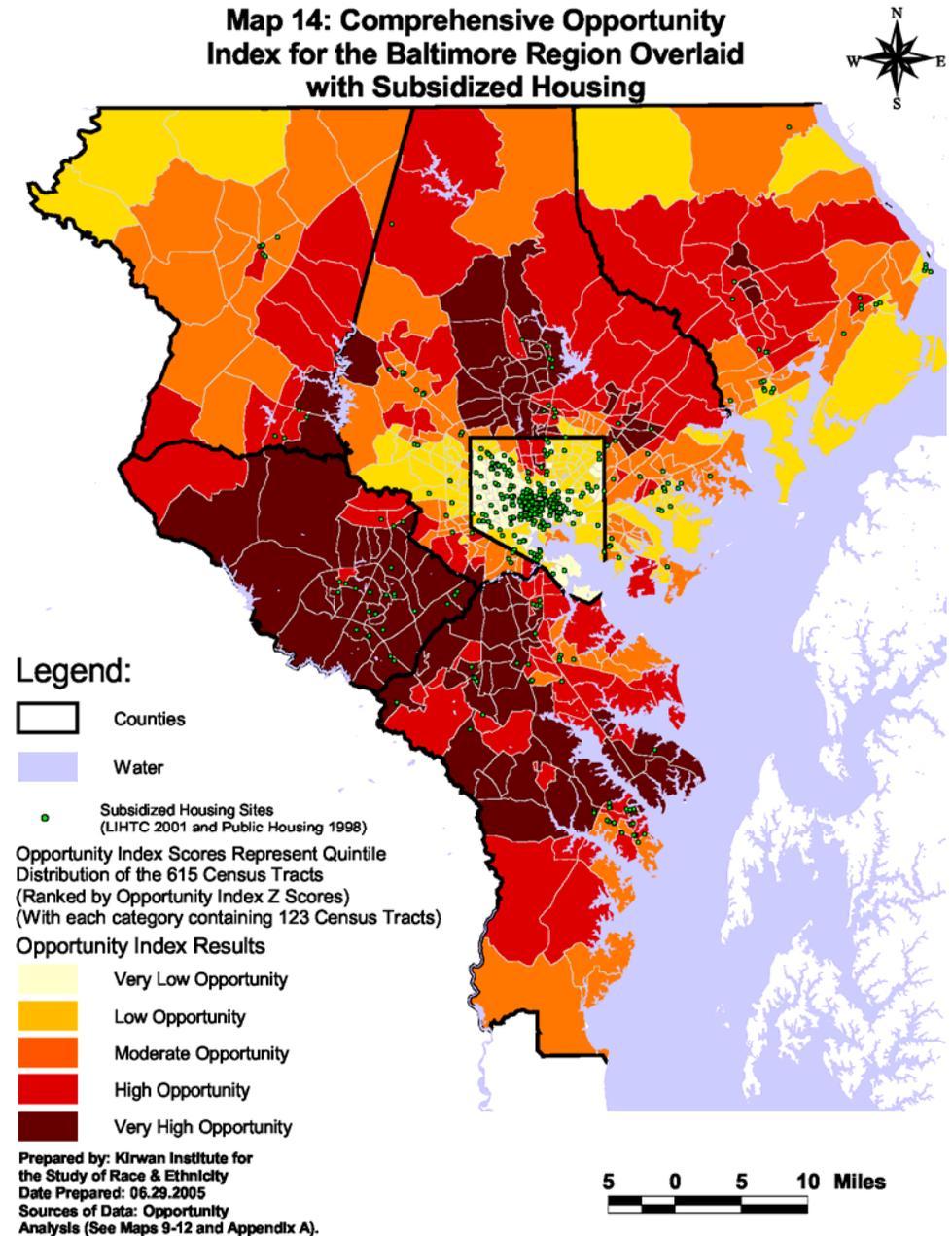
5 0 5 10 Miles

# Technical Shortcomings

## Equal weighting of indicators

- Indicators are typically given no weight relative to their impact on long-term life outcomes, or upward mobility.
- Allows the size of composite groups to dictate the impact of particular indicators on the final opportunity index score.

**Map 14: Comprehensive Opportunity Index for the Baltimore Region Overlaid with Subsidized Housing**

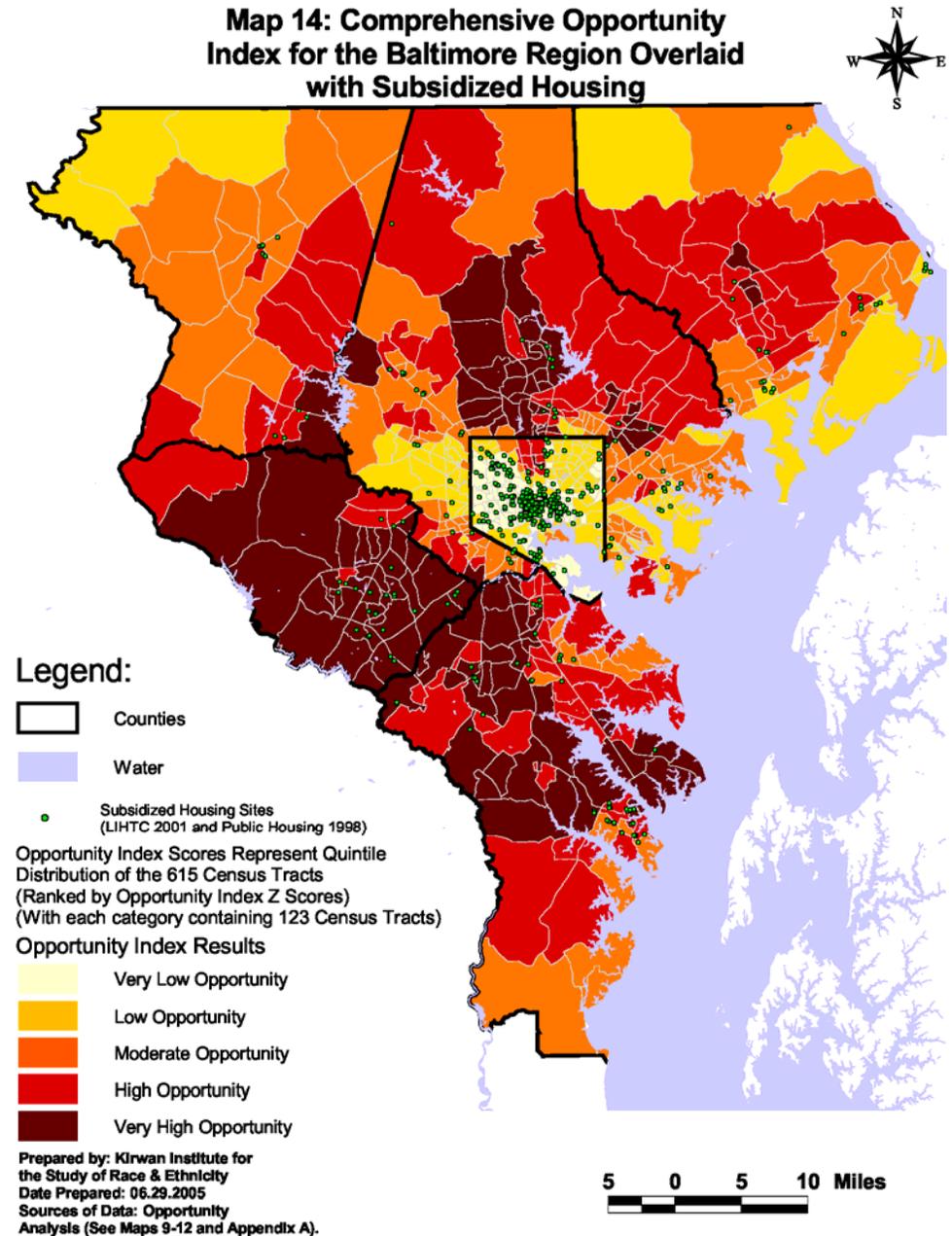


# Technical Shortcomings

## Subjective interpretation of scores

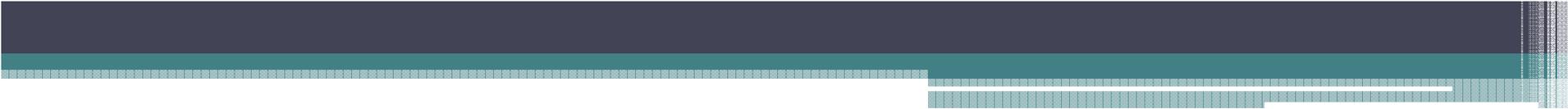
- Classification of neighborhoods typically entail the use of Z Scores – a statistical measure of a value relative to the mean of all regional index scores.
- No standard for ordinal classification of “High,” and “Low” opportunity.

**Map 14: Comprehensive Opportunity Index for the Baltimore Region Overlaid with Subsidized Housing**



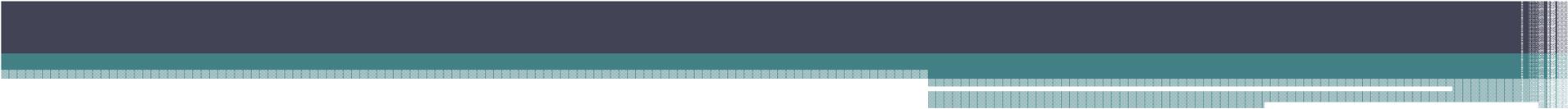
# Choosing Indicators

Variables Proven to Have  
Causal Effects on Upward  
Mobility and Long-Term Life  
Outcomes of Individuals



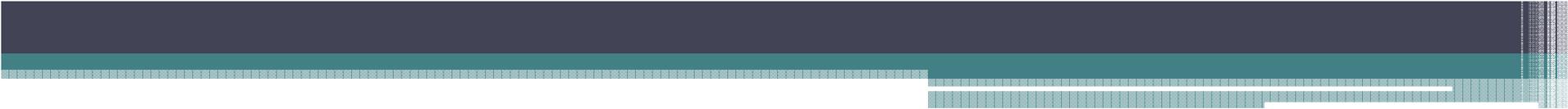
## So many variables, where to start?

- We recommend an opportunity index that includes, to the extent feasible, variables that are shown to have a **causal impact** on individual opportunity.



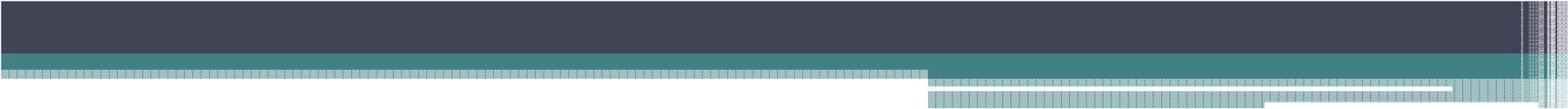
## Social science research offers three causal factors for opportunity

- Low poverty rate
- School quality
- Infrequent violent crime



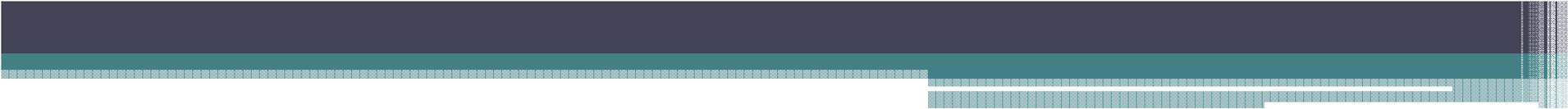
# Evidence for causal impact of poverty

- Moving to Opportunity randomized demonstration
- Conducted among 4,600 VLI families with children in high-poverty public housing
- Exposure to low poverty neighborhoods reduced obesity, depression, diabetes in adult women
- It reduced depression, oppositional-defiant behavior, and mood disorders in young women.
- Among children LT 13 y.o. at moving, it increased earnings, employment, college attendance; reduced out of wedlock childbearing.



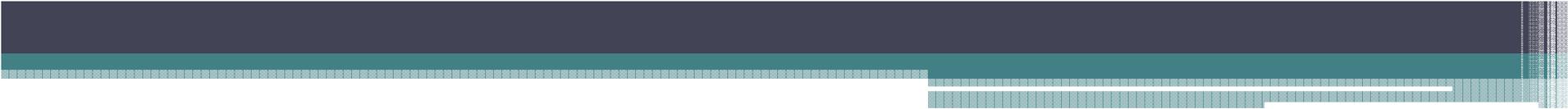
# Evidence of causal impact of good schools

- Strong evidence exists on importance of several components of quality.
- Charter school evidence: students randomized to no-excuses charter schools consistently perform better.
- Teachers: past increase in student performance for a particular teacher is highly predictive of future increase in student performance.
- Peer group: randomly assigned peers have generally positive impact on student performance.



## Evidence of causal impact of violent crime

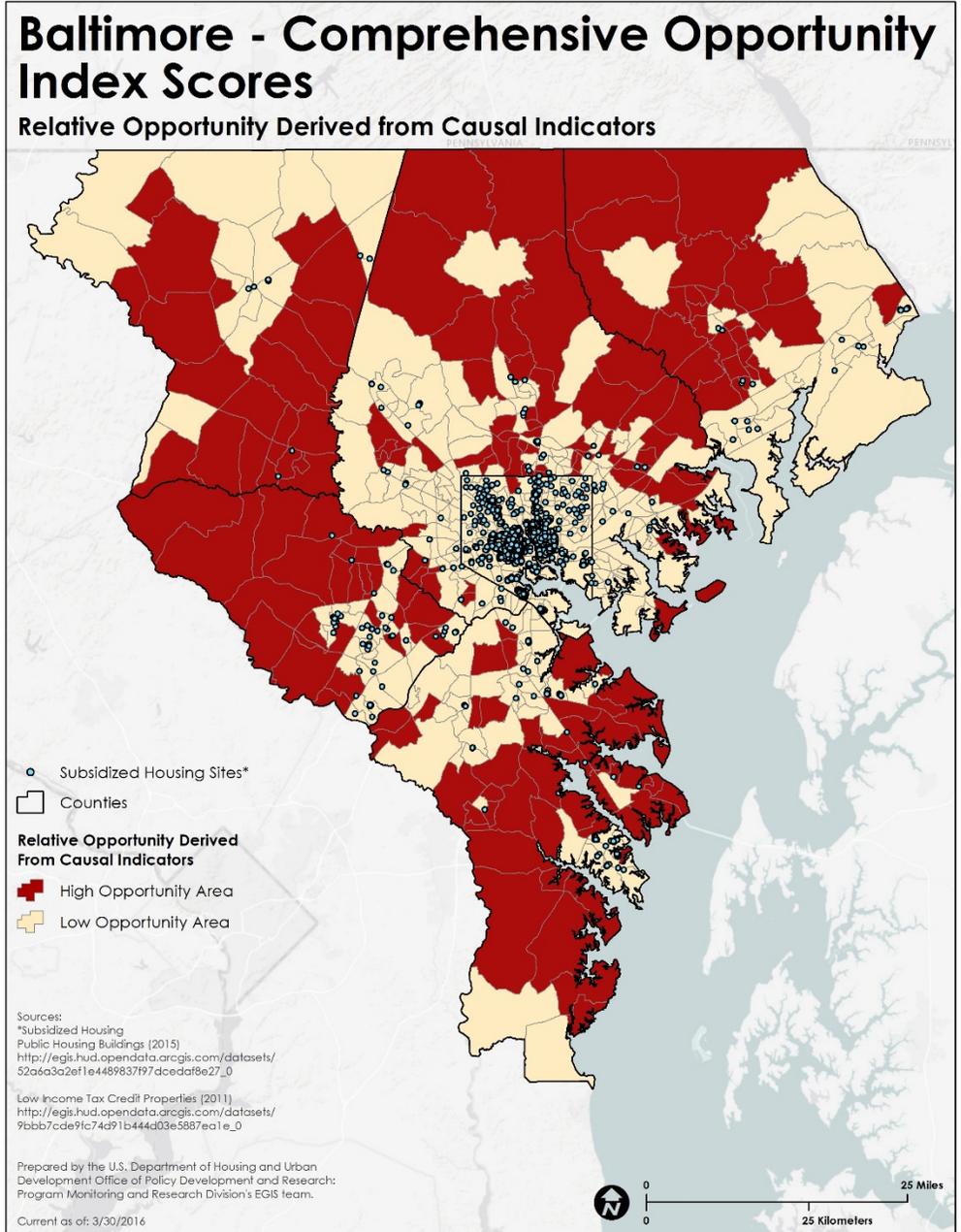
- Evidence limited but strong that recent exposure to violence in immediate neighborhood has sharp negative impact on short-term test performance of very young children.
- Evidence somewhat less strong for older children.



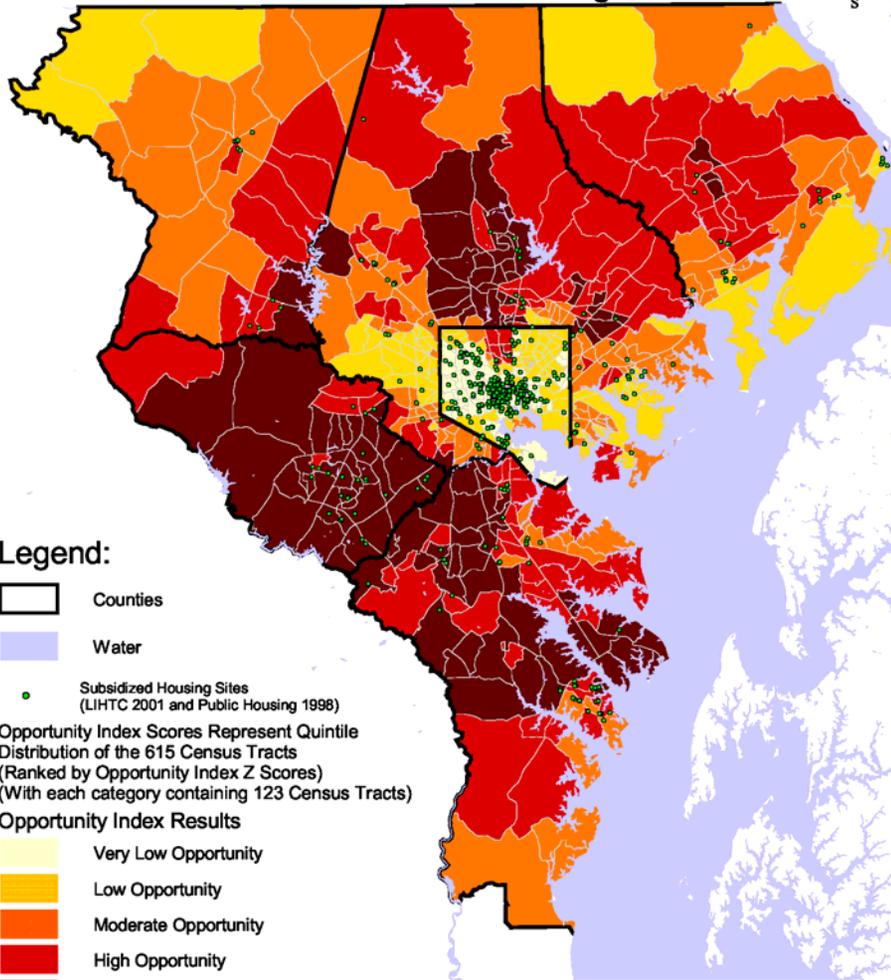
# Summary of recommendations

- Always use poverty rate.
- Use best school quality measure relevant to family.
- Consider options for use of violent crime.

# Neighborhood Opportunity Measured from Causal Indicators



**Map 14: Comprehensive Opportunity Index for the Baltimore Region Overlaid with Subsidized Housing**



**Legend:**

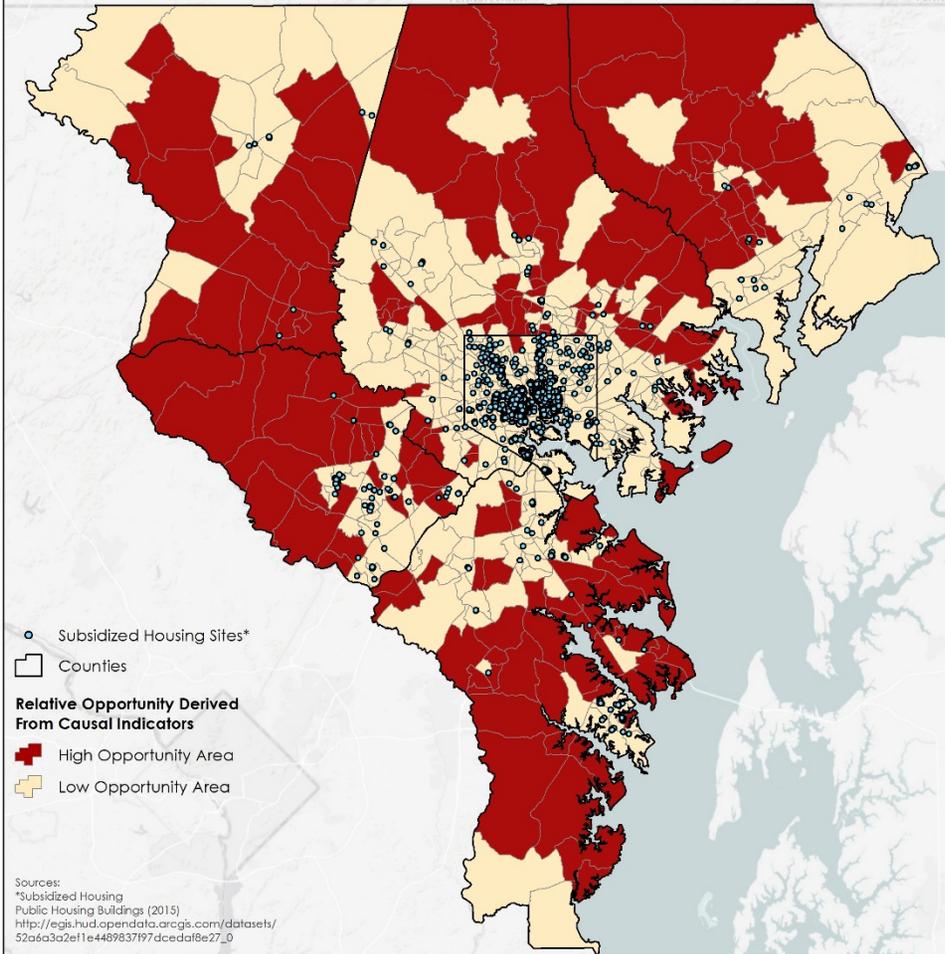
- Counties
  - Water
  - Subsidized Housing Sites (LIHTC 2001 and Public Housing 1998)
- Opportunity Index Scores Represent Quintile Distribution of the 615 Census Tracts (Ranked by Opportunity Index Z Scores) (With each category containing 123 Census Tracts)
- Opportunity Index Results**
- Very Low Opportunity
  - Low Opportunity
  - Moderate Opportunity
  - High Opportunity
  - Very High Opportunity

Prepared by: Kirwan Institute for the Study of Race & Ethnicity  
 Date Prepared: 06.29.2005  
 Sources of Data: Opportunity Analysis (See Maps 9-12 and Appendix A).



# Baltimore - Comprehensive Opportunity Index Scores

Relative Opportunity Derived from Causal Indicators



- Subsidized Housing Sites\*
  - Counties
- Relative Opportunity Derived From Causal Indicators**
- High Opportunity Area
  - Low Opportunity Area

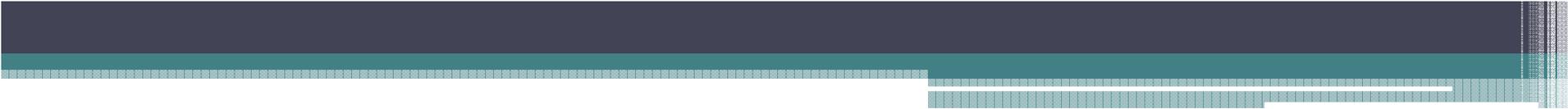
Sources:  
 \*Subsidized Housing Public Housing Buildings (2015)  
[http://egis.hud.opendata.arcgis.com/datasets/52a6a3a2ef1e4489b37f97dcedaf8e27\\_0](http://egis.hud.opendata.arcgis.com/datasets/52a6a3a2ef1e4489b37f97dcedaf8e27_0)

Low Income Tax Credit Properties (2011)  
[http://egis.hud.opendata.arcgis.com/datasets/9bbb7cde9fc74d971b444d03e3887ea1\\_e\\_0](http://egis.hud.opendata.arcgis.com/datasets/9bbb7cde9fc74d971b444d03e3887ea1_e_0)

Prepared by the U.S. Department of Housing and Urban Development Office of Policy Development and Research: Program Monitoring and Research Division's EGIS team.

Current as of: 3/30/2016



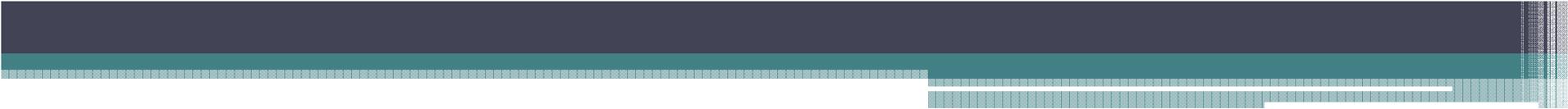


If 2-3 variables don't work for you...

- You might consider a latent variable model for neighborhood opportunity.

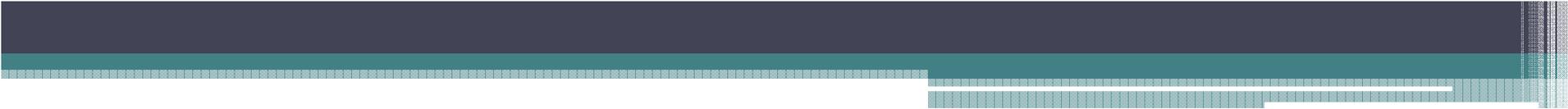
# Latent Variable Modeling

A Statistical Weighting  
Technique for Evaluating the  
Importance of Opportunity  
Indicators



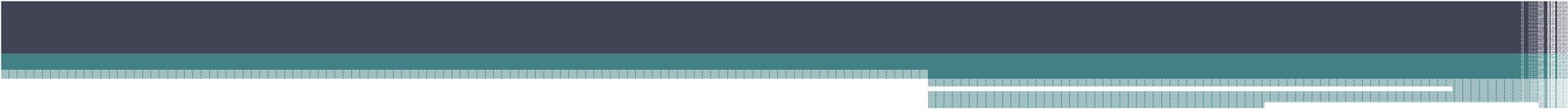
# Bayesian Networks

- A Bayesian Network (BN) is a popular approach for estimating probability models with latent variables.
- A BN is a type of graphical probability model, where random variables are represented by nodes (or vertices).
- Relationships between nodes are represented by edges (or arcs) connecting nodes.



# Bayesian Networks

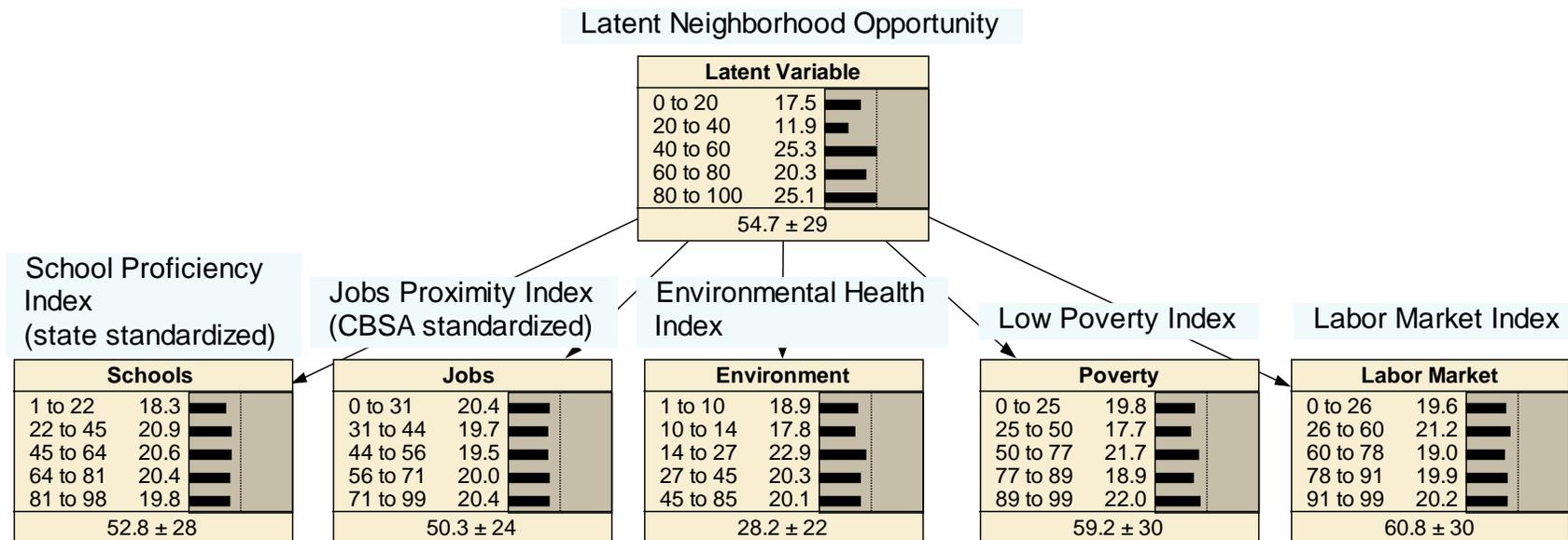
- Each node in a BN has a local probability distribution that can be estimated in a variety of ways:
  - subject matter knowledge;
  - directly from data; or
  - by statistical methods such as simulation or regression.



# Bayesian Networks

- Local distributions with missing data or latent variables can be estimated with methods such as the expectation-maximization (EM) algorithm or gradient algorithm.
- The joint probability distribution for a BN is a product of the local distributions.

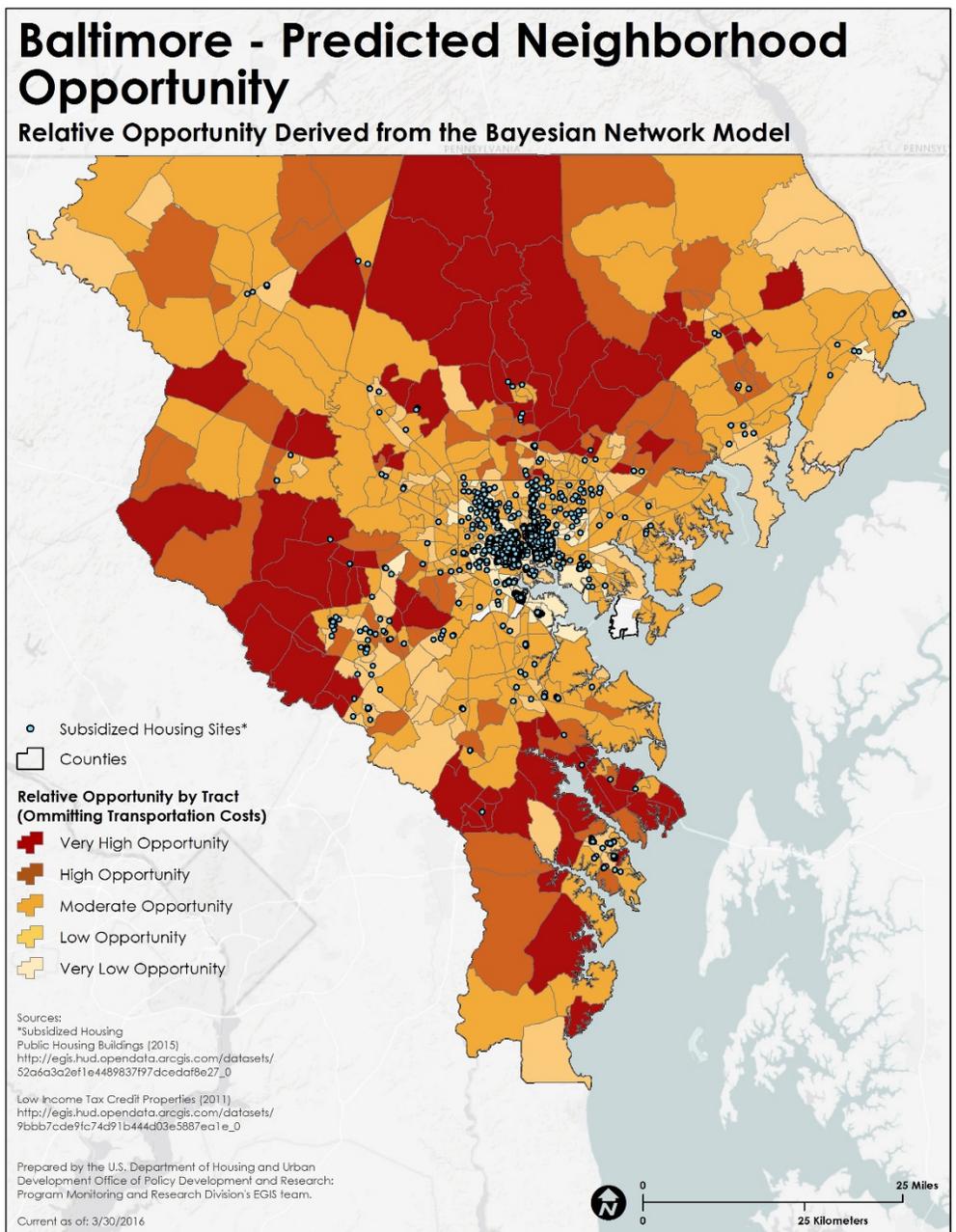
# Bayesian Network Model of Baltimore Neighborhood Opportunity



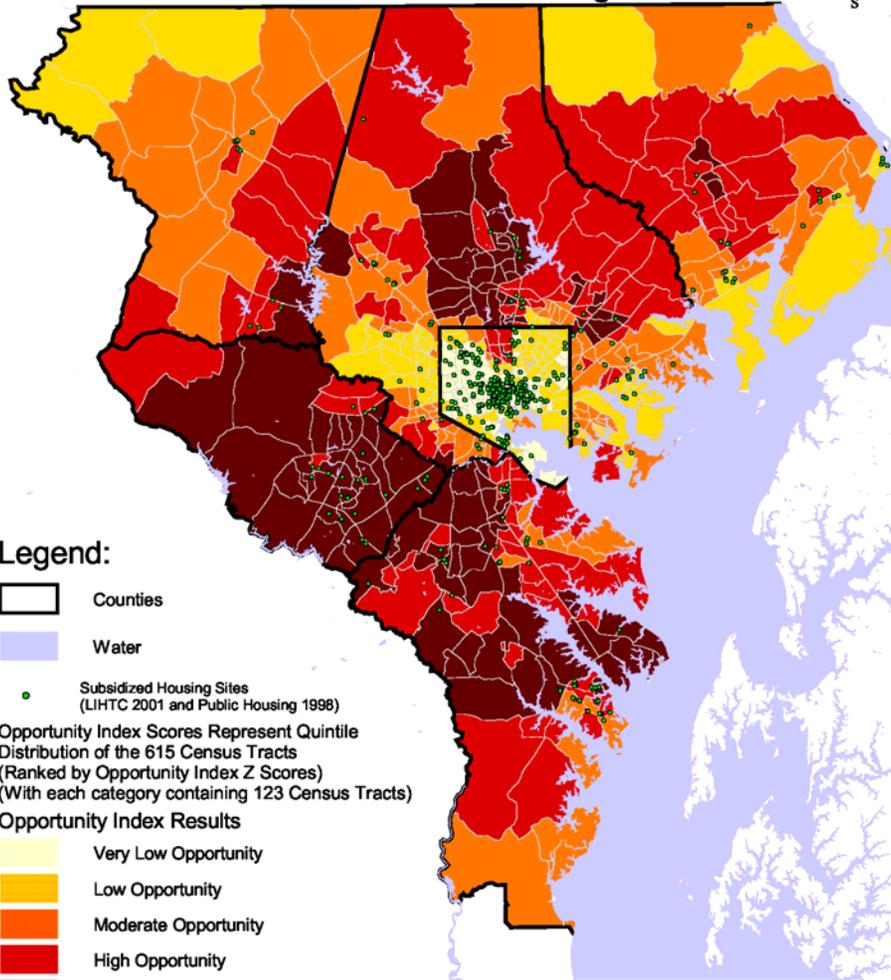
# AFFH Opportunity Indices Descriptive Statistics

<b>Index</b>	<b>N</b>	<b>Min</b>	<b>Median</b>	<b>Mean</b>	<b>Max</b>	<b>Std Dev</b>
<b>School Proficiency</b>	676	1.000	55.000	52.244	98.000	27.640
<b>Jobs Accessibility</b>	676	0.217	49.994	50.964	99.000	22.525
<b>Environmental Health</b>	676	1.000	20.000	26.756	85.000	19.684
<b>Low Poverty</b>	673	0.000	66.000	58.664	99.000	31.227
<b>Labor Market</b>	673	0.000	70.000	60.710	99.000	30.989

# Expected Neighborhood Opportunity for Baltimore CBSA



**Map 14: Comprehensive Opportunity Index for the Baltimore Region Overlaid with Subsidized Housing**



**Legend:**

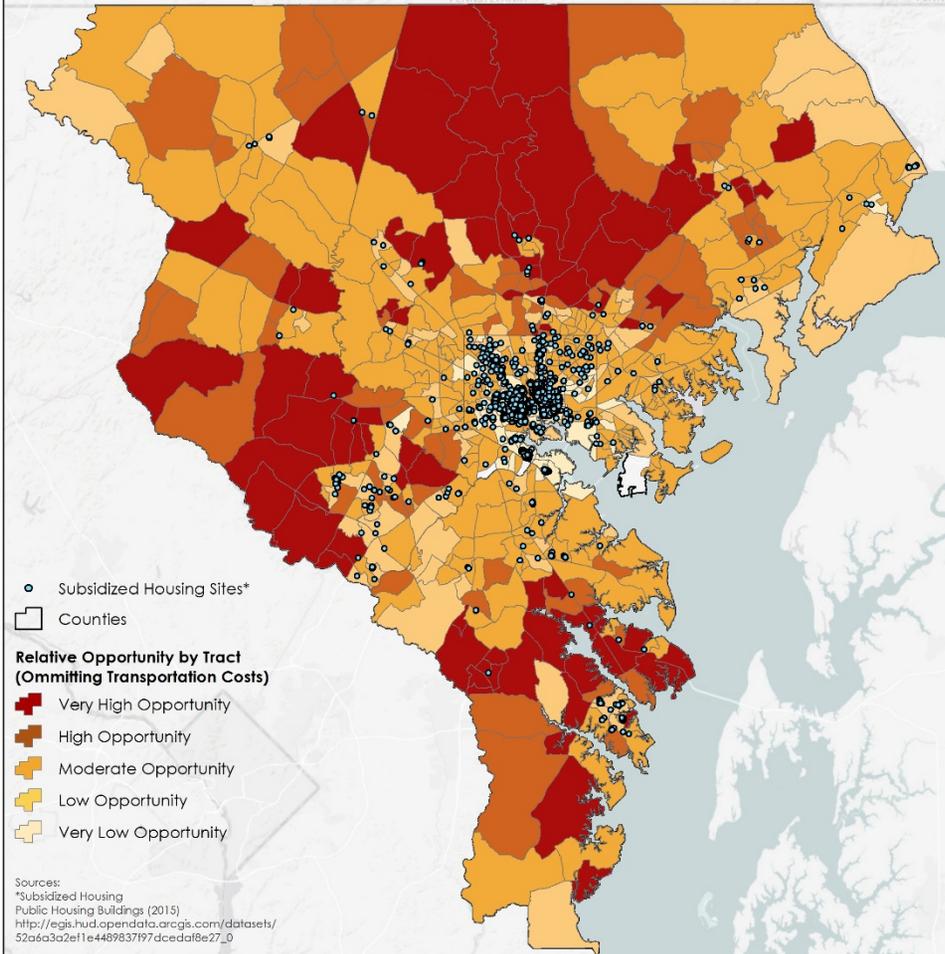
- Counties
  - Water
  - Subsidized Housing Sites (LIHTC 2001 and Public Housing 1998)
- Opportunity Index Scores Represent Quintile Distribution of the 615 Census Tracts (Ranked by Opportunity Index Z Scores) (With each category containing 123 Census Tracts)
- Opportunity Index Results**
- Very Low Opportunity
  - Low Opportunity
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  - High Opportunity
  - Very High Opportunity

Prepared by: Kirwan Institute for the Study of Race & Ethnicity  
 Date Prepared: 06.29.2005  
 Sources of Data: Opportunity Analysis (See Maps 9-12 and Appendix A).



**Baltimore - Predicted Neighborhood Opportunity**

Relative Opportunity Derived from the Bayesian Network Model



- Subsidized Housing Sites\*
  - Counties
- Relative Opportunity by Tract (Omitting Transportation Costs)**
- Very High Opportunity
  - High Opportunity
  - Moderate Opportunity
  - Low Opportunity
  - Very Low Opportunity

Sources:  
 \*Subsidized Housing Public Housing Buildings (2015)  
[http://egis.hud.opendata.arcgis.com/datasets/52a6a3a2ef1e4489b37f97dceda8e27\\_0](http://egis.hud.opendata.arcgis.com/datasets/52a6a3a2ef1e4489b37f97dceda8e27_0)

Low Income Tax Credit Properties (2011)  
[http://egis.hud.opendata.arcgis.com/datasets/9bbb7cde9fc74d971b444d03e3887ea1\\_e\\_0](http://egis.hud.opendata.arcgis.com/datasets/9bbb7cde9fc74d971b444d03e3887ea1_e_0)

Prepared by the U.S. Department of Housing and Urban Development Office of Policy Development and Research: Program Monitoring and Research Division's EGIS team.

Current as of: 3/30/2016



Questions?

# Thank You

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