PATHWAY TO THE COMMON MEASUREMENT OF URBAN HEALTH: 
A DATA ENVELOPMENT ANALYSIS (DEA) APPROACH

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE 
UNIVERSITY OF HAWAI’I AT MĀNOA IN PARTIAL FULFILLMENT OF THE 
REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY 
IN 
SOCIOLOGY 

AUGUST 2013

By
Quincy A. Edwards

Dissertation Committee:

D. William Wood, Chairperson 
John Casken
Albert Robillard
Ann Sakaguchi
Wei Zhang

Keywords: measure urban health indicators determinants DEA
DEDICATION

To my dear mother who supported all my dreams and aspirations throughout my academic endeavors. I’d like to thank her for her friendship and patience in standing by me through the long hours of research and writing, and for passing on a true love of reading and respect for education.

And if I do say so myself, I think she has done a fine job of raising me!
ACKNOWLEDGMENTS

I would like to express my deep appreciation and gratitude to my committee chair, Dr. D. William Wood, for the guidance and mentorship he provided me. Without his persistent aid, this dissertation would not have been possible.

Additionally, I would like to thank my committee members, Drs. John Casken, Albert “Britt” Robillard, Ann Sakaguchi, and Wei Zhang, for their friendly guidance, thought-provoking suggestions, and general collegiality as I moved from idea to completed study.

Lastly, I would like to thank my friends, Dr. Libby Ruch who provided support, encouragement, and insights on innumerable occasions, and Lei Wakayama who offered constant reassurance as I juggled teaching with completion of my dissertation.

Altogether, it made for a reflective and rewarding journey. My deepest gratitude to everyone.
ABSTRACT

This study examined the extent to which a generic set of indicators would permit intercity health comparisons. Central to this objective was the identification of consistent readily-available indicators that would aid in the measurement of human health in urban environments.

Specifically, this study sought to identify and classify health indicators related to the determinants of human health in urban environments, to compare the influence of each indicator on and among urban areas, to determine the relationship between income inequality and urban health, and similarly, between racial and ethnic diversity and urban health.

Using readily-available data, this study employed an input-oriented Data Envelopment Analysis (DEA) to establish a benchmark to measure the relative health of a Metropolitan Statistical Area (MSA) along with an identified peer group and peer weights relative for each sub-optimal MSA.

Of the 188 MSAs analyzed, the average effectiveness score was 0.91. Overall, 38% of the sample operated below the 0.90 level of efficiency, 51% operated at 0.90 but less than 1.00, and 11% were deemed to be effective with a score of 1.00. While no statistically significant relationship was found between income inequality and urban health, a statistically significant positive correlation was found between racial and ethnic diversity and urban health.

With the establishment of a benchmark, a relative peer group, and peers weights, intercity and intracity exemplars may be identified rendering insight into best practices, pragmatic target setting and resource allocation, and the effectiveness of policy and environmental changes over time.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xiii</td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 OVERVIEW</td>
<td>1</td>
</tr>
<tr>
<td>1.2 SUBJECT OF THE STUDY</td>
<td>1</td>
</tr>
<tr>
<td>1.3 BACKGROUND OF THE STUDY</td>
<td>2</td>
</tr>
<tr>
<td>1.3.1 Context in which to collect data</td>
<td>7</td>
</tr>
<tr>
<td>1.3.2 Planning the research</td>
<td>7</td>
</tr>
<tr>
<td>1.4 SIGNIFICANCE OF THE STUDY</td>
<td>8</td>
</tr>
<tr>
<td>1.4.1 Origin of the idea for this research</td>
<td>9</td>
</tr>
<tr>
<td>1.5 THE PROBLEM</td>
<td>11</td>
</tr>
<tr>
<td>1.6 PAST STUDIES</td>
<td>13</td>
</tr>
<tr>
<td>1.6.1 Developing a public health measure</td>
<td>13</td>
</tr>
<tr>
<td>1.6.2 Changes in European urban social structures</td>
<td>16</td>
</tr>
<tr>
<td>1.6.3 Changes in American urban social structures</td>
<td>18</td>
</tr>
<tr>
<td>1.6.4 Dimensions in urban health</td>
<td>22</td>
</tr>
<tr>
<td>1.7 ORGANIZATION OF THE STUDY</td>
<td>25</td>
</tr>
<tr>
<td>2. LITERATURE REVIEW</td>
<td>26</td>
</tr>
<tr>
<td>2.1 HISTORICAL OVERVIEW</td>
<td>26</td>
</tr>
<tr>
<td>2.1.1 The social approach to health</td>
<td>28</td>
</tr>
<tr>
<td>2.1.2 The Healthy Cities Project</td>
<td>29</td>
</tr>
<tr>
<td>2.1.3 Evaluating Healthy Cities: 20 years later</td>
<td>31</td>
</tr>
<tr>
<td>2.1.4 The Millennium Development Goals (MDGs)</td>
<td>32</td>
</tr>
<tr>
<td>2.2 MEASUREMENT OF HEALTH CITIES</td>
<td>32</td>
</tr>
<tr>
<td>2.2.1 Determinants that affect human health</td>
<td>35</td>
</tr>
<tr>
<td>2.2.2 Indicators that influence urban health levels</td>
<td>38</td>
</tr>
<tr>
<td>2.2.3 Evaluation framework</td>
<td>41</td>
</tr>
<tr>
<td>2.2.3.1 The future of indicators</td>
<td>43</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS (Continued)

## 1.8 THE SOCIAL CAUSES OF HEALTH AND ILLNESS

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8.1 Disparities, inequalities, and inequities</td>
<td>45</td>
</tr>
<tr>
<td>1.8.1.1 Education</td>
<td>51</td>
</tr>
<tr>
<td>1.8.1.2 Income</td>
<td>52</td>
</tr>
<tr>
<td>1.8.1.3 Occupation</td>
<td>55</td>
</tr>
<tr>
<td>1.8.1.4 Housing</td>
<td>57</td>
</tr>
<tr>
<td>1.8.2 Psychosocial environment</td>
<td>58</td>
</tr>
<tr>
<td>2.3.2.1. Social status</td>
<td>60</td>
</tr>
<tr>
<td>1.8.2.1 Social relationships</td>
<td>62</td>
</tr>
<tr>
<td>1.8.3 Ecological approaches</td>
<td>64</td>
</tr>
<tr>
<td>1.8.3.1 External conditions</td>
<td>66</td>
</tr>
<tr>
<td>1.8.3.2 The urban forest</td>
<td>67</td>
</tr>
<tr>
<td>1.8.3.3 The urban heat island</td>
<td>70</td>
</tr>
<tr>
<td>1.8.3.4 Green mobility</td>
<td>71</td>
</tr>
<tr>
<td>1.8.3.5 Urban noise</td>
<td>73</td>
</tr>
<tr>
<td>1.8.4 Environmental sustainability</td>
<td>74</td>
</tr>
<tr>
<td>1.8.4.1 The urban form and public welfare</td>
<td>74</td>
</tr>
<tr>
<td>1.8.4.2 The urban form and physical activity patterns</td>
<td>77</td>
</tr>
<tr>
<td>1.8.4.3 The urban form and green spaces</td>
<td>82</td>
</tr>
<tr>
<td>1.8.4.4 The urban form and adaptive re-use</td>
<td>85</td>
</tr>
<tr>
<td>1.8.4.5 Future directions</td>
<td>88</td>
</tr>
</tbody>
</table>

## 2.4 INTERSECTORAL PARTNERSHIPS

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4.1 Local</td>
<td>91</td>
</tr>
<tr>
<td>2.4.1.1 Social cohesion and social conflict</td>
<td>101</td>
</tr>
<tr>
<td>2.4.1.2 Community-based intervention</td>
<td>103</td>
</tr>
<tr>
<td>2.4.2 National</td>
<td>105</td>
</tr>
<tr>
<td>2.4.3 Global</td>
<td>105</td>
</tr>
</tbody>
</table>

## 2.5 GOVERNANCE

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5.1 Social</td>
<td>107</td>
</tr>
<tr>
<td>2.5.2 Economic</td>
<td>109</td>
</tr>
<tr>
<td>2.5.3 Political</td>
<td>110</td>
</tr>
<tr>
<td>2.5.3.1 Policy interventions — past and present</td>
<td>112</td>
</tr>
<tr>
<td>2.5.3.2 Political determinants of health — future</td>
<td>113</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (Continued)

2.5.4 Relationships between Land Use and Public Health .......................... 117
  2.5.4.1 *Land use and public health* .................................................... 122
  2.5.4.2 *Land use and alcohol control* ............................................. 125
  2.5.4.3 *Land use and tobacco control* ........................................... 128
  2.5.4.4 *Land use and nutrition* ..................................................... 129

2.6 SUMMARY ......................................................................................... 132

3. METHODS ............................................................................................ 134

3.1 DATA .................................................................................................. 134

  3.1.1 Geographic areas .......................................................................... 134

  3.1.2 Study areas — level of measurement ........................................... 140

3.2 DATA SOURCES, VARIABLES, AND MANAGEMENT ..................... 140

  3.2.1 Gallup-Healthways ....................................................................... 140

    3.2.1.1 *Well-being Index* ............................................................ 141
    3.2.1.2 *Percentage non-diabetic (derived)* .............................. 141
    3.2.1.3 *Percentage non-obese (derived)* ................................. 141
    3.2.1.4 *Percentage engaging in frequent exercise* ............... 141
    3.2.1.5 *Percentage eating produce frequently* .................... 141
    3.2.1.6 *Percentage optimistic* ............................................... 141
    3.2.1.7 *Percentage with health insurance (derived)* ........... 142

  3.2.2 USCB American Community Survey ........................................... 142

    3.2.2.1 *Gini index* ..................................................................... 142
    3.2.2.2 *Percentage of households receiving public assistance or food stamps/snap (derived)* ................................. 143
    3.2.2.3 *Median age* ............................................................... 143
    3.2.2.4 *Median selected monthly owner costs as a percentage of household income* ................................. 143

  3.2.3 US2010 ........................................................................................ 143

    3.2.3.1 *Racial and ethnic diversity — Entropy index* .................. 144

  3.2.4 U.S. Bureau of Labor Statistics .................................................... 144

    3.2.4.1 *Unemployment rate (U3)* ........................................... 144

3.3 PROCEDURES ...................................................................................... 145

  3.3.1 Polar area diagram ...................................................................... 145

  3.3.2 Data Envelopment Analysis (DEA) .......................................... 145
TABLE OF CONTENTS (Continued)

3.3.2.1 Conceptual framework .................................................. 146
3.3.2.2 Efficiency measurement ................................................ 148
3.3.2.3 Strengths and Limitations of DEA ............................... 150

3.3.3 Literature review ................................................................. 151
  3.3.3.1 Healthcare applications of DEA ................................. 151
  3.3.3.2 Strengths and Limitations of Healthcare Applications in DEA 152

4. RESULTS ........................................................................................... 154

3.4 Disparity of individual measures of urban health ....................... 154
  3.4.1 Descriptive statistics ...................................................... 154
  3.4.2 Enhanced Polar Area diagram ........................................ 154

3.5 Urban health on income inequality ............................................. 159
  3.5.1 Correlation of urban health on income inequality ............ 159
  3.5.2 Testing of hypotheses ...................................................... 160
    4.2.2.1 Correlation .............................................................. 160
    4.2.2.2 Homoskedasticity .................................................... 161
    4.2.2.3 Linearity ................................................................. 163

3.6 Racial and ethnic diversity on urban health ............................... 167
  3.6.1 Correlation of urban health on racial and ethnic diversity ... 167
  3.6.2 Testing of hypotheses ...................................................... 168
    4.3.2.1 Correlation .............................................................. 168
    4.3.2.2 Homoskedasticity .................................................... 169
    4.3.2.3 Linearity ................................................................. 172
  3.6.3 Estimated parameters ....................................................... 174
    4.3.3.1 Coefficient of determination .................................... 174
    4.3.3.2 Explained variance .................................................. 175

3.7 Empirical results of the Data Envelopment Analysis (DEA) .......... 175
  3.7.1 DEA model of the 2010 U.S. Metropolitan Statistical Areas (MSAs) 175
  3.7.2 Technical efficiency of the 2010 U.S. MSAs .................... 178
  3.7.3 DEA frontier ................................................................. 179
  3.7.4 Peers .............................................................................. 186
  3.7.5 Peer Weights ($\lambda$) ...................................................... 192
TABLE OF CONTENTS (Continued)

5. DISCUSSION AND CONCLUSION ................................................................. 204

5.1. The study .......................................................... 204

5.1.1. DEA model of health indicators as a means of
intercity and intracity comparison .......................................................... 204
5.1.2. Income inequality and non-cash income sources ....................... 206
5.1.3. Racial and ethnic heterogeneity ................................................. 208
5.1.4. Benchmarking Metropolitan Statistical Areas (MSAs) ............... 210
5.1.5. Peer groups and peer weights ................................................. 210

5.2. Limitations of the research .............................................................. 211

5.3. Direction for future research ............................................................... 212

APPENDIX A: Nightingale’s graphs, the connection
between health and housing................................................................. 214
APPENDIX B: Polar area diagram reading and construction ......................... 217
APPENDIX C: Linear regression analysis .................................................. 220
REFERENCES ................................................................. 223
LIST OF TABLES

1.1. Most widely used definitions of “urban” presented to United Nations ........... 12
1.2. Some of the questions listed in Parks’ research program............................. 21

2.1. Quality-of-life issues ..................................................................................... 39
2.2. Comparison of health differences between the U.S. and Canada ............... 50
2.3. Distribution of coronary heart disease risk factors by educational level in sample prevalence of risk factor by educational level ...................................................................................... 53
2.4. How unemployment affects levels of morbidity and mortality .................... 56
2.5 Suggested typology of urban open spaces from users’ viewpoints ............. 87

3.1. Single input and single output (x100).......................................................... 146

4.1. Descriptive statistics of individual health measures................................. 154
4.2. Rank and percentage of non-diabetics by MSA........................................... 155
4.3 Rank and percentage of non-obesity by MSA. ............................................. 157
4.4. Rank and percentage of engagement of frequent exercise by MSA ............ 157
4.5. Rank and percentage of eating produce frequently by MSA ....................... 158
4.6. Rank and percentage of city optimism by MSA ......................................... 158
4.7. Rank and percentage of health insurance by MSA ..................................... 159
4.8. Description of variables............................................................................... 159
4.9. Descriptive statistics by MSA...................................................................... 159
4.10. PPMCC estimates....................................................................................... 161
4.11. Results from the studentized Breusch-Pagan test..................................... 163
4.12. Results of the lack of fitness test ................................................................. 166
4.13. Results of the Spearman’s rho test.............................................................. 166
4.14. Description of variables............................................................................... 167
4.15. Descriptive statistics by MSA...................................................................... 167
4.16. PPMCC estimates....................................................................................... 169
LIST OF TABLES (Continued)

4.17. Results from the studentized Breusch-Pagan test........................................ 170
4.18. PPMCC estimates......................................................................................... 171
4.19. Results of the lack of fitness test ................................................................. 174
4.20 Description of input and output specific variables........................................ 176
4.21 Descriptive statistics of the 2010 DEA.......................................................... 177
4.22 Summary of technical efficiencies................................................................. 178
4.23 Descriptive statistics for estimated MSA technical efficiencies..................... 178
4.24 DEA results of the MSAs .............................................................................. 181
4.25 Peer MSAs.................................................................................................... 187
4.26 Peer weights ................................................................................................. 193

C.1. Summary of linear regression analysis.......................................................... 220
C.2. Summary of measures of fit quality............................................................... 221
C.3. Results from the studentized Breusch-Pagan test........................................ 222
C.4. Results from the Ramsey RESET test for general specification............... 222
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Basic framework for indicators</td>
<td>24</td>
</tr>
<tr>
<td>2.1</td>
<td>Smoking — influenced by a combination of activities in other groups</td>
<td>33</td>
</tr>
<tr>
<td>2.2</td>
<td>Intersectoral partnerships combine two or more sectors</td>
<td>92</td>
</tr>
<tr>
<td>2.3</td>
<td>A health map for the human habitat</td>
<td>100</td>
</tr>
<tr>
<td>3.1</td>
<td>U.S. Census Bureau geographic hierarchy</td>
<td>136</td>
</tr>
<tr>
<td>3.2</td>
<td>El Paso–Juárez—Las Cruces Area</td>
<td>138</td>
</tr>
<tr>
<td>3.3</td>
<td>U.S. core-based statistical area</td>
<td>139</td>
</tr>
<tr>
<td>3.4</td>
<td>Single input and single output</td>
<td>147</td>
</tr>
<tr>
<td>4.1</td>
<td>Enhanced Polar Area diagrams of individual health measures by MSA</td>
<td>156</td>
</tr>
<tr>
<td>4.2</td>
<td>Enhanced scatterplot of well-being composite score on Gini Index</td>
<td>160</td>
</tr>
<tr>
<td>4.3</td>
<td>Studentized Breusch-Pagan test</td>
<td>162</td>
</tr>
<tr>
<td>4.4</td>
<td>Residual plot of Pearson residuals on fitted values</td>
<td>164</td>
</tr>
<tr>
<td>4.5</td>
<td>Residual plot of Pearson residuals on Gini Index</td>
<td>165</td>
</tr>
<tr>
<td>4.6</td>
<td>Enhanced scatterplot of Well-being Composite Score on Entropy Index</td>
<td>168</td>
</tr>
<tr>
<td>4.7</td>
<td>Studentized Breusch-Pagan test</td>
<td>170</td>
</tr>
<tr>
<td>4.8</td>
<td>Plot of Pearson residuals on Fitted Values</td>
<td>172</td>
</tr>
<tr>
<td>4.9</td>
<td>Plot of Pearson residuals on Entropy Index</td>
<td>173</td>
</tr>
<tr>
<td>4.10</td>
<td>Illustration of Common Variance</td>
<td>175</td>
</tr>
<tr>
<td>4.11</td>
<td>VRS input-oriented Data Envelopment Analysis (DEA)</td>
<td>179</td>
</tr>
<tr>
<td>5.1</td>
<td>Sen. Sessions comparison of welfare spending and median income</td>
<td>207</td>
</tr>
<tr>
<td>5.2</td>
<td>Demographic data by census block</td>
<td>213</td>
</tr>
<tr>
<td>A.1</td>
<td>Nightingale’s polar area diagram (1858)</td>
<td>215</td>
</tr>
<tr>
<td>B.1</td>
<td>Pie chart of national average of urban health (2010)</td>
<td>218</td>
</tr>
<tr>
<td>B.2</td>
<td>Polar area diagram of national average of urban health (2010)</td>
<td>218</td>
</tr>
</tbody>
</table>
# LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS</td>
<td>American Community Survey</td>
</tr>
<tr>
<td>ADHD</td>
<td>Attention deficit hyperactivity disorder</td>
</tr>
<tr>
<td>AIDS</td>
<td>Acquired immune deficiency syndrome</td>
</tr>
<tr>
<td>AODS</td>
<td>Alcohol and Other Drug Services</td>
</tr>
<tr>
<td>APA</td>
<td>American Planning Association</td>
</tr>
<tr>
<td>BG</td>
<td>Census block group</td>
</tr>
<tr>
<td>BTG</td>
<td>Bridging the Gap (Robert Wood Johnson Foundation program)</td>
</tr>
<tr>
<td>°C</td>
<td>degrees Celsius</td>
</tr>
<tr>
<td>CAOI</td>
<td>Coalition on Alcohol Outlet Issues</td>
</tr>
<tr>
<td>CCHS</td>
<td>Contra Costa Health Services (in California)</td>
</tr>
<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>CDP</td>
<td>Census-designated place</td>
</tr>
<tr>
<td>CHD</td>
<td>Coronary heart disease</td>
</tr>
<tr>
<td>CBSA</td>
<td>Core based statistical area</td>
</tr>
<tr>
<td>CPHI</td>
<td>Canadian Population Health Initiative</td>
</tr>
<tr>
<td>CPS</td>
<td>Current Population Survey</td>
</tr>
<tr>
<td>CRS</td>
<td>Constant returns to scale</td>
</tr>
<tr>
<td>CVD</td>
<td>Cardiovascular disease</td>
</tr>
<tr>
<td>DEA</td>
<td>Data Envelopment Analysis</td>
</tr>
<tr>
<td>DMU</td>
<td>Decision making unit (DEA)</td>
</tr>
<tr>
<td>DRS</td>
<td>Decreasing returns to scale</td>
</tr>
<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>EVEO</td>
<td>Life Style, Education, and Occupation (Argentinean index of SES)</td>
</tr>
<tr>
<td>°F</td>
<td>degrees Fahrenheit</td>
</tr>
<tr>
<td>GDPpc</td>
<td>Gross Domestic Product per capita</td>
</tr>
<tr>
<td>GHWBI</td>
<td>Gallup Healthways Well-Being Index</td>
</tr>
<tr>
<td>GRO</td>
<td>General Registry Office</td>
</tr>
<tr>
<td>HCP</td>
<td>Healthy Cities Program</td>
</tr>
<tr>
<td>HMCA</td>
<td>Health and Medical Care Archive</td>
</tr>
</tbody>
</table>
LIST OF ABBREVIATIONS (Continued)

HUD .......... U.S. Department of Housing and Urban Development
ICPSR ........ Inter-university Consortium for Political and Social Research
IRS ............ Increasing returns to scale
ISPs ............ Intersectoral partnerships
MDGs .......... Millennium Development Goals
MSA ............ Metropolitan statistical area
MPSS .......... Most productive scale size
µSA ............. Micropolitan statistical area
NACCHO ..... National Association of County and City Health Officials
NGO ............ Non-governmental organization
NHANE 1..... National Health and Nutrition Examination Survey (1972-1975)
NHEFS ........ NHANES 1 Epidemiologic Follow-up Studies (1982-1993)
OLS ............ Ordinary least squares
PAD ............. Peripheral arterial disease
PPMCC ....... Pearson product-moment correlation coefficient
PUMA......... Public use microdata area
RTS ............ Returns to scale
RWJ .......... Robert Wood Johnson [Foundation]
SES .......... Socio-economic status
SHS .......... Second-hand smoke
SSI .......... Supplemental Security Income
SSZEAA ....... Standard State Zoning Enabling Act
TANF .......... Temporary Assistance to Needy Families
TE .............. Technical efficiency
TOPS .......... Technical optional productive scale
UA ............. Urban area
UN ............. United Nations
UNCHS ......... United Nations Centre for Human Settlements
UNDP .......... United Nations Development Programme
LIST OF ABBREVIATIONS (Continued)

USCB ........... U.S. Census Bureau
USPS ........... U.S. Postal Service
VRS............. Variable returns to scale
WSSD ........... World Summit on Sustainable Development
WHO ........... World Health Organization
ZCTAs™...... Zip code tabulation areas
CHAPTER 1
INTRODUCTION

1.1. OVERVIEW

Given that physical living environments can affect public health, the high population
densities of modern cities convey a greater exposure to health hazards and inequities.
The inherent difficulties in evaluating the health of cities signify a compelling need to
develop a universal conceptual model, a benchmark. Thus, if concrete indicators to
measure the health of a city are established, each city will be afforded a potential for
equitable health and well-being outcomes for its citizens along with opportunities to
improve city planning and policies.

1.2. SUBJECT OF THE STUDY

The development of a generic set of indicators to permit intercity health comparisons is
unfeasible because indicators are context-bound. For this reason, each city will need to
develop a discrete set of indicators in order to meet its own requirements (Hancock, 1993).

In order to establish benchmarks for measuring the health of a city, the key areas of
research in this study will be those that address the following:

(i) Identification and classification of various city indicators that are related to the
determinants of human urban health.

(ii) Comparing the extent of influence that each health indicator has on and among
selected Metropolitan Statistical Areas (MSAs).

(iii) Determining if there is a statistically significant relationship between income
inequality and urban health.
(iv) Determining if there is a statistically significant relationship between racial and ethnic diversity and urban health.

(v) Developing a statistical model and applying Data Envelopment Analysis (DEA) to measure the technical efficiency of every MSA.

(vi) For each MSA, identifying its relevant peer group for the purpose of benchmarking.

(vii) With a given relevant peer group, determining the peer weights of its members.

By providing a measurement of urban health that is both tractable and intuitive, a clear benchmark is established and, most importantly, a model to emulate is offered as a method of improving an individual MSA's performance (i.e., effectiveness).

1.3. BACKGROUND OF THE STUDY

City dwellers are exposed to a number of health risks such as infectious diseases, non-communicable diseases (cardiovascular disease, cancer, diabetes), unhealthful behaviors (smoking, unhealthy diets, physical inactivity, drug and alcohol abuse), injuries (work, traffic accidents) and violence (WHO 2011:27). And within the city, health hazards and inequities abound, especially for the marginalized populations who live in poverty, their health threatened by the potentially harmful conditions of their environment. Noise pollution, air pollution, industrial pollutants, factory and vehicle emissions are also contributing factors to the challenges faced by public health. To understand the health risks associated with a city’s inhabitants, it is essential to ascertain the health hazards and inequities that affect them along with their determinants.

In 2008, the accumulated proportion of the human population residing in urban places tipped past the halfway mark to over 3.3 billion people — a “Dawn of an Urban Millennium” (UNFPA 2007) and by 2050, the urban population is expected to increase to
6.4 billion (WHO 2011:xvii). In the United States, over 50 percent of all Americans live in the 37 largest Metropolitan Statistical Areas having a population of one million or more (Palen 2000:91-2). Consequently, urbanization — the upsurge in migration to and growth of urban areas — appears inexorable.

As people continue to move to cities at record rates, it is essential to recognize the connection between urban planning and public health. By 2015, it is projected that nearly three hundred million people will be living in 20 megalopolises and that by 2030, 60% of the world population will live in such large conurbations (de Leeuw 2001:34). If the total world population continues its current rate of growth, by 2050, 75 percent will be urban (Gehl 2010:215). And the condition of urban environs will influence the constituents of day-to-day living — education, employment, health, housing, recreation, and crime — “both for individuals and communities or populations as a whole.” Clearly then, the strongest and most essential elements in a framework of fundamental needs are physiological safety and affiliation (Woolley 2003:1).

While rapid urbanization walks hand-in-hand with significant economic growth, so too do “diseases of poverty” and “diseases of affluence.” Health risks are spatially and socially structured (Fitzpatrick and LaGory 2003:34-5); as a result, urban planners and health practitioners will need to address “the physical, mental, social, and ecological health implications of urban design at multiple spatial scales” (Jackson 2003:199).

In low-income and middle-income countries, slum populations are estimated to double in less than 30 years. Needless to say, a major problem in both general and slum populations is communicable disease, and it is expected that the “unique social, historic, and urban context in which the disease manifests itself must lead to the creation of solutions that suit local conditions” (Sclar, Garau, and Carolini 2005:903). Indeed, medicine and public health are increasingly aware that societal forces actually shape the
disease patterns experienced by a society, thus requiring successful health interventions to address the social factors that produce them. Consequently, place is a critical social factor in the process (Fitzpatrick and LaGory 2003:34-5).

While de Leeuw (2001:34) claims that there are “no unequivocal empirically validated theories…explaining causal or final correlates between ‘urbanisation’ and ‘health’,” Frumkin (2000:211) puts forth the likelihood that many different kinds of built environments could promote health and that “optimal approaches will borrow elements of cities, suburbs, and small towns.” Urban writer and activist Jane Jacobs (1961:352) conceptualized cities as complex adaptive systems. She looked to urban design as a powerful tool to improve human well-being, espousing that higher densities yield a critical mass of people capable of supporting more vibrant communities.

Urbanites often inhabit less than desirable living conditions. Yet given the circumstances, optimum conditions may be achieved by improved planning, community collaborations, nurturing social entrepreneurship, and engaging multi-sectoral partnerships that emphasize improving the physical and mental health of community residents. Furthermore, sharing accurate information facilitates the platform for evidence-based medicine and decision-making.

As the world becomes more urban, especially in developing countries, there are “close correlations between poverty, environmental hazards and ill health.” Owen and Roberts (2005) contend that there are huge gaps in social services and infrastructure in many megacities due to poor regulation and environmental hazards. Even though the United Nations (UN) and other organizations have scaled up their aid programs, the effort remains under-resourced.

In the early 1980s, the World Health Organization launched its urban public health initiative, the Healthy Cities project in Europe to “lend support to city-based health
promotions.” Regions and countries throughout the world, by realizing the “history, culture, strengths, weaknesses, resources and skills” uniquely characteristic of each city, could initiate a network of cities to work in partnership to develop intersectoral health promotion strategies (Ashton, Grey and Barnard 1986:320).

Just as there have been changes in traditional social structures, there have been changes in medical problems in urban areas — most noticeably in the case of heart disease and cancer which have displaced infectious diseases. Often issues of local and national public policy are causal of these lifestyle diseases (Ashton et al. 1986:320).

Again, to mitigate the poor living conditions endured by urban residents across low, middle, and high income countries, urban planning and public health must be linked. By adopting “smart growth” initiatives, human health may be improved irrespective of additional financial capital requirements. “Smart growth” is the seed of increased social capital and the promotion of health for all (Kawachi and Berkman 2000; de Leeuw 2001:34). “Smart growth” is an urban planning approach that is characterized by “higher density, more contiguous development, preservation of green spaces, mixed land use with walkable neighborhoods, limited road construction balanced by transportation alternatives, architectural heterogeneity, economic and racial/ethnic heterogeneity, a balance of development and capital investment between central city and periphery, and effective, coordinated regional planning” (Frumkin 2002:211). The many health benefits emanating from this approach include less air pollution, lower temperatures, and more physical activity on the part of neighborhood residents. These, in turn, provide a cleaner environment and more habitable neighborhoods (Frumkin 2002:211). Spaces are redefined and reshaped, taking on new levels of significance for those inhabitants who remain in the shifting landscapes of these densely-populated regions of uneven development; there are huge discrepancies in their populations’ socio-economic and health conditions. In the ghettos,
the disadvantages of low-income and minority status are intensified, and one of the most significant outcomes is a so-called urban health penalty — the “confluence of conditions such as poor nutrition, poverty and unemployment with deteriorating housing, violence and loss of services” (Fitzpatrick and LaGory 2003:34-5). Today, the challenge faced by many cities is that of revitalizing inner-city neighborhoods “in ways that improve health and promote greater equity” (Corburn 2009:1).

To reach a greater number of urban poor, there is a demand for government involvement in the design of health service outreach and public health infrastructure. At least as important as the desired outcome is the method by which help arrives. Sclar et al. (2005:903) recount that they have “witnessed some of the most effective approaches to reduction of urban health problems carried forward by some of the poorest people in the world’s poorest cities.” The most common thread that weaves throughout such stories of success is that the poor should be meaningfully involved in the process of improving the slum conditions under which they live, and that the challenge is to bring these “participatory approaches to a scale where they can measurably improve the urban environment and population health.”

At such a time, it is important to support democratic governments at the local level as they partner with the urban poor in their acceptance and judicious use of critically needed external aid. Sclar et al. caution:

If we neglect the environmental and urban causes of the growing health burden on the urban poor, national governments and global society in general will simply accumulate a massive ‘health debt’ [that will] be far more expensive to pay off, if possible at all, three decades from now through conventional curative methods than it would be to prevent the problems now through housing, water, sanitation, and public health interventions that we know will permit us to avoid them (2005:903).
1.3.1. Context in which to collect data.

Determining the “top five” socioeconomic indicators that must be addressed is a complex question and to a certain extent *plurium interrogationum* as it presupposes something that has not been accepted by all the people involved — level of measurement aside. For example, “affluence” could be measured via personal income, market liquidity, household income, wealth, per capita income, average annual earnings per household, per capita balance of savings, per capita value of housing and land property, or per capita value of consumer durables. While some socioeconomic indicators are no doubt more frequently employed than others, these may not necessarily ensure they are uppermost in terms of availability, reliability, or validity.

In any city, people have different visions of the world, different definitions of health, different powers to impose their will on others, that all serve to suggest there are different ways to define indicators (Baum 1992; O’Neil 1993). Thus, within an evaluation framework, indicators are context-bound and each city will have to develop its own set of indicators so as to meet its own unique needs (Costongs and Springett 1997: 350).

1.3.2. Planning the research

Data Envelopment Analysis (DEA) will be applied to identify benchmarks for measuring the health of cities.

The determinants of urban health are complex. Factors derived from comparisons of local, national, and global aggregated statistics, and recognized as predictors of population health include income, social status, education, employment, living conditions, access to appropriate health services, and the physical environment.

Research consistently indicates that social and material deprivations are directly linked to disease incidence and are inversely connected to health and well-being — whether
such a concentration can be accounted for by the residents’ socio-economic status (SES) or if, in disadvantaged areas, an amassment of problems reinforces their occurrence.

1.4. SIGNIFICANCE OF THE STUDY.

In his book, *The City in History*, Lewis Mumford) began by asking: “What is the city? How did it come into existence? What processes does it further; what functions does it perform; what purposes does it fulfill?” (1969:3). These are queries to contend with before any semblance of a device for measurement may be constructed.

In a healthy city, the key driving concept is “quality of life.” This term means different things in different locations according to local issues and priorities. Yet rather than being given a rigid definition, citizens are given considerable control over the definitions; they are actively involved in projects often beyond committee representation — through surveys, people’s forums, workshops and local professional, religious and citizen organizations (Waddell 1995).

In 2000, the United Nations Centre for Human Settlements (UNCHS) proposed policies for urban health, and in its “Inclusive City” Declaration, set forth the norms of governance:

> Urban governance is the sum of the many ways individuals and institutions, public and private, plan and manage the common affairs of the city. It is a continuing process through which conflicting or diverse interests may be accommodated and cooperative action can be taken. It includes formal institutions as well as informal arrangements and the social capital of citizens; urban governance is inextricably linked to the welfare of the citizenry.

Good urban governance must enable women and men to access the benefits of urban citizenship. Good urban governance, based on the principle of urban citizenship, affirms that no man, woman, or child can be denied access to the necessities of urban life, including adequate shelter, security of tenure, safe water, sanitation, a clean environment, health, education and nutrition, employment and public safety and mobility.
Through good urban governance, citizens are provided the platform which will allow them to use their talents to the full to improve their social and economic conditions -- UNCHS 2000:5 (de Leeuw 2001:36).

All of this encompasses an overall strategy designed to build a strong local constituency of support, integrated into local activities, and with local objectives determined by its citizens. This differs substantially from traditional ways of developing social indicators; citizen-driven committees have replaced the isolated teams of researchers working for the central government. Furthermore, these citizen-driven committees exhibit independent viewpoints, do not depend on daily bureaucracy, and can meet with top government officials should they ever need to press their case (Waddell 1995:221).

A concise empirical investigation of urban productivity and provision of a model that bridges the gap between theory and the actual empirical estimation of urban health will establish benchmarks for measuring the health of urban populations.

1.4.1. Origin of the idea for this research.

The original research sought a definition: “What is a disaster?” However, during the research, it became apparent that to gauge the indicators of a city that had experienced a disaster, man-made or natural — but in any event, an ailing city — one must first invert the question and define the measures of a city that had not experienced a disaster — in other words, a healthy city. A considerable amount of literature was reviewed before this decision was reached and a great deal of it has provided insight for the task at hand.

In his definition of a disaster, Benjamin Wisner (2004) reflects a widespread opinion when he posits that all disasters can be seen as being man-made, reasoning that human actions before the onset of the hazard can actually prevent it from developing into a disaster. Thereby, all disasters come about as a result of human failure to implement
appropriate disaster counter-measures. However, this does little to answer the fundamental query; it merely appends itself to the discourse about disasters.

Raise the question “What is a disaster?” and the reference is to the definitional and conceptual problem the term presents for the advancement of social science research. Then how should the term “disaster” be conceptualized for social science purposes?

Despite more than a half-century of fairly extensive empirical disaster research, Quarantelli argues that the central concept of the field has not been systematically addressed. To be concerned about what is meant by the term “disaster” is not to engage in some useless or pointless academic exercise. Rather it is to “…focus in a fundamental way on what should be considered important and significant in what we find to be the characteristics of the phenomena, the conditions that lead to them, and the consequences that result” (1998a:xv).

Studies in the sociology of knowledge suggest that after a period of pioneering work, a developing field will flounder unless there emerges some agreement about certain central concepts. Therefore, unless a consensus is reached within the field of disaster research on what a disaster actually is, “…the area will intellectually stagnate” (Quarantelli 1998a:xiii). Thus, it is so in the absence of a consensus regarding the measurement of healthy cities.

The disagreement within and between disciplines on what should be the defining features of a disaster remain at issue. While empirical research will continue by way of the elephant test or a policy of I know it when I see it¹, the lack of consensus will continue to impede the development of any theoretical superstructure. Put simply, without clarification and relative consensus on a disaster’s defining features, researchers will continue to misread and talk

¹ Made famous by Justice Potter Stewart in his concurring opinion in Jacobellis v. Ohio (State Supreme Court, 1964), “I know it when I see it” is a colloquial expression used to categorize an observable fact or event. Especially, when the category is subjective or lacks clearly-defined parameters.
past one another on the characteristics, conditions and consequences of disasters. And so it will be in the case of determinants and measures of healthy cities.

While social science disaster researchers have not presented a unified view on what comprises a disaster, there has been a “noted move from the use of a label with a referent to primarily a physical agent to one which mostly emphasized social features of the occasion” (Quarantelli [1982] 1998a:xii) involving radically changed behaviors to meet a crisis. More specifically, disasters may be characterized as social change within social space and time.

In the wake of Hurricane Katrina, Jim Wallis, editor of liberal evangelical journal Sojourners, commented, “Sometimes it takes a natural disaster to reveal a social disaster.” In the aftermath of Katrina, it became readily apparent that natural disasters take place in the same social, historical, and political environments in which disparities in health already exist. Indeed, the hurricane exposed the underlying vulnerability of the residents, many of whom were black and poor. Michael L. Williams, the only black member of the elected Railroad Commission of Texas queried, ”…the real story is going to be what it always is: What is really being done about education? About jobs? About housing?” (Fletcher 2005).

Although mass casualties or significant property damage are not a prerequisite, they create major social disruptions and therefore are often economically costly and psychologically disturbing. And so, in similar way, without benchmark determinants and measures, it will be in the case of healthy cities.

1.5. THE PROBLEM

What is a healthy city? A concept that is difficult to define is difficult to measure, and what constitutes a healthy city is today at the forefront of many health policy debates throughout the world. A readily accessible and ever-increasing quantity of global data on the “healthy
“cities” concept is such that its very magnitude and availability demand that benchmarks be established in order to measure rightly the degree of an urban population’s health.

Sociologist William Schwab points out that several problems exist, one of which is measuring the process of population concentration — urbanization. Initially, one must consider “how great a population concentration is necessary to constitute an urban place — 2,000, 10,000, or 100,000 people?” And then, once this figure has been established, “how does one go about delimiting the city’s boundaries?” (Schwab 1992:36, 59). The United Nations spent many years trying to establish standards for measuring cities in order to make international comparisons, only to be thwarted by a miscellany of more than 30 global definitions when categorizing a population concentration as “urban.” Nevertheless, these definitions appear to fit into three somewhat broadly-based classifications as shown in Table 1.1 (Schwab 1992:36, 59).

TABLE 1.1. MOST WIDELY USED DEFINITIONS OF “URBAN” PRESENTED TO UNITED NATIONS.

<table>
<thead>
<tr>
<th>(1) BASED ON POPULATION SIZE</th>
<th>(2) BASED ON LEGAL OR GOVERNMENT CRITERIA</th>
<th>(3) USUALLY BASED ON LEGAL OR ADMINISTRATIVE STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used by approximately 35% of countries. Varies greatly: From 250 to 40,000 inhabitants.</td>
<td>Regardless of size if it is an administrative center (e.g., a county seat). Similarly, incorporation — recognition by state as a legal entity.</td>
<td>Combines size and legal or administrative standards. Whereas in the U.S., most state governments require a population concentration to reach a predetermined size before it can be incorporated, other nations combine criteria with other requirements (e.g., number of inhabitants employed in non-agricultural jobs) (Schwab, 1992: 36).</td>
</tr>
</tbody>
</table>
Another problem is in delimiting the city's boundaries. Boundaries based on population concentration and employment, or politics could be employed. In the U.S., “the larger urban places have a central city defined by politically established boundaries, but these central cities are surrounded by densely populated suburban areas whose inhabitants are employed in non-agricultural jobs” (Schwab 1992:37-8).

1.6. **PAST STUDIES**

For the most part, health policies are established by politicians. However, other actors influence the environment in which they are created and the various forms of knowledge on which they are based.

1.6.1. **Developing a Public Health Measure**

In 1801, England and Wales introduced a census which resulted in an increased awareness of various death-causing diseases and spotlighted the horrendous sanitary conditions of towns at that time. In the age of industrialization, those who flocked to the cities for jobs were vulnerable to health risks from carcinogens and pollutants, developing such as cancer, lung disease, and tuberculosis. As the population increased, poverty intensified. In many cases, overcrowded cities could offer their workers only substandard housing that lacked adequate ventilation and sanitation. (Magnello 2011:268-269).

An amendment to the 1836 Births and Deaths Registration Act required additionally that the cause of death be recorded. A General Register Office was established along with a “new method of enumeration that enabled the population to be measured without duplication or omission.” The 1841 census was planned, with the assistance of medical statistician William Farr, “so that it would produce the numbers at risk that could then be matched to the death statistics.” This allowed the calculation of “mortality rates by age, occupation, area, and cause of death” (Magnello 2011:269).
As Statistical Superintendent at the General Registry Office (GRO), Farr developed “a comprehensive nosology\(^2\) that listed secondary and tertiary causes of death” that aided both medics and assurance societies. It was he who redefined statistics “as a method of analysis rather than a social discipline in itself” (Goldman 1991 as cited in Magnello 2011:270).

Using statistics to assess public health and welfare, Farr also developed English life tables that gave the “exact measure of the duration of life under given circumstances” (Greenwood 1921 as cited in Magnello 2011:270) and these led to the *British Medical Journal* and the *Lancet* providing “monthly reports on the vital statistics of Britain and foreign countries.” His efforts to “create a predictive social science based on numerical relationships” resulted in his series of statistical laws which introduced “the law of recovery, the law of epidemics, and the law of mortality.” However, his laws, rather than being mathematically constant and therefore laws of epidemics, were instead, “mathematical expressions of specific situations with results that varied as circumstances changed,” consequently describing “various empirical distributions for different populations” (Magnello 2011:270).

Public health reforms in 1848 led to towns installing their own ministers of health and sanitary legislation led to reductions in the occurrence of infectious disease and death rates during the latter part of the nineteenth century. Thus, since the collection of data had given rise to the success of sanitary reforms, “the function of statistics became the measurement of health” (Magnello 2011:269).

\(^2\) Nosology: The systematic classification of diseases, or the branch of medical science that deals thereto. *Source: MedicineNet.com*
As its public health and hygiene movement advanced, so did Britain’s extensive system of vital statistics. It became a tool of bureaucracy with which to effect social reforms and develop health policies — moreover, it was unique to Britain (Magnello 2011:272).

Several years later, humanitarian and founder of modern nursing Florence Nightingale (1820-1910) was placed in charge of 38 nurses and dispatched to a hospital at Scutari, near Constantinople and the Crimea battlefields. She is credited with revolutionizing medical care in military and civilian hospitals “through her use of statistics” and the introduction of “essential measures of sanitary reform in hospitals in the battlefield and in London” (Magnello 2011:272).

On her arrival at Scutari in November 1854, Nightingale was aghast at the unsanitary conditions in the military hospital and after discovering that many of the soldiers were dying from infectious diseases (cholera, typhus, dysentery) rather than from war wounds, she quickly implemented new standards of diet, hygiene, and water treatment that, within a year, resulted in a 99 percent decrease in deaths due to infectious diseases (Aigner, Miksch, Schumann, Tominski 2011:22). “In February 1855, the mortality rate at the hospital was 42.7 percent of the cases treated” and “half a year after she arrived at Scutari, mortality in the hospital had dropped from 42.7 percent to 2.2 percent” (Cohen 1984:30-31). Also, during this time at Scutari, Nightingale began tediously to record mortality data (Aigner et al. 2011:22).

On her return to England in 1856, Nightingale was introduced to William Farr who was now “a major figure in statistics, author of a number of publications relating to public health,” and a founding member of the Social Science Association (Cohen 2005: 167). When Nightingale compared Farr’s figures with “the death rate in army barracks,” she discovered that even in periods when no wars were being fought, army death rates eclipsed civilian death rates by an almost 2:1 ratio.
Nightingale went on to campaign for sanitation reforms by communicating her compilation of data to Queen Victoria and parliament, and pressing for a formal investigation of military health care.

May 1857 saw the establishment of a Royal Commission on the Health of the Army (Cohen 1984:133). Subsequently, the Secretary at War requested that Nightingale “prepare a report of her experiences and observations in the Crimean campaign, and her views on sanitary reform generally” (Cohen 2005:168). To convey the quantitative data she had accumulated during the two-year period, Nightingale created polar area diagrams (also called Nightingale graphs) with which to present her findings (see Appendix A).

Later, exerting her influence over the 1862 Census, Nightingale persuaded the GRO firstly, “to extend its scope by collecting statistics that would serve as a foundation for sanitary reform,” this to be accomplished by including the previously marginalized “sick and infirm,” and secondly, “to obtain complete data on the housing of the population” since she was convinced there was a significant connection between health and housing (Magnello 2011:277).

For Nightingale, the importance of her statistical data lay in their political and practical value as they culminated in “medical and social improvements, parliamentary reform, and, ultimately, the saving of human lives.” (Magnello 2011:278).

1.6.2. Changes in European urban social structures

In his seminal 1887 book Gemeinschaft and Gesellschaft, Ferdinand Tönnies pointed out three aspects of change in European society:

(i) People’s status was becoming more dependent on their individual accomplishments rather than their ancestry.
(ii) The individual was becoming “increasingly viewed as the basic unit of society rather than simply a member of a communal organization.”

(iii) “The character of societies themselves had changed from sacred-communal to the secular-associational” (Schwab 1992:336).

Using a technique known as ideal types to analyze the qualities of past and present societies, Tönnies developed a theoretical polarity between two different types — Gemeinschaft (community) and Gessellschaft (society). The former refers to “small, homogeneous communities based on tradition, communities in which an individual is guided by the norms and conventions of the community and is tied to the institutions of family and church.” The family is the basic unit of the social structure; hence, an individual’s life “has meaning only in the context of the family and the larger community.” Gessellschaft is diametrically opposed to Gemeinshaft and refers to “large, complex, heterogeneous societies composed of individuals. In these societies, reason prevails and contracts define the relationships between people” due to the fact that economic self-interest guides their relationships. Furthermore, the vast and complex social structure negates the identification of an individual’s social status (Schwab 1992:337-8, 362).

Tönnies provided insights into the fundamental social changes wrought by increasing urbanization and industrialization. Gessellschaft is not only a concept, but it is also a process of transformation. Thus, as society is transformed from Gemeinshaft to Gessellschaft, the character of its social organization is changed due to the weakening of communal ties, the decrease in social solidarity, and individuals becoming alienated and more isolated (Schwab 1992:338).

Émile Durkheim was concerned with the social glue that holds individuals together to form a functioning society and his analysis of the types of social solidarity is considered most important. Durkheim hypothesized that there are two types of social solidarity —
mechanical and organic. The first is similar to Tönnies’ *Gemeinschaft* and concerns a division of labor based on the age and sex of individuals within the family unit and their agreement on what society should be — the collective conscience. The second concerns large, complex societies and the division of labor is based on specialized skills learned through years of formal training. Durkheim reasoned that because there is no single unifying collective conscience, they must have a special type of social cohesion — organic solidarity (Pearce 2005:219; Schwab 1992:339). In organic solidarity, Durkheim claimed there may be “pathological forms of the division of labor.” One such case is the anomic division of labor when “individuals suffer from a lack of moral and social relatedness; they cannot see the relationship between their specialized activity, that of others, and the goal of an enterprise as a whole, and the extant forms of regulation are inappropriate for the key forms of social organization.” Also, he maintained that genuine organic solidarity demands “the appropriation, redistribution, and abolition of inherited wealth” (Pearce 2005:219).

In his empirical study, *Suicide: A Study in Sociology*, published in 1897, Durkheim described suicide, “the most private of human decisions, whether to live or to die, was best understood as an effect of social relationships.” In identifying four main types of suicide, he stated that one — fatalistic suicide — “derives from excessive regulation, that of persons with their futures pitilessly blocked and passions violently choked by excessive discipline.” And yet it remains a present-day phenomenon for there is still “forced division of labor” and whole social classes see their futures “pitilessly blocked” (Pearce 2005:220).

1.6.3. Changes in American urban social structures

Sociological theorist Georg Simmel, born in 1856, had an “ability to move from micro-level analysis to a metaphysical and metahistorical concern with the nature of human civilization” (Parker 2004:14). In his 1903 seminal essay, *The Metropolis and Mental Life*
Simmel alludes to the pressures of city life, but insists that “the freedom from parochialism and surveillance that Gemeinshaft (small town) existence perpetuates” is more than compensatory (Parker 2004:14). His theory of the city explores the relationship between the urban environment and the behaviors, attitudes, and experiences found there — the individuality, blasé attitudes, and emphasis on precise time schedules wrought by conditions found in the city. Beyond the physiological dimension of health and disease, Simmel hypothesized that as the size and density of a city increase, each individual is less able to comprehend and control situations and consequently develops feelings of powerlessness, isolation, social withdrawal, and alienation (1950:414) — characteristics that have been the concern of sociologists during most of the twentieth century and considered to be at the root of many urban problems. Moreover, the nonstop bombardment of irreconcilable stimuli upon individuals ultimately exhausts their mental energies, impeding their response to new situations.

Urban scholars in the United States were influenced by European theorists and by the changes they observed in the cities where they lived. This was especially true of Robert E. Park and his colleagues and students at the University of Chicago when they formed the Chicago School of Sociology (Schwab 1992:3; Palen 2008:150). For instance, Simmel’s impact on the Chicago School was undeniable and greatly influenced social scientist Stanley Milgram who, after deeming the significance of bringing investigations “under a more rigorous theoretical discipline,” used systems analysis to research specific phenomena of city behavior (Milgram 1970:243; Parker 2004:13).

During the 1920s, Park developed a conception of the city as a social organism made up of interdependent communities, and theorized that within cities there arose natural social areas such as immigrant colonies, ghettos, or bohemies. Park’s sociology proposed examining the processes that led to the emergence of these areas, their relationship to
other parts of the city, and the experiences of their inhabitants. In collaboration with Ernest Burgess, he and his students immersed themselves in the ecology of the city of Chicago (Lauer 2003:1053).

Park and his colleagues theorized that the cultural level of society is a structure based on customs, norms, laws, and institutions, involving “the unique aspects of the human species — reason, morality and psychological makeup.” He cited a working-class neighborhood that demonstrates a relationship between the two levels of society. The natural area is the place in the city where working-class members can afford to purchase housing and still pay for transport to their workplaces — the biotic factors. Then once this is established, the natural area “develops norms and values as well as institutions such as schools, churches, and fraternal organizations — the cultural level of society” (Schwab 1992:5).

Park and his team trekked into the city of Chicago to document verifiable facts in order to bring about meaningful social reform since American cities at that time faced “massive levels of poverty and social disorganization, deplorable housing and sanitation conditions, and inadequate transportation.” From the onset, Park placed emphasis on “the location and spatial relationships of institutions, groups, and sub-areas within the city and the processes that modify these patterns over time.”

In 1916, his benchmark work, The City: Suggestions for the Investigation of Human Behavior in the Urban Environment, was published. Some of the questions Park asked are listed in Table 1.2 (Schwab 1992:5-7; Park 1969:91-130). Park’s research program led to the understanding of how cities operate and it engaged Chicago ecologists throughout the next two decades (Schwab 1992:36). But even Park and the Chicago School, who described natural areas as concrete entities “that could be searched for, identified, and described scientifically,” were unable to reach a consensus on how to define an area’s boundaries (Schwab 1992:240).
TABLE 1.2. SOME OF THE QUESTIONS LISTED IN PARK’S RESEARCH PROGRAM.

(i) What are the sources of a city’s population? How is city growth a combination of natural increase and net migration?

(ii) What are the city’s natural areas? How is the distribution of the city’s population among the neighborhoods affected by economic interests such as land values and by non-economic factors as well?

(iii) What are the social rituals of various neighborhoods—what things must one do in the area to be fully socially integrated and to avoid being looked upon with suspicion or thought peculiar?

(iv) Who are the local leaders? How do they embody local interests? How do they attain and maintain social influence and power? How do they exercise control?

(v) Do social classes in fact become cultural groups? Do they acquire an exclusiveness independent of race and nationality?

(vi) Do children in the city follow in the occupational footsteps of their fathers?

(vii) How is social unrest generated and manifested? Are strikes and mob violence produced by the same conditions that generate financial panics, real estate booms, and mass movements of the general population?

(viii) What changes have taken place in the family? In what areas of family life has change been the greatest? How has such change been induced by the urban environment?

(ix) How have educational and religious institutions been modified by the process of urbanization?

(x) Does property ownership affect school truancy, divorce, crime? In what areas of the city and among which groups is crime endemic?
In the 1950s, sociologist Herbert Gans wrote a series of essays that addressed many urban problems, most notably poverty and racial equality. He argued that city planning “has not paid much attention to people’s goals, effective means, or to the urgent problems of the cities,” and in 1950, he became a member of the planning profession. “I became one of a handful of planners who were also sociologists and attempted to bring sociological concepts and data to bear on the policy issues of planning” (Gans 1968:vii).

Social scientists entered city planning in the 1930s, and following World War II, some joined the University of Chicago in the establishment of a planning school that was “the first to stress social science rather than architectural techniques” (Gans 1968:71).

In his essays, Gans chronicled the replacement of the “working-class machine politician by middle-class, college-educated politician-administrators” which resulted in city governments reacting more favorably to the latters’ specialized knowledge. At the same time, he noted, communication between the planners and the politicians improved due to the lessening of their class differences (Gans 1968:70).

Nonetheless, Michael Marmot, Chair of the WHO Commission on Social Determinants of Health (2005-2008) admonished: “Recognising the health effects of poverty is one thing. Taking action to relieve its effects entails a richer understanding of the health effects of social and economic policies’ (2005:1101).

1.6.4. Dimensions in urban health

The World Health Organization (WHO) published a series of yellow monographs in the late 1980s which laid down the foundation of the Healthy Cities concept and, in reviewing the material some years later, much of the writing is still considered inspirational with validated observations concerning the creation and maintenance of health in the urban context.
Hancock and DuHL put forth that one must encounter a healthy city in order to identify it:

It must be experienced, and we must develop and incorporate into our assessment of the health of a city a variety of unconventional, intuitive and holistic measures to supplement the hard data. Indeed, unless data are turned into stories that can be understood by all, they are not effective in any process of change, either political or administrative (de Leeuw 2001).

Because health affects everyone, people from all walks of life have a personal stake therein, and those citizens of first-world countries count health services among their given “rights.” Furthermore, the high profile nature of health becomes a very sensitive political subject of concern with many issues of power. As health care models change, resources shift to new institutions and professions, creating uncommon challenges and opportunities (Waddell 1995).

When Marleen Goumans (1998) did research for her *Innovations in a Fuzzy Domain*, she asked politicians and civil servants in 10 British and Dutch cities for their perceptions of their towns as being Healthy Cities, and no two perceptions were alike. If she had included community leaders and non-governmental organization (NGO) representatives in her questioning, the responses would have been even more “fuzzy.” Nevertheless, writings used to bolster Healthy Cities projects globally appear more consistent, but even then, the sets of core health determinants vary considerably.

Hancock and Labonte (1999) used a framework that was developed and tested over a number of years, proving to be both “empirically useful and conceptually strong.” Figure 1.1 shows the basic framework which links the elements into a “three-legged stool” configuration of community sustainability and well-being — community, environment, and economy.
Focus is, of course, on the desired outcome — health. By interpreting health as human development, and community as society, the model also serves to integrate the “four capitals” that are often used in Canada as an organizing structure for community-level quality-of-life indicators: human, social, ecological, and economic.
However, in its original development, the model did not adequately represent several significant dimensions of community health and well-being, namely education and governance. The former is a key driver of human development and the latter covers various aspects and modes of governing. These two key “drivers” encompass communication, participation, empowerment, civil rights, and government performance. These elements independently enhance human health and increase the probability that individual, community and political decisions in the three spheres and their links will result in improved health.

1.7. **Organization of the Study.**

Chapter 1 explains the correlation between public health and living environments within a city, and the compelling need for indicators to measure the health of a city. From this discussion arises the statement of the problem, along with the topic, context, and significance of the study. Chapter 2 reviews the relevant literature on the social causes of health and illness, the measurement of health in cities, the enabling features of intersectoral partnerships, and governance via social, economic, and political bases. Chapter 3 describes the research methodological choices that were made and how they were put into practice. Chapter 4 disseminates the disparity of the individual measures of urban health among MSAs, measures the relationships between urban health and both income inequality racial and ethnic heterogeneity. Data Envelopment Analysis is then used as a means of benchmarking individual MSAs and, as a result, peer groups are identified and peer weights offered. Chapter 5 discusses the accomplishments of the study, its limitations, and suggestions for future research.
2.1 HISTORICAL OVERVIEW

It has long been recognized that people’s health is strongly influenced by social and environmental factors. Harking back to the sanitary campaigns of the nineteenth century is an awareness of the significant connection between social position, living conditions, and health outcomes. Major population health improvements in industrialized nations began in the early nineteenth century, and by the early twentieth century, mortality rates had declined dramatically.

During the nineteenth century, the undernourished populations in European and North American cities suffered through epidemic diseases along with insanitary housing conditions and environs. Cities throughout the world made a collective effort to initiate a movement to form municipal public health departments charged with executing public health legislation to cover improvements in environmental issues and development of fundamental hygiene standards for food, housing, sanitation, and water (Ashton et al. 1986:319).

Anthropologist and politician Rudolf Virchow (1821-1902), credited for his decisive role in the founding of social medicine in Germany, focused on the fact that disease is never purely biological but often is socially derived. Virchow placed emphasis on a sociological theory of disease, arguing that “political and socio-economic factors acted as significant predisposing factors in many ailments” (Irwin, Scali, Vega, and Solar 2005:8; Steen 2008:5). Virchow also put forth that some diseases were "artificial," having been caused by societal conditions, and therefore, could be healed through social change (Kleinert 2010).
A proponent of social medicine, Virchow posited:

If medicine is to fulfill her great task, then she must enter the political and social life of our time; it must indicate the barriers which obstruct the normal completion of the life cycle and remove them. Should it ever come to pass, Medicine, whatever it may then be, will become the common good of all.

He questioned, “Do we not always find the diseases of the populace traceable to defects in society?” (Irwin et al. 2005:8; Steen 2008:5).

However, more structural causes may be identified according to an analogy recounted by sociologist Irving Zola and told to him by a physician friend as he lamented the dilemmas of modern medicine:

“...sometimes it feels like this. There I am standing by the shore of a swiftly flowing river and I hear the cry of a drowning man. So I jump into the river, put my arms around him, pull him to shore and apply artificial respiration. Just when he begins to breathe, there is another cry for help. So I jump into the river, reach him, pull him to shore, apply artificial respiration, and then just as he begins to breathe, another cry for help. So back in the river again, reaching, pulling, applying, breathing and then another yell. Again and again, without end, goes the sequence. You know, I am so busy jumping in, pulling them to shore, applying artificial respiration, that I have no time to see who the hell is upstream pushing them all in” (Zola 1970, cited by McKinlay 1975:7).

Thus, important ethical issues arise, not the least of which is a moral imperative in deciding whom to rescue when not all can be saved. Also, unquestionably, attention must be focused “upstream.”

2.1.1. The social approach to health

The World Health Organization (WHO) drafted its Constitution in 1946. The issues it addressed included the fundamental social causes of health problems along with the challenges of delivering effective remedial medical care. One of the WHO’s most important functions is working with member states and specialized agencies in
promoting “the improvement of nutrition, housing, sanitation, recreation, economic or working conditions and other aspects of environmental hygiene.” Moreover, the WHO’s Constitution expects a “supportive integration of biomedical/technological and social approaches to health,” even though there have been some disruptions in this unity along the way (Irwin, Scali, Vega, and Solar 2005:8).

On July 22, 1946, at the International Health Conference held in New York, the Constitution of the WHO was adopted and signed by the “duly authorized” representatives of 61 States, and “entered into force” in April 1948. Its strength is evidenced in its Preamble which states the principles on which the document is based and “implicitly asserts a claim to jurisdiction.” It claims as its own “the full area of contemporary international public health” (Grad 2002).

Despite subsequent amendments that have been adopted throughout the ensuing years, the Preamble remains unchanged and defines health positively with the first principle proclaiming: “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO 1946:2; Grad 2002; WHO 2006a:1). So, in addition to a solely physiological dimension of health and disease, the WHO definition emphasizes the relevancy of the psychological and social aspects (Saracci 2010:12).

Moreover, on December 10, 1948, the United Nations General Assembly adopted and proclaimed in Article 25 of the Universal Declaration of Human Rights:

Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing, and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control (UN 1948).
Duhl and Sanchez posit that these definitions are indicative of the public health concept relinquishing a medical model and shifting back toward a social model — the former focusing on “the individual and on interventions that are used to treat disease”; the latter considering health as “an outcome of the effects of SES [socio-economic status], culture, environmental conditions, housing, employment and community influences” (Duhl and Sanchez 1999:7). By controlling risk and making modifications to the environment, public health seeks to “prevent disability and premature death through organized collective action.” All persons are not born equal and social justice is about shared responsibility and the collective good (Duhl and Sanchez 1999:8).

2.1.2. The Healthy Cities Project

It is becoming increasingly apparent that human health is inextricably linked to environmental health (Jackson 2003:191). Based on the connection between urban living conditions and health, the WHO is central to the development of the Healthy Cities Project, an idea spawned in 1984, declaring:

A healthy city is one that is continually creating and improving those physical and social environments and expanding those community resources which enable people to mutually support each other in performing all the functions of life and in developing to their maximum potential (WHO 1998:13).

When the WHO’s European Office launched the Healthy Cities project, Ashton et al. (1986) reported that it was an opportune time to support “integrated approaches to health promotion at the city level.” And, perhaps more importantly, they emphasized that:

The city is often the lowest administrative level which can marshal the resources and has the political mandate and authority to develop and implement intersectoral approaches to health; because it is a place with which its citizens identify, there are good prospects for participation harnessed to neighbourhood or civic pride (Ashton et al. 1986:320).
As WHO promoted its core principles and emphasized the importance of non-medical interventions for good health, the Healthy Cities movement gained recognition in international initiatives. Following a presentation of the Healthy Cities Project at a Lisbon, Portugal symposium in 1986, its popularity exploded and spread to more than 3,000 communities in more than 50 countries throughout the world (Flower 1993; Hancock 1993; Waddell 1995). The symposium focused on finding a new paradigm for a healthy city — one that would view health “as a social rather than a narrowly medical concept” and show how health in cities might be determined as a result of measurement (Ashton et al. 1986:321).

In 1986 in Ottawa, Canada, the *Ottawa Charter for Health Promotion* was presented and adopted at the first International Conference on Health Promotion, proclaiming:

> The Conference is firmly convinced that if people in all walks of life, nongovernmental and voluntary organizations, governments, the World Health Organization and all other bodies concerned join forces in introducing strategies for health promotion, in line with the moral and social values that form the basis of this CHARTER, health for all by the year 2000 will become a reality (Canadian 1986; Duhl and Sanchez 1999:39).

The Charter highlighted the significance of specific and effective community action in prioritizing health concerns, developing strategic plans, and decision-making in order to achieve better health (Nutbeam 1998:354). More specifically, the Charter, as a source of inspiration and guidance for health systems throughout the world, identified:

> Five priority action areas which are the basic tools for health promotion…

- build healthy public policy.
- create supportive environments for health.
- strengthen community action for health.
- develop personal skills.
- re-orient health services (Nutbeam 1998:351).
Ashton and others emphasized the need for traditional public health matters (education, unemployment, housing, environments) to be re-examined from a different standpoint and mourned the fact that health had become somewhat mechanistic, thus ignoring perspectives “derived from anthropology, sociology and behavioural and political science” (Ashton et al. 1986:320).

Leonard Duhl (in his 1984 article on Healthy Cities) contended that a city should be conceived as a whole. Within this context, rather than considering only the urban setting as a whole, why not take a global perspective on the social and political determinants of health? (Ashton et al. 1986:320; Barten, Mitlin, Mulholland, Hardoy, and Stern 2007:i171).

2.1.3. Evaluating Healthy Cities: 20 years later.

Since the Healthy Cities project was launched in 1986, it has become an international movement with thousands of communities participating globally. Despite many efforts to evaluate the effectiveness of the project, there is a failure to realize that identifying an appropriate way in which to evaluate Healthy Communities initiatives is largely a political task to be agreed upon by different stakeholders (O’Neill and Simard 2006:146). From various reasons put forth by evaluation specialists, O’Neill and Simard selected five that they considered most important with an initiative such as the Healthy Cities movement:

(i) To assess the extent to which the movement has changed anything in community political processes or community health.
(ii) To maintain the political legitimacy of a Healthy Cities project.
(iii) To make a comparison with other citizen groups, community organizations, and politicians.
(iv) To demonstrate the success of community mobilization and sustainability.
(v) To contribute to scientific knowledge.
They emphasize that all of these are legitimate reasons to evaluate the Healthy Cities movement and that no one reason is more valuable than another (O’Neill and Simard 2006:146).

2.1.4. The Millennium Development Goals (MDGs)

Within the United Nations Development Programme (UNDP) — instituted in 1965 — are the Millennium Development Goals (MDGs). In 2000, 189 countries committed to the MDGs that set benchmarks for reducing by 50% extreme poverty and hunger by 2015; reducing by 66% the under-five child mortality rate; reducing by 75% the maternal mortality ratio; and to halt and begin to reverse the spread of HIV/AIDS and the incidence of malaria and other major diseases (UNDP 2010; Lancet 2010:929).

The MDGs have had positive achievements: mobilizing “unprecedented political support, advocacy efforts, financial resources, and encourag[ing] improved monitoring and evaluation of programmes” (Lancet 2010:929). The goal of disease-specific interventions, while possibly accelerating the progress of MDGs, is to strengthen existing health systems rather than to create parallel structures. It is essential that existing health systems not be undermined so that interventions may be integrated in a manner that ensures better funding, “staffing by qualified personnel and…adequate transport facilities and infrastructure” (UNDP 2010:13).

2.2. Measurement of Healthy Cities

“The determinants are the predictors of our future health.” America’s Health Rankings® is an annual assessment of U.S. health on a state-by-state basis with a 22-year history, and in 2011, it grouped determinants into four individual measures on which to base its findings, stating that these are the “actions that can affect the future health of the population”:
(i) Behaviors.
(ii) Community and Environment.
(iii) Public and Health Policies.
(iv) Clinical Care.

However, while noting that development of these inputs would enhance outcomes over time, they also pointed out that “most measures are actually a combination of activities in all four groups.” For example, smoking is a behavior strongly influenced by the groups shown in Figure 2.1. It follows, then, that changes in health determinants are due if an improvement of the urban population’s health is to be achieved (United Health 2011:30).

FIGURE 2.1. SMOKING — INFLUENCED BY A COMBINATION OF ACTIVITIES IN OTHER GROUPS.
In 1925, Robert Park wrote:

> Because of the opportunity it offers, particularly to the exceptional and abnormal types of man, a great city tends to spread out and lay bare to the public view in a massive manner all the human characters and traits which are ordinarily obscured and suppressed in smaller communities. The city, in short, shows the good and evil in human nature in excess. It is this fact, perhaps, more than any other, which justifies the view that would make of the city a laboratory or clinic in which human nature and social processes may be conveniently and profitably studied (45-46).

By examining determinants and using indicators, the needs of a healthy city can be established. These include the available resources, the characteristics and relationships of populations and communities, and the inequalities in health (Nakamura 2003:78).

Health inequalities are relentless and difficult to transform. Thus, the need to develop mechanisms of measurement is crucial, along with audit and review procedures to evaluate progress (Earwicker 2010:221). The recently published Marmot Review of health inequalities in England post-2010 affirms that there is a social gradient in health; namely, that the “the lower a person’s social position, the worse his or her health.” Members of the team concluded that all the social determinants of health must be included in actions to reduce the gradient in health (Marmot 2010:15, 16).

At a 2002 national roundtable discussion, the Canadian Population Health Initiative (CPHI) concluded that without a life-course perspective on theories about the relationship between poverty and health at the population level, key pieces of the picture are missing. Also, that because “general theories that apply to the entire population miss the ‘highly selective disadvantage’ in some sub-groups in the population,” theoretical frameworks, to be of use in assessing the effectiveness of interventions, “must be focused to ensure that issues specific to selected sub-groups are addressed” (CPHI 2003:13).
In other words, a community’s health goals, bolstered by benchmarks and indicators, may influence federal, provincial, territorial, and local investments to improve health (Subcommittee 2009:23)

2.2.1. **Determinants that affect human health.**

Because health is unevenly distributed throughout populations, on average, poorer people are less healthy than wealthier people; this indicates an association between health and wealth (Evans 2007:155). Consequently, how resources are distributed affects the quality of the social determinants of health (Raphael 2003:15), and so, influences the health of the community.

Over the past several decades, the determinants of health at both individual and population levels have been well-documented, and thus, their bases are numerous. The WHO defined the determinants of health as “the range of personal, social, economic and environmental factors which determine the health status of individuals or populations” (WHO 1998). In other words, the conditions under which people are born, live, work, and their age affect their opportunities for health, risk of illness, and life expectancy (WHO 2010a).

In 2000, a European Commission report stated that individuals exercise control of some determinants of health, such as “individual health behaviors and the use of health services,” whereas other determinants, such as “social, economic and environmental conditions, and the provision of health services” are outside their control (International 2000:3).

Most importantly, there is growing evidence that income distribution is one of the key determinants of population health and Wilkinson states, “It is now clear that the scale of income differences in a society is one of the most powerful determinants of health standards in different countries, and that it influences health through its impact on
social cohesion” (Wilkinson, 1996: ix). Indeed, research shows that health status improves through ascension of the income and social hierarchy. Moreover, despite the amount they spend on healthcare, richer societies with an equitable distribution of wealth experience the healthiest populations (Federal 2004:2).

Lynch and others concluded that income inequality should be viewed as a structural aspect of the economy and that varied distribution of income results from the “complex interaction of particular economic, historical, and social factors” (Lynch et al. 1998:1079). In 1999, Michael Wolfson and others conducted a study using data from the 1990 U.S. Census and the CDC in which the principal purport was “to assess the extent to which observed associations at population level between income inequality and mortality are statistical artifacts.” They concluded that an important association exists between state level income inequality and mortality “over and above anything that could be accounted for by any statistical artifact.” The result emphasized the essentiality for a wide scope of societal issues to be considered as fundamental determinants of health (Wolfson 1999:953).

On the other hand, Hugh Gravelle posits that individual risk of mortality is affected by individual characteristics (e.g., education) and state level characteristics (e.g., climate, public health infrastructure), cautioning that, when testing for a meaningful connection between income distribution and the distinction between actual and hypothetical state mortality, the potentially confusing effect of other measures at state level (mean education level, climate, expenditure on public health, etc.) necessitates deliberation (Gravelle 1999:957). However, an increase in education provides an opportunity for increases in income and job security, and bestows a sense of control of life circumstances (Federal 2004:2).
Although recognized behavioral risk factors such as smoking, poor diet, high alcohol consumption, and lack of physical exercise are reasons for some of the inequality in health, they account for less than half of the socio-economic gradient in mortality (Evans 2007:160). Even so, the effects of strong social relationships (friends, families, communities) can counteract such risk factors including obesity and high blood pressure (Federal 2004:2).

Health inequalities can be reduced and population health can be improved by the strengthening of social determinants of health (Raphael 2000:16). Also, disease causation in individuals or within a population can be studied at many different levels — including lifestyle and socio-economic factors (Pearce 1996:680). And then, there are other inequalities that might be avoided, such as those that are genetically based, “but are for the most part restricted by economics and social acceptance.” Yet others may include health-damaging behavior as a matter of individual choice in spite of health promotion efforts. However, some determinants are regarded as avoidable — namely, safe and healthy work and living environments, healthy childhood development, and so forth (Carter-Pokras and Baquet 2002:427-8).

Nevertheless, there is considerable difficulty in determining what is avoidable and what is unavoidable since knowledge, available resources, public acceptance, and ideology all play roles. Carter-Pokras and Baquet theorized that if it can be verified that an inequality is avoidable, “a judgment may be made as to whether it is unjust,” and consequently, whether an inequity is discernible. Moreover, they counseled that the concept of a health disparity “includes an ethical judgment of which conditions are considered unacceptable” (Carter-Pokras and Baquet 2002:428).

In 2005, the WHO, arguing that procedure on social determinants of health is the most equitable and effective way in which to improve people’s health, instituted the
Commission on Social Determinants of Health — its mission being to “link knowledge with action” (Marmot 2005:1099; Labonté and Schrecker 2007). However, the WHO’s Regional Office for Europe, rather than issuing an authoritative definition or list of social determinants of health, specified 10 topic headings: social gradient, stress, early life, social exclusion, work, unemployment, social support, addiction, food, and transport (Wilkinson and Marmot 2003:10-29; Labonté and Schrecker 2007). Despite acknowledging that the list is “impressive,” Labonté and Schrecker criticize the list for the way in which it mixes categories:

[F]or example, working conditions, unemployment and access to transport all contribute to the social gradient. Further confusing the issue is the inclusion of stress and addiction, with the former arguably a pathway through which SDH [social determinants of health] affect physiology and the latter a response to characteristics of the social environment (2007).

The design of research must take into account the influences of the social and political context on health and health behavior (Stokols 1992). After all, the making of policy and the decisions on what is or is not avoidable and unjust, will depend on who is deciding and how it is decided (Carter-Pokras and Baquet 2002:432).

2.2.2 Indicators that influence urban health levels.

It is essential that indicators of a healthy city be established in order to monitor its progress, to make intra comparisons, and to make adjustments. Now, with the advancement of technology, it is possible to get more accurate indicators of socio-economic status. The WHO (1998:9) defined health indicators as follows:

A health indicator is a characteristic of an individual, population, or environment which is subject to measurement (directly or indirectly) and can be used to describe one or more aspects of the health of an individual or population (quality, quantity, and time).
Most importantly, there is a need to establish tangible and measurable health goals, objectives and targets in order to establish standards of comparison. These will identify the areas on which attention is to be focused along with the data to be collected and the indicators with which to monitor; thus strategies will be devised and progress will be measured and reported (Subcommittee 2009:21, 23).

The foundation for the development of a community’s health indicators is based on “health statistics, including vital statistics, demographic statistics from census reports, socio-economic statistics, and results from other community-based surveys” (Nakamura 2003:77). Tyler Norris, after researching the social determinants of health, also concluded that health encompasses a broad range of quality-of-life issues and is a secondary product derived from many choices and factors — not just the result of medical intervention (see Table 2.1).

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifestyle and behavior choices</td>
<td>50%</td>
</tr>
<tr>
<td>Genetic endowment</td>
<td>20%</td>
</tr>
<tr>
<td>Socio-economic, cultural, and physical environment</td>
<td>20%</td>
</tr>
<tr>
<td>Medical intervention</td>
<td>10%</td>
</tr>
</tbody>
</table>


Healthy Cities indicators may be used in many ways, thus providing important source material for policy-makers. However, their value depends on the development of strong measures that overcome the various difficulties encountered in the collection of data — namely, accuracy in recording and validating, and economic feasibility. Some cities are limited by financial and/or human resource constraints in their ability to conduct sophisticated and sizeable surveys (Crown 2003:68).
Work on indicators, undertaken by the WHO and elsewhere, has “demonstrated the problems of interpretation across different cultural, ethnic, political and economic groups,” thus pointing out the difficulties in comparing or quantifying the health of cities in a meaningful way (Crown 2003:71, 72). Well-supported programs of intervention have resulted from those cities’ publications that were presented with accuracy, and consequently, they have had a positive effect on the lives of those most needy (Crown 2003:72).

In quantifying the problems of disadvantaged and under-served groups in the community, special surveys may be needed aside from routinely collected data, to expand the prevailing scope of information on specific indicators. In question are the groups that include single parents, older people, homeless people ethnic minorities, and so forth (Crown 2003:70). Also to be measured are those behaviors closely connected to an individual’s health status, such as “lifestyle, coping skills, health literacy, diet and eating habits, and disease-prevention activities.” These aggregated results produce health indicators. (Nakamura 2003:77).

In 1986, Ashton and others theorized that cities would collaborate in data collection and surmised that a common data base would consist of three categories — “mandatory, recommended, and optional” (Ashton et al. 1986:321). Conversely, in 1993, Hancock argued that indicators are context-bound and, for this reason, each city will need to develop its own set of indicators in order to meet its own requirements; as a result, the development of a generic set of indicators to allow intercity comparison is not possible (Hancock 1993).

At a 2004 Symposium on Land Use and Health held in Washington, DC, while discussing the integration of land use and public health in community design, one participant put forth repeatedly the idea of a Health Equity Index that: “could serve as an
indicator for how society is faring.” Even though the idea might be only hypothetical at the time, the participant emphasized the importance of planners and health officials not allowing others to “define what the questions are and what is important to discuss,” and that collaborators should adopt a fearless approach in discussing health issues bracketed to the built environment (National 2004:14).

In short, indicators point to priorities and offer measures for progress. Therefore, because systematic and quantified measures are critical, the ranking of objectives should be complemented by indicators. (Crown 2003:71).

2.2.3 Evaluation framework

The evaluation framework is a practical method of organizing an analysis of social determinants and demonstrating their relevance, feasibility, and value. It indicates the impact of social determinants on specific health conditions, the disparate vulnerabilities of individuals and populations, and the social and economic consequences.

In 2005, the World Health Organization established a Commission on the Social Determinants of Health to consider potential policies to address social determinants of health and health inequalities between and within countries. The Commission’s vision is “a world in which all people have the freedom to lead lives they have reason to value,” and its 2008 report confirmed that the fundamental determinants of health rest in the social conditions in which people live and work (WHO 2000; Marmot 2009:9-10).

The WHO Commission on Social Determinants of Health, commenting on the causes of health inequities between and within countries, stated:

This unequal distribution of health-damaging experiences is not in any sense a ‘natural’ phenomenon but is the result of a toxic combination of poor social policies and programmes, unfair economic arrangements, and bad politics. Together, the structural determinants and conditions of daily life constitute the
social determinants of health and are responsible for a major part of health inequities between and within countries (WHO 2008).

Information on the policy process may be had through the development and interpretation of evaluation indicators. Because there are numerous types of indicators already in existence for measuring health-related policy concepts, those indicators selected will vary according to who requests the indicators, who pays for the selection, who uses it, and their accompanying agendas. As a result, the development and use of indicators to evaluate health-related policies may prove to be less a technical problem than a political problem (O’Neill 1993).

Above all, an evaluation framework in a variety of contexts is requisite in order to measure the success and/or influence the processes and conditions under which health-related urban policies are formulated, implemented, and facilitated (Costongs and Springett 1997:345, 359). Developing a framework that is apposite to the numerous health-related policies of cities requires insightfulness regarding the implications of policy that affect various public sectors, the political and organizational contexts, and the hidden agendas of stakeholders (Costongs and Springett 1997:347).

No matter who funds the evaluation project, they are the most likely to shape the kind of evaluation to be implemented. Furthermore, there is a potential for those financing the project to seek control and sanction — but that is often denied. Nevertheless, the client for the evaluation often determines “the very nature of the process and, in the end, the nature of the knowledge produced and its utilization for decision-making” (O’Neill and Simard 2006:149). So, in the development of a project, equal importance is placed on the different stakeholders’ attainment of a consensus on evaluation and the results of the evaluation itself (O’Neill and Simard 2006:150).
2.2.3.1. The future of indicators

The health levels of city residents must be dealt with in terms of complex reciprocal actions among a diverse set of health determinants — social, physical, economic (Takano and Nakamura 2001:263).

It is imperative that consistency be maintained in regular data collection and standard definitions of the indicators in use. Even though improvements and amendments to the data set may be introduced, it is wise to retain a small number of key indicators in the long term; these will be recognized by project partners as signifying the most important determinants of health — health services, environment and socio-economic measures (Crown 2003:69). O’Neill and Simard point out that there is already an abundance of indicators that can be employed, the result of “a broad definition of health in communities, from classical epidemiological indicators to whole sets of environmental, social, or economic ones.” But which of these should one choose in order to develop the health profile of a particular area? (O’Neill and Simard 2006:146, 147). In the traditional sense of interpreting social health as representative of society as opposed to individuals, McDowell submits that social health indicators might include economic wealth distribution, public participatory decision-making, and public officials’ accountability (McDowell 2006:150).

In the end, one must conclude that there is no single list of indicators that can be employed universally to perform Healthy Cities’ evaluations. Groups and individuals will inevitably create tension by differing on the priorities and methods attached to such evaluations. Hence short-, mid-, and long-term needs for evaluation must be decided by each Healthy Cities project itself (O’Neill and Simard 2006:150). Perhaps the most interesting and difficult challenges are in developing new indicators that can provide adequate measures of the factors that are now considered to be crucial for health improvement, such as sustainability and equity (Crown 2003:72).
Integration of measures and social determinants of health for local, national, and global monitoring systems is crucial. It follows that monitoring the progress of such interaction will provide the means to achieve broader objectives and, at the same time, will help to ensure that participating entities are held accountable (WHO 2008:198).

In a 2002 four-day qualitative residential workshop on how research evidence influences public health policy-making (with specific reference to reduction in health inequalities), senior policy advisors “with a substantive role in policy development across a range of sectors” identified a need for predictive research and for methodological research in order to advance the development of “methods for assessing the impact on health of clusters of interventions” (Petticrew 2004:811). Questioned on how the policy relevance of research on health inequalities might be advanced, Smith et al. specifically identified the need for:

- **Evaluations** …………. Of the distributional effects and cost-effectiveness of policy and other interventions to reduce health inequalities.

- **Predictive research**….. For example, modeling the effects of globalization.

- **Methodological research** To develop methods further for assessing the impact on health of clusters of interventions (“policy clustering”), possibly taking the form of “systems analysis” for public health.

- **Other**…………………. Help with identifying relevant key indicators of progress toward health inequalities targets.

Stronger theoretical underpinnings for existing quantitative research and methodological work on policy evaluation, to take account of plausible causal pathways to ill health (Petticrew 2004:813-814).
Unfortunately, in many developing countries, the dissemination and communication of research findings may be hampered by a lack of basic resources, such as training, funds, and information sources, and this will lessen the impact of the research findings. Thus, it is essential for systems to be in place “to allow relevant scientific information to be identified, synthesized, and disseminated appropriately” (Petticrew 2004:814).

However, there are pitfalls. While many participants enthusiastically discuss taking action in priority areas, interest wanes in areas such as indicator development and reporting. Moreover, while the value of having formal indicators is understood, the development process is seen as burdensome. Participants tend to be “perceptively critical” of the indicators’ ability to capture important community changes and may express doubts about the trustfulness of indicators (Smith, Littlejohns, Hawe, and Sutherland 2008:122).

2.3. The Social Causes of Health and Illness

Socio-economic status (SES), a composite demographic variable, is often used in health research to compile a summary score composed of statistical data on levels of income, education, and occupational prestige (Poleshuck and Green 2008). SES is tied to life chances in many salient ways. Although the influences of education, income, and occupation are interrelated, it is thought that each, to some extent, manifests “different individual and societal forces associated with health and disease” (Winkleby, Jatulis, Frank, and Fortmann 1992:816).

In 1957, August B. Hollingshead, a pioneer in the field of medical sociology, developed a measure of objective SES without reference to prestige. Among the most prominent scales in use, the Two Factor Index of Social Position consisted of an occupational scale and an educational scale. The SES was computed by totaling the weighted values applied to levels of each (7 for occupation, 4 for education) on a seven-point scale (Hollingshead 1957; Miller and Salkind 2002:460, 462). As time passed, Hollingshead received criticism
because the Index (i) became dated, (ii) had a range of occupations too narrow, and (iii) the family’s status position was based on data pertaining to the head of household. Consequently, in 1975, while also citing that social and cultural changes had occurred in the interim period, Hollingshead revised his original index and, using data from the 1970 U.S. Census, developed a Four-Factor Index of Social Status based on education, occupation, gender, and marital status (Hollingshead 1975; Ribas et al. 2003:377). Later, to test its validity in the international arena, Hollingshead’s Index was paired with a similar Argentinean index of SES, the Life Style, Education, and Occupation (EVEO). As a result, a high correlation ($r = .88$) was found between the two indexes and both displayed “similar patterns of association with lifestyle and maternal perceptions about childrearing,” thus attesting to its value outside the United States (Ribas et al. 2003:377).

In the early 1990s, Winkleby and others conducted an empirical analysis quantifying the relative impact of education, income, and occupation on risk factors for cardiovascular (CVD) disease. A further objective was to determine whether one measure of SES is the most dominant predictor of risk factors. The study population (2380 participants from the Stanford Five-City Project) was 85% white, non-Hispanic, and thus the findings were deemed “not generalizable to populations representing a broad spectrum of racial groups.” However, overall, individuals who displayed the highest incidence of risk factors were those with the lowest levels of education (Winkleby et al. 1992:816-7).

Winkleby and others defined SES as a “complex phenomenon predicted by a wide range of variables that is often conceptualized as a combination of financial, occupational, and educational influences.” Even though each of these dimensions indicates different individual and societal forces linked to health and disease, they are interrelated:
Income ............... Spending power, housing, diet, medical care.

Education ........... Skills requisite for acquiring positive social, psychological, and economic resources.

Occupation .......... Prestige, responsibility, physical activity, work exposures.

After examining the independent contribution of these dimensions against a set of CVD risk factors such as smoking, high serum cholesterol, and high blood pressure, it was concluded that higher education may well be the strongest and most consistent predictor of good health (Winkleby et al. 1992:816, 819; Evans 2007:160).

Nevertheless, Winkleby and others cautioned against using education as the sole indicator of SES since its stability can conceal significant changes in people’s situations. For instance, do differences in education exist within regions? And consider, in terms of measurement parameters, if degrees or certification are superior to years of schooling. Also, in some population subgroups, there may be other dimensions of SES that are more precise indicators for health (Winkleby et al. 1992:819).

In a review of Winkleby et al.’s article, J. Paul Leigh noted that prior research supports their conclusion that education is probably the most important of the three dimensions. However, “before education is assigned a causal role,” Leigh chided the authors for not addressing more fully Victor Fuchs’ argument (1982) concerning the ability to delay gratification — that it is not the high level of education conferring health benefits, but rather “it is an unobserved variable such as the ability to delay gratification.” Fuchs contended that those who have this ability will promptly implement health habits to secure their future well-being and, in anticipation of high wages, they will devote many years to schooling. Leigh opined that if Fuchs is correct, the contention that investments in education will enhance health is “sophistry,” — in other words, flawed or misleading (Leigh 1993:289).
In summary, it appears that a person’s education, income, occupation, and living environment are inter-related and all their experiences and disadvantages in these areas will combine to engender significantly poorer states of mental health and physical health (Marmot 2010:82).

2.3.1. Disparities, inequalities, and inequities

Health disparities occur differentially across social groups and are held, for the most part, to be related to several social factors. When disparity is used in the context of public health and social science, is there an implication of injustice? Carter-Pokras and Baquet believed this to be so. In their attempt to define the term, they maintained that a health disparity “should be viewed as a chain of events signified by a difference in: (i) environment, (ii) access to, utilization of, and quality of care, (iii) health status, or (iv) a particular health outcome that deserves scrutiny.” Additionally, they suggested that equality and inequity should be considered when evaluating such a difference, noting that “what is unequal is not necessarily inequitable” (2002:427).

Inequalities are variations that are perceived to be unfair or unjust. According to Baggott (2000), concepts of equity and inequity are value-based and refer to “what should be” — they are “contestable.” He alluded to controversy regarding whether certain inequalities are inequitable, and if so, what should be done about them (Evans 2007:156). On the other hand, Woodward and Kawachi, while agreeing that to make a distinction between health inequalities and inequities can invite contention, put forth that “inequalities become unfair” when poor health itself stems from a disproportionate distribution of fundamental social determinants of health (e.g., inequitable employment or educational opportunities). Meanwhile, as potentially all members of society are plagued by socioeconomic inequalities, they will continue to experience the palpable and indirect effects of various
types of social ills, including those related to infectious diseases (AIDS and tuberculosis), alcohol and drug misuse, or violence and crime (Woodward and Kawachi 2000).

Inequities in societal organization decree the extent to which good health is unequally distributed between and within societies. For instance, consider “the conditions of early childhood and schooling, the nature of employment and working conditions, the physical form of the built environment, and the quality of the natural environment in which people reside.” Contingent upon peoples’ individual experiences in these environments, their material conditions, behavioral free choices, and psychosocial influences will affect their vulnerability to poor health. Furthermore, social stratification will determine their access to health care (WHO 2008:49).

The challenges of health inequalities exist at various levels of the population and the public health workforce. To confront the fundamental causes of ill health, a series of actions can be executed at different levels to eradicate “poverty, homelessness, lack of life chances and unemployment or by working directly to develop communities and individuals who have the worst health” (Evans 2007:155).

Globally, inequalities fluctuate wildly. Consider the life expectancy at birth in Sierra Leone — 34 years — compared to that of Japan — 81.9 years. Insofar as inequalities within countries endure, one needs to look no farther than the United States which experiences a 20-year gap between its “most and least advantaged populations” (Marmot 2005:1099).

Not only do inequalities in health occur between geographic areas, they also occur between women and men. Indeed, health inequalities are characterized as “the virtually universal phenomenon of variation in health indicators… associated with socio-economic status and ethnicity” for there is a distinct positive relationship between health and wealth. Hence, a
nation’s impoverished individuals are, on average, facing poorer health and are at greater risk of dying prematurely (Evans 2007:156). (Refer to 2.5.4.4. Land Use and Nutrition.)

Raphael states that “health inequalities result from differences in material conditions of life that are mediated through the social determinants of health” and that materialist points of view help to account for health variances among developed nations. As an example, Table 2.2 shows comparisons between the United States and Canada.

<table>
<thead>
<tr>
<th>UNITED STATES</th>
<th>CANADA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher rates of infant mortality.</td>
<td>Lower rates of infant mortality.</td>
</tr>
<tr>
<td>Higher rates of family and child poverty.</td>
<td>Lower rates of family and child poverty.</td>
</tr>
<tr>
<td>Lower-end workers earn far less.</td>
<td>Lower-end workers earn far more.</td>
</tr>
<tr>
<td>Larger gap between rich and poor.</td>
<td>Smaller gap between rich and poor.</td>
</tr>
<tr>
<td>Spends less on public infrastructure.</td>
<td>Spends more on public infrastructure.</td>
</tr>
</tbody>
</table>


Studies show that individuals are affected by the economic and social conditions under which they live and these conditions have a cumulative effect on their health. In short, under adverse conditions, individuals are more susceptible to the probability of developing many diseases, most prevalent being heart disease and stroke, followed in more recent years by diabetes (Raphael 2000:16).

Consequently, in developed countries, depending on socioeconomic inequalities, the poorer and less educated individuals may expect an average life span of two to 15 years
fewer than those toward the pinnacle of the social pyramid. In fact, the effectiveness of medical care is less significant than the preliminary socioeconomic factors that initiate the disease (Wilkinson 2005:57, 59).

Noting the severe impact of poverty on health, the Director of the Montreal Public Health Department issued a 1998 statement:

Poverty weighs heavily on health in both its material and social dimensions: poor education, dependence, precarious jobs, inactivity. And the consequences of this are reflected in most of our social and health indicators: globally, in reduced life expectancy and, more particularly, in the higher proportion of diseases or psychosocial problems, in low-birth-weight babies, in developmental problems, in school dropout rates, in adolescent pregnancies, in psychosocial distress, etc. (Raphael 2000:50-51).

In short, equity in health represents that “everyone has the right and the opportunity to realize their full potential. The political, economic and social inequality of groups of citizens clearly influences their state of health” (Barton and Tsourou 2000:32). Certainly, both the health and the caliber of social relationships in a society may be affected to the extent of inequality (Wilkinson 2005:57). (Refer to 2.5.4.4. Land Use and Nutrition.)

2.3.1.1. Education

The relentless inequalities in both educational outcomes and health are upheld in a comparable social gradient (Marmot 2010:104). In a 2003 prospective cohort study, Fiscella and Franks compared “the risk of death from coronary heart disease for patients of low socio-economic status, measured by educational level, with established risk factors.” The U.S. participants (6,479 adults, aged 25-74 years) were free of coronary heart disease at enrollment. The authors compared “the independent risk associated with low educational level with traditional coronary heart disease factors” — hypertension, elevated cholesterol levels, diabetes mellitus, and smoking. Theirs was a subsequent study of (i) the original
National Health and Nutrition Examination Survey (NHANE 1) carried out between 1971 and 1975, and (ii) active follow-up surveys by NHANES 1 Epidemiologic Follow-up Studies (NHEFS) that traced and re-interviewed respondents in 1982 to 1984, 1986, 1987, and 1993. Their findings and the incidence of coronary heart disease risk factors depicted in Table 2.3 imply that the risk associated with an education level of less than 12 years is significantly comparable to many of the traditional risk factors. Fiscella and Franks noted that questions regarding education are reported more reliably since responders find them less sensitive than questions regarding their family income. Furthermore, they put forth that education “is also subject to less change with time than income, which is strongly linked to employment status” (Fiscella and Franks 2004:469-472).

2.3.1.2. Income

The connection between income and life chances is significant because the lives that people are able to lead are affected by disparities in income distribution (Marmot 2010:18). For example, for some people on low incomes, there are days when they have to forgo meals and these are the individuals who are hardest hit by fluctuating food prices (Marmot 2010:81). Thus the income gap between middle- and low-income distribution must be lessened so as to inhibit the degree to which social exclusion and relative deprivation take place (Subramanian and Kawachi 2004:540).

There are three ways in which the correlation between income and health manifests itself, namely:

(i) Through the gross national product of countries.

(ii) Through the income of individuals.

(iii) Through the income inequalities among rich nations and among geographic areas (Marmot 2002:31).
<table>
<thead>
<tr>
<th>RISK FACTOR</th>
<th>PREVALENCE OF RISK FACTOR BY EDUCATIONAL LEVEL</th>
<th>&lt;12 YEARS %</th>
<th>12 YEARS %</th>
<th>&gt;12 YEARS %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-74</td>
<td></td>
<td>64</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>55-64</td>
<td></td>
<td>48</td>
<td>33</td>
<td>19</td>
</tr>
<tr>
<td>45-54</td>
<td></td>
<td>38</td>
<td>38</td>
<td>23</td>
</tr>
<tr>
<td>35-44</td>
<td></td>
<td>27</td>
<td>42</td>
<td>31</td>
</tr>
<tr>
<td>25-34</td>
<td></td>
<td>19</td>
<td>41</td>
<td>40</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>35</td>
<td>41</td>
<td>24</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>36</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Systolic blood pressure (mm HG) &gt;160:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;160</td>
<td></td>
<td>56</td>
<td>28</td>
<td>17</td>
</tr>
<tr>
<td>140-169</td>
<td></td>
<td>44</td>
<td>33</td>
<td>23</td>
</tr>
<tr>
<td>130-139</td>
<td></td>
<td>35</td>
<td>36</td>
<td>29</td>
</tr>
<tr>
<td>120-129</td>
<td></td>
<td>30</td>
<td>41</td>
<td>30</td>
</tr>
<tr>
<td>&lt;120</td>
<td></td>
<td>27</td>
<td>39</td>
<td>34</td>
</tr>
<tr>
<td>Diabetes:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>64</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>35</td>
<td>37</td>
<td>28</td>
</tr>
<tr>
<td>Cholesterol level (mg/dL):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;280</td>
<td></td>
<td>44</td>
<td>34</td>
<td>22</td>
</tr>
<tr>
<td>240-279</td>
<td></td>
<td>41</td>
<td>35</td>
<td>23</td>
</tr>
<tr>
<td>200-239</td>
<td></td>
<td>35</td>
<td>38</td>
<td>28</td>
</tr>
<tr>
<td>&lt;200</td>
<td></td>
<td>30</td>
<td>37</td>
<td>33</td>
</tr>
<tr>
<td>Smoker:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>37</td>
<td>38</td>
<td>25</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>34</td>
<td>36</td>
<td>30</td>
</tr>
</tbody>
</table>

*Note:* Numbers (rounded) in each row refer to % of persons in each educational category (Fiscella and Franks, 2004: 470).
According to earlier studies by Lynch and others, high correlations were discovered between income inequality and a range of social indicators which included “violent crime rates, per capita medical care expenditures, proportions of sedentary behavior and smoking, percentage unemployed, educational spending, high school graduation rates, library books per capita, and fifth-grade reading and math scores.” Furthermore, high income inequality could result in an adverse psychological and social environment — one that directly affects health by its influence on the extent of social cohesion (Lynch, Kaplan, Pamuk, Cohen, Heck, Balfour, and Yen 1998:1079). By reducing income inequality, there is a potential for significant social cohesiveness and improved population health (Kawachi and Kennedy, 1997: 1037).

However, in some cities in the world, although social and economic inequality is often the locale for high crime rates, there are societies rich in “cultural tradition, family networks and social structure” that maintain low crime rates irrespective of economic inequalities (Gehl 2010:97).

Lynch and others cite recent U.S. reports showing the disparity between levels of income and mortality after adjustment for absolute income differences. Apparently it is not only the absolute amount of income that affects health, but equally important is the relative disparity with which income distribution is made within a population. For these reasons, it is possible that improved levels of health may be experienced in more equitable societies than those societies that display a great disparity between the haves and have-nots. In fact, beyond ages 30 to 40 years, African Americans with higher real incomes and residing in Harlem (New York) have lower survival rates than people living in countries with low income, such as China, Bangladesh, and parts of India (Lynch et al. 1998:1074).
Wilkinson seeks a theory that unifies the causes of social class differences in health with the effects of income distribution on national mortality rates. Probable core factors are “the depths of material insecurity and social exclusion which societies tolerate, and the direct and indirect psychosocial effects of social stratification” (Wilkinson 1996:539).

Another aspect of income inequality is the gender pay gap — the significant difference between men’s and women’s median hourly earnings. However, according to a 2007 survey in the United Kingdom (UK) by the Office for National Statistics, the disparity decreased somewhat between April 2006 and April 2007. Expressed as a percentage of men’s median hourly pay, the gap was 12.8% in 2006 compared to 12.6% in 2007. During this period, the median hourly rate increased 2.8% for men and 3.1% for women (Marmot 2009:63).

2.3.1.3. Occupation

Patterns of employment reveal and uphold the social gradient. Frequently, it falls to socio-economically disadvantaged individuals to fill physically demanding jobs with low job satisfaction and little or no health insurance (Poleshuck and Green 2008).

Table 2.4 summarizes three fundamental ways in which joblessness influences levels of morbidity and mortality. Hence, in order to limit the cycle of unemployment and ill health, it is essential that people have work of a sustainable nature with an accompanying minimum level of quality (Marmot 2010:110).

Linked to negative health outcomes are jobs that are “insecure, low-paid and that fail to protect employees from stress and danger.” Individuals with few qualifications and skills, those with disabilities, mental ill health, and members of ethnic minority groups all experience higher rates of unemployment. Likewise are workers at both ends of the age
spectrum and those with care-giving obligations. People in these groups are repeatedly trapped in low-paid employment that offers little in the way of advancement, often in deplorable working conditions, thus placing them at higher health risk. Especially vulnerable are the long-term unemployed for they experience the most adverse health effects (Marmot 2010:68-69).

In depressed urban areas, toxic products also play a part in workplace health hazards, along with “injury and ergonomic hazards, noise, external pollution, and traffic generation.” Health problems in these areas have been exacerbated due to the “inappropriate zoning\(^3\), town planning, and location of industrial activities” that allow a mix of workplaces and settlements since there are increased health risks when major industrial accidents occur (Kjellstrom, Friel, Dixon, Corvalan, Rehfuess, Campbell-Lendrum, Gore, and Bartram 2007:i90).

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>MAY RESULT IN…</th>
</tr>
</thead>
</table>
Reduced social integration.  
Lower self-esteem. |
| 2. Psychosocial stressors. | Distress, anxiety, and depression.  
Also affects partners and children.  
Loss of sense of identity.  
Loss of rewards, social participation, and support. |
| 3. Health behaviors | Increased smoking.  
Increased alcohol consumption.  
Decreased physical exercise. |


---

\(^3\) Zoning — Local codes regulating the use and development of property within specific categories. (Source: Centers for Disease Control and Prevention.)
There is now significant evidence that high noise levels promote hearing loss, mostly in occupational settings. Also, that exposure to noise (primarily road and air traffic) at environmental levels is responsible for the progression of chronic health outcomes due to annoyance and sleep disruption, including hypertension and ischemic heart disease (van Kamp, Babisch, and Brown 2012:87).

2.3.1.4. Housing

As stated previously, the early twenty-first century is experiencing an upsurge in urbanization. Rural to urban migration continues along clearly delineated migration routes and immigrants will choose a region’s largest city where wages are high and transportation costs are low. Relatives and former neighbors are often residing within a large city — ready to assist the migrant in transition to city life. These familial networks are often able to help the migrant find employment, and provide housing and financial support. Research indicates that, for the most part, migrants to the city appear to have made a change for the better rather than if they had remained in their rural areas (Schwab 1992:78).

Harvey Zorbaugh (one of Robert Park’s students at the University of Chicago) states in his classic book about Chicago that the organization of an immigrant community is conducted thusly:

As the colony grows, the immigrant finds in it a social world. In the colony he meets with sympathy, understanding and encouragement. There he finds his fellow countrymen who understand his habits and standards and share his life-experience and viewpoint. In the colony he has status, plays a role in a group. In the life of the colony’s streets and cafes, in its churches and benevolent societies, he finds response and security. In the colony he finds that he can live, be somebody, satisfy his wishes — all of which is impossible in the strange world outside (Zorbaugh 1929:141).
But for those with no familial networks in the city it is a different story and many end their journey in less-than-acceptable living conditions.

Poorer neighborhoods are often comprised of low-income housing developments and government-subsidized rented housing. Apart from the quality of the public housing, the residents’ health disadvantage is linked to the make-up of the social housing population. The composition of the social housing population is prescribed by the specific authority in “supporting disadvantaged groups and allocating according to need.” As a group, the tenants’ rates of unemployment, ill health, and disability exceed the average for the general population (Marmot 2010:79).

Considered as unacceptable housing conditions are overcrowding, insecurity, temporary accommodation, and homelessness — all representing health risks. A 2006 study suggests that children raised in adverse housing conditions are more likely to have mental health problems, respiratory problems, and to experience slow physical growth and delayed cognitive development. Such outcomes indicate the immediate influence of bad housing conditions along with the attendant material deprivation (Marmot 2010:79-80).

It is often the case that people with low incomes live in environments that are exposed to storms and flooding. Furthermore, they are less likely to have access to insurance against risks related to extremes in weather. These circumstances bear a direct relevance to health and inequalities (Marmot 2010:78).

2.3.2. Psychosocial environment

From a psychosocial standpoint, mental and physical illnesses are affected by subjective experience and emotions that create acute and chronic stress (Marmot and Wilkinson 2005:3). These psychosocial risk factors are particularly significant because a large proportion of the population is exposed to them (Wilkinson 2005:87). Epidemiological
studies, in identifying the main sources of chronic stress in contemporary societies, have provided a “key to understanding the problematic nature” of the attendant social environment (Wilkinson 2005:89).

Several decades ago, researchers studying the social gradient in health assumed that health differences resulted from different levels in material living standards. Consequently, they attempted to make a connection between the differences in material living standards and specific diseases. In recent years, some of these ascriptions have been superseded by new studies that put forth psychosocial variables to explain the differences in morbidity and mortality. These variables included “a lack of a sense of control, depression, hopelessness, hostility, lack of confidence, lack of social support, bad social relationships, stressful life events, family conflict, stress at work… bereavement, being single or divorced rather than married, and job and housing insecurity,” all of which appeared to result in poor health (Wilkinson 2005:60).

Also in evidence were many types of psychosocial stress peculiar to and fostered by the workplace, such as differences within hierarchies, limited control and/or involvement in decision-making, and varying discriminatory practices, any of which may cause ill health. Coupled with low wages, a high rate of job instability, and often with substandard safety conditions, deprived workers fell subject to many forms of psychological and physical ill health, including “depression, cardiovascular disease, coronary heart disease and musculoskeletal disorders” (Marmot 2010:72).

The psychosocial environment construal directs attention to characteristics of personal psychological performance that include trust, respect, and support. Lynch and others find it difficult to understand how the underscoring of psychological performance and informal interpersonal relations would function as the foundation for a public policy agenda to reduce health inequalities. Since individual resources are influenced by the
political and economic processes that engender income inequality, it appears that public resources such as “schooling, health care, social welfare, and working conditions” are also strongly affected (Lynch, Smith, Kaplan, and House, 2000).

In the United States, measures of “social trust” deliver a statistical connection between mortality and income distribution while studies also indicate that greater assimilation into a social network is beneficial to health (Wilkinson 1997:593). Individuals who are well-integrated in their social systems are inclined to have longer lifespans and an ability to shed disease and illness whereas those individuals who are socially isolated are at increased risk for morbidity. And rather than treating patients simply for their medical symptoms, the social view of medicine argues that their reintegration into “productive lives in society” should be the target (McDowell 2006:150).

But social wellbeing is not merely a case of more powerful networks. Equally important is the view that relative poverty is a form of social exclusion, and there is evidence that health is directly affected by racial discrimination (Wilkinson 1997:593).

All in all, the reports on equity in health substantiate that variations in health are due to social differences, with the lowest social classes characterized by higher chronic illness rates, higher cancer rates, higher mortality rates, and lower self-assessed health status.

2.3.2.1 Social status.

Although death rates in poorer areas are two to four times greater than those in more affluent areas, researchers have been slow to acknowledge the significance of the social environment’s influence on psychosocial risk factors or, indeed, to realize that social status is not simply a matter of higher or lower material living standards (Wilkinson 2005:67). Low social status, itself, is a stressor. It conjures up a sense of being held in low esteem, of being second-rate (Wilkinson 2005:75).
Admittedly, in poorer undeveloped countries that lack such basics as clean water and adequate nutrition, there is a correlation between the lower standards in material conditions and the health of the population. Raising the living standards in these countries does improve health. However, as countries are developed and basic necessities become available, “the relationship between measures of average living standards — such as gross domestic product per capita (GDPpc) — and health progressively weakens” (Wilkinson 2005:67). Most importantly, researchers find that the “relation between average income (or GDPpc) . . . and life expectancy… is strongest in the poorest countries” whereas in economically developing societies, “further increases in living standards gradually lose their power to improve standards of health.” After combing 1998 WHO data, researchers could find no correlation at all between GDPpc and average life expectancy among the world’s 25 richest nations. For example, life expectancy in the United States (considered one of the richest countries) is less than in the majority of other developed countries — in some cases, even those half as rich, such as Greece (Wilkinson 2005:67-68).

Nevertheless, although there is no connection between variations in mean living standards and health between the developed countries, there is compelling evidence of the commonly observed social gradient in health within the developed countries (i.e., that people toward the top of the social hierarchy invariably experience better health than those toward the lower part of the social hierarchy). In fact, large national differences in living standards do not appear to affect the average health of the populations of richer developed countries whereas within each country, the average health of the population appears to be ranked or determined by income. Again, as Wilkinson succinctly theorizes, “what matters within countries is not absolute income but income relative to others — a marker of social status and position in society” (Wilkinson 2005:69).
2.3.2.2. *Social relationships.*

Sociologist Mark Granovetter studied the strength of interpersonal ties and “the importance of weak ties in diffusion” (Granovetter 1973:1366) and their value to individuals trying to plot their route through the city.

He argued that “those to whom we are weakly tied are more likely to move in circles different from our own and will thus have access to information different from that which we receive.” For example, while strong ties (friends) may dispense information that is limited and redundant due to the propinquity of their group, job seekers would benefit most from their access to weak ties (acquaintances, and their many friends and acquaintances). In the labor market, the number of weak ties in a person’s network is crucial to mobility and success. It follows that as a person leaves one job and moves to another, he is creating an additional link (or bridge) from his previous network of ties to his new one (Granovetter 1973:1371-1373). In theory, then, weak ties are empowering and allow those in poverty to experience upward mobility.

When discussing the benefits and detriments of linkage on micro and macro levels, Granovetter saw weak ties as “indispensable to individuals’ opportunities and to their integration into communities” but put forth that “strong ties, breeding local cohesion, lead to overall fragmentation” (Granovetter 1973:1378). He argued that, within a neighborhood, “cohesive network clusters” disengaged from one another could cause fragmentation, thus making mobilization problematic for individuals (Granovetter 2002:49). For instance, a larger unit of analysis such as a community, divided entirely into cliques, could inhibit access by outsiders (Granovetter 1973:1378).
On the other hand:

[T]he more local bridges (per person?) in a community and the greater their degree, the more cohesive the community and the more capable of acting in concert. Study of the origins and nature (strength and content, for example) of such bridging ties would then offer unusual insight into the social dynamics of the community (Granovetter 1973:1376).

Jane Jacobs discussed the efficacy of “hop-and-skip” links and relationships in community organizations, noting that they “are more fortuitous in cities” than those among “people from different small groupings within self-contained settlements.” For example, if people from a district encounter others at a special-interest meeting of the whole city, the resultant hop-and-skip relationships “bridge” into all of their individual districts. Jacobs also observed that such links “require the growth of trust, the growth of cooperation” in order to reach a stage of effectiveness (Jacobs [1961] 2002:134-6). Jacobs’ “hop-and-skip links” are Granovetter’s “weak ties” and he, too, maintains that they could be infinitely more effective than strong ones that “tend to be concentrated within particular groups” (Granovetter 1973:1376).

Death rates among men and women who are more socially isolated have long led researchers to become mindful of the advantageous effects of social connectedness on health. Individuals with few friends and weak social networks have death rates often 100 or 200 percent higher than those with positive social support. Furthermore, evidence demonstrates that healthy people who initially have satisfying social support are less likely to become ill and die, and that heart attack survival may be three times greater among those who are more socially integrated (Wilkinson 2005:79). Generally, a higher quantity and quality of social relationships is associated with health benefits whereas social stratification (more specifically, inequality of income) is associated with higher all-
cause mortality, higher infant mortality, and higher mortality from various specific causes independent of income and poverty (Frumkin 2002:209).

Most important are the health and the caliber of social relationships in a society for they may be affected by the extent of inequality (Wilkinson 2005:57). Additional research provides evidence that negative relationships, such as bad marriages, are harmful to one’s health (Wilkinson 2005:81).

2.3.3. Ecological approaches

The heterogeneity in urban ecosystems is evident in as small a measure as a city block, marked by transitions in its density, vegetation, culture, and economic activity. A distinguishing characteristic of the interdependence between humans and the natural environment is the extent to which ecological problems occur, such as air, noise, and water pollution, the heat island effect, and so forth.

In taking an ecological approach to design and management, Girling and Kellett (2005) advocate a study of each urban environment and its uniquely interacting ecosystems that, in the past, have experienced change through urban structures and development.

The defining features of landscape ecology are three:

(i) **Structure**: “the spatial relationships among the distinctive ecosystems of landscape elements present.”

(ii) **Function**: “the interactions among the spatial elements, such as flows of energy, materials, and species.”

(iii) **Change**: “the alterations in landscape structure or function over time” (Forman and Godron 1986; Dramstad, Olson, and Forman 1996, as cited in Girling and Kellett 2005:63).
Then consider health-promotive environments, defined in terms of mental, physical, and emotional health outcomes, for they are the result of reciprocal action over time between humans and their surroundings (Stokols 1992:9; Frank and Engelke 2001:207). In terms of their physical and social components, environments can be characterized by their “objective (actual) or subjective (perceived) qualities, and their scale or immediacy to individuals and groups (proximal vs. distal)” (Stokols 1992:7). Furthermore, environments may be regarded as enablers or disablers of health behavior and can be identified by several spatial scales (Stokols 1992:9, 13; Frank and Engelke 2001:207).

In the context of health-promotive environments are the consequences of global climate change. Besides resource depletion, other important issues are the effects of urban “heat islands,”4 a rise in sea levels, “more violent tropical cyclones and river floods, water- and food-borne gastrointestinal infections, and vector-borne diseases” such as dengue fever, all of which constitute health risks to the urban poor. In Africa, Asia, and Latin America, access to improved water and sanitation is sadly lacking and almost 50 percent of urban populations in these countries are suffering from “diarrhea, worm infections, and other infectious diseases” which are spread through the use of contaminated water (Kjellstrom et al. 2007:i87, i90).

In particular, 2002 found that 51 percent of developing countries’ populations were still deficient in proper sanitation and 21 percent were deficient in sufficient, safe drinking water. In slum areas, these figures are even higher. Another concern is the lack of liquid or solid waste management which creates a burgeoning health threat to

---

4 “Heat islands” are built up areas with higher temperatures than nearby rural areas. The annual mean air temperature of a city with a one-million population may be 1.8–5.4°F greater than that of surrounding areas, and during evening hours, the variance may be as high as 22°F. “Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality.” (Source: U.S. Environmental Protection Agency)
residents through their exposure to disease-transmitting organisms, such as mosquitoes (Kjellstrom et al. 2007:i90).

With an understanding that cities are a part of nature, an ecologically based approach to urban structure looks to nature and its processes to aid in city sustainability (Girling and Kellett 2005:62). Therefore, in realization of the escalating environmental challenges that lie ahead, “[t]his generation will require leaders and citizens who can think ecologically, understand the interconnectedness of human and natural systems, and have the will, ability, and courage to act” (Stone 2009:4).

2.3.3.1. **External conditions**

External conditions that are conducive to the health of individuals and groups are those available to an area’s occupants through environmental resources and interventions that support and encourage enhanced well-being. As a result, the outcomes of health behavior in such environments include reductions in stress, along with physical and emotional well-being (Stokols 1992:6, 8, 11, 13). For example, to mitigate the effects of social isolation, evidence points to “green space” as a method to increase informal contact. For low-income residents of identical public housing, the presence of trees and grass is associated with the formation of strong social ties among neighbors (Jackson 2003:193-4).

In 1984, Edward Wilson published his biophilia hypothesis that there is an “innately emotional affiliation of human beings to other living organisms” (1984:31). There is enough quantitative data to substantiate this hypothesis — essentially that there is a therapeutic influence on people when they are connected to such elements as plants, trees, water, and sunlight, within the natural world. For example, in 1984, Roger Ulrich completed a study that linked hospital patients recovering from gall bladder surgery to views of nature:
The patients were assigned essentially randomly to rooms that were identical except for window view: one member of each pair overlooked a small stand of deciduous trees; the other had a view of a brown brick wall. Patients with the natural window view had shorter postoperative hospital stays, had fewer negative comments in nurses’ notes (“patient is upset,” “needs much encouragement”), and tended to have lower scores for minor post-surgical complications such as persistent headache or nausea requiring medication. Moreover, the wall-view patients required many more injections of potent painkillers, whereas the tree-view patients more frequently received weak oral analgesics such as acetaminophen (Ulrich, 1993: 106-7).

It follows that further estrangement from the natural world would be to the detriment of society’s well-being.

Most recently, planners and ecologists have considered the use of urban open spaces to restore the hydrological balance that, in many cities, is deficient. The green spaces can “clean sewage and urban runoff; clean, store, and infiltrate rainwater in ponds and wetlands,” and mitigate the effects of flooding (Girling and Kellett 2005:58).

Numerous studies indicate the correlation between land use planning and public health, and at the same time seek to identify best practices or the potential for “melioration through imitation.” Yet again, there is no one-size-fits-all solution for interventions, so it is incumbent upon each metropolitan area to address its unique political and cultural specificities in the process of planning for a healthy city (Corburn 2009:19).

2.3.3.2 The urban forest

The term urban forest refers to all trees and woody vegetation within the city’s built environment. As an ecosystem, it also encompasses “soils and related microorganisms, insects, wildlife, and humans” (as cited by U.S. Department of Agriculture Forest
Service, 1993). Furthermore, it is a heavily managed resource that provides vital services to the city (Girling and Kellett 2005:104).

In addition to aesthetics, the planting of urban trees is key to a healthy ecosystem that comprises urban heat island mitigation, filtering of stormwater runoff, reduction in building energy consumption, and “improved mental health and social interaction for residents, particularly in densely developed areas” (Schwab and Fesperman 2008:2).

Urban tree planting offers many benefits. Firstly, stands of shade trees shield buildings within the city from sunlight and a corresponding heat build-up. It is possible to block up to 95 percent of incoming radiation by planting heavy canopy trees. Secondly, dense plantings of trees cool ambient air by evapotranspiration. Thirdly, buildings are protected from cold winter gusts and wind speeds decline under tree canopies. Furthermore, there are reductions in air temperature and system-wide cooling loads that result in reduced energy use and improved air quality due to decreases in smog (Akbari 2005:11; Girling and Kellett 2005:106).

Additionally, trees play a part in mitigating air pollution; through photosynthesis, they “absorb gaseous pollutants, intercept particulates, reduce ozone, and sequester carbon dioxide.” The U.S. Environmental Protection Agency (EPA), in 1992, cited estimates of reduction in airborne dust particles on a tree-lined street “by as much as 7,000 particles per liter of air” (Girling and Kellett 2005:106, 112).

One area of public health concern is the increase in respiratory disease and breathing difficulties associated with particulate matter (solid and liquid particles) air pollution generated by many different sources in the urban environment (Dunnett and Kingsbury 2008:62). The American Heart Association cautions that inhalation of particulate matter can trigger cardiovascular incidents “within hours to days after exposure” along with the potential to provoke any number of “adverse biological responses” that could raise future
cardiovascular risk "after months to years of exposure" (Brook et al. 2010:3; Walker and Adenuga 2012:390). The underlying cause of most cardiovascular diseases is atherosclerosis, an inflammatory disease, and long-term exposure to fine particulate matter air pollution may hasten its advancement (Walker and Adenuga 2012:397). There is also evidence of a potential effect on other cardiovascular risks such as hypertension, heart failure, and diabetes (Brook et al. 2010:2364).

While considering the adverse health effects of exposure to ambient particulate matter air pollution, several subgroups are identified as being more sensitive to air pollution than the general public, namely, the elderly, and individuals with pre-existing chronic cardiac disease, chronic respiratory disease, and diabetes (WHO 2010b:6; Walker and Adenuga 2012:390). Moreover, the risk is greater for children since their higher inhalation rate to body weight ratio and more intense physical activity increase the "pollutant doses" they receive (WHO 2010b:15). Overall, the scientific consensus is that the risk for cardiovascular morbidity and mortality increases with both short- and long-term exposure to fine and ultrafine particulate matter (Walker and Adenuga: 2012:393).

Other air pollutants, gaseous ones such as ozone and nitric oxides, may also raise the risk of cardiovascular morbidity and mortality. For instance, when workers at a U.S. copper smelter went on strike for 8.5 months, the resultant reductions in sulfate particulate matter emissions produced a substantial drop in air-pollution-related mortality across four southwestern states (Walker and Adenuga 2012:397-398).

As ground level ozone (smog) concentrations increase, more people experience health effects. Smog tends to intensify as temperatures soar. For example, in Los Angeles, "for every 1°C [33.8°F ] the temperature rises above 22°C [71.6°F], incident of smog increases by 5%" (Akbari 2005:2).
Both ozone from smog and particulate matter from industrial and vehicular emissions are linked to increased rates of mortality from respiratory-related complaints during periods of elevated temperatures. Yet fine airborne particles are filtered and gaseous pollutants are absorbed by the city’s vegetation. Research evidence reveals that the capturing of air pollutants is directly associated with the trees and shrubs distributed throughout the city (Dunnett and Kingsbury 2008:62).

2.3.3.3 The urban heat island

In the United States between 1979 and 2003, more people died from intense heat "than from floods, lightning, hurricanes, tornadoes and earthquakes combined. The Centers for Disease Control and Prevention (CDC) state that heat-related deaths and illness are preventable and that air-conditioning is the “number one protective factor.” Those at greatest risk are infants and young children, the elderly, the obese, and those suffering from mental illness and chronic diseases. Also at high risk are individuals who are physically ill, particularly those with “heart disease or high blood pressure, or who take certain medications, such as for depression, insomnia or poor circulation” (Centers, 2011).

For urban livability, the range of density must be considered. For example, there is a need for privacy, natural light, and open green spaces, along with parking areas (Bosselmann 2008:214). The density of a city’s buildings and paved areas are responsible for its restricted airflows, polluted air and increased concentrations of particulates. In this way, a city’s climate is formed which is further typified by elevated nocturnal temperatures and humidity. Thus, the urban “heat island” effect is an aggregate of increased smog and temperatures from the heat-absorbent built environment, a lack of shade-providing vegetation, an increase of surface run-off, and a dearth of cooling winds due to the deeply cavernous spaces between buildings that
prevent cool air from draining into them. These factors all lead to heat stress, respiratory and circulation problems for city dwellers (Dunnett and Kingsbury 2008:63-65).

As mentioned in the previous section, it is possible to block up to 95 percent of incoming radiation by planting heavy canopy trees to help mitigate the effects of heat islands, and dense plantings of trees will cool ambient air by evapotranspiration (Akbari 2005:11; Girling and Kellett 2005:106).

The installation of green roofs addresses some of a changing climate’s crucial elements — namely, an increase in severe rainstorms and accompanying flooding, and higher urban temperatures along with air pollution. Public benefits of green roof construction include a “better quality of life and environment . . . [and] greater long-term cost-efficiency” for city tax payers and residents (Dunnett and Kingsbury 2008:41-2).

To lessen the effects of urban heat islands, the installation of green roofs can improve public health and comfort by lowering heat transfer through city roofs, thus improving indoor physical relaxation and lowering heat stress during heat waves. Due to their capacity to act as insulators, green roofs also reduce energy demands for air-conditioning and heating. (EPA, 2011).

2.3.3.4 Green mobility

Green mobility denotes travel by pedestrians, cyclists, and riders of public transport systems. These forms of transport benefit the city due to reduced resource consumption, limited emissions, and decreased noise levels (Gehl :2010:7).

As a consequence of the sedentary lifestyle of today’s workforce, “with cars providing door-to-door transport,” health problems have escalated rapidly, but the health of a city will receive a boost when walking and cycling become a part of citizens’ quotidian activities. Furthermore, if there is a way to make individuals feel safe and secure
while walking or cycling to and from buses, light rail, and train, the appeal of public transport systems will increase — an added sustainable aspect (Gehl :2010:7; Gehl and Svarre 2010:2).

The European Union (EU) cities have incorporated the density of housing and jobs to a higher degree than American cities, and this has resulted in pedestrian and cycling activities that are five times higher than in the United States (McCann and Ewing 2003:19). To create cycle- and pedestrian-friendly travelways, many communities are generating networks of sidewalks and bicycle lanes (McCann and Ewing 2003:26).

One of the first UK groups to lobby decision-makers on behalf of cyclists is the London Cycling Campaign, a charitable organization formed in the 1970s that now boasts a membership of almost 12,000. It presents “evidence-based arguments for encouraging bicycle use before motorized transport,” including:

- Widespread economic benefits.
- Improvements to public health.
- Reductions in road danger.
- Less motor traffic congestion.
- Zero CO₂ emissions.
- Reduced air pollution.

Citing the success of cycling amenities in Denmark and the Netherlands, the group calls for London to adopt a continental-standard cycling infrastructure in the interests of reducing road danger. It also encourages citizens to walk, cycle, and use public transit before succumbing to the use of automobiles — all this to “help London become a safer, greener, more cohesive and pleasant city” (London 2013).
July 2010 saw the UK open the first two of 12 planned London Cycle Superhighways that aim to increase cycling in the capital. Almost a year later, Transport for London claimed that “the number of cyclists on the two pilot routes . . . has risen by 70 percent.” Cyclists commuting to and from work in the city made approximately 80 percent of the journeys (Cycling 2011). Two additional Cycle Superhighways were launched in July 2011, and the remaining eight routes are expected to open between 2013 and 2015. The Cycle Superhighways are designed for commuters and “85 percent of users along the routes cycle to or from work. The routes are used predominantly by young males” (Transport for London 2011:9, 13). A recent analysis of “cycle counts recorded before and after the launch of the pilot routes” shows that, overall, the weighted increase in cycling grew by 45 percent along one route and 83 percent along the other (Transport for London 2011:17). Cyclists cited fitness, saving money, journey time reliability, safety, speed, and ease of following the routes, as the reasons they started using the Cycle Superhighways (Transport for London 2011:30).

Gehl and Svarre emphasize that, in the quest for lively, safe, sustainable, and healthy cities, it is imperative to plan with “human beings as the point of departure — and not the number of cars, the number of square meters or technical specifications of different transport systems” (2010:1, 3).

2.3.3.5. *Urban noise.*

Exposure to environmental noise can lead to a range of health effects from psychosocial responses (annoyance, sleep disturbance, disruption of daily activities) to physical responses (hearing loss, hypertension, ischemic heart disease) (van Kempen et al. 2002:307). Responses to noise exposure are contingent, in part, on the “frequency, intensity, duration, and meaning” of the noise and, in part, on the non-acoustical facets
such as “context, attitude, expectations, fear, noise, sensitivity, and coping strategies” (van Kamp et al. 2012:69-70).

Van Kempen et al., in a meta-analysis of 43 epidemiologic studies, encountered difficulty when trying to discern the contribution that noise makes to CVD, and cited “the preponderant influence of lifestyle and genetic predisposition” (2002:307, 315). Due to the complex relationship between noise exposure and its potential health impact, and “limitations in exposure characterization, blood pressure measurement, and/or definition of hypertension, adjustment for important confounders, and the occurrence of publication bias,” they concluded that the evidence for a link between noise exposure and CVD “seems plausible” but is still inconclusive (van Kempen et al. 2002:315-6).

2.3.4 Environmental sustainability

Environmental sustainability is targeted by the MDGs with great import placed on the limited access to clean water and sanitation facilities that is directly correlated with child mortality (UNDP 2010:2). Correspondingly, as the United States continues to meet the challenges of providing safe, reliable public water sources and preventing waterborne disease and outbreaks, the Centers for Disease Control and Prevention (CDC) and the National Academy of Engineering have named water treatment as “one of the most significant public health advancements of the 20th century” (EPA 2000:4).

2.3.4.1. The urban form and public welfare.

Defining the value of urban design is a complex task in that urban form impacts health, economic, environmental, and social/cultural outcomes. Because the design and management of a city’s public spaces have such strong effects on the quality of its
citizens’ lives, it follows that urban morphology is interrelated with physical design, land use regulations, and regional policies.

As public health is studied in the context of built environments, consider the physical design of work places and residential areas and how, for instance, they can impact people’s travel modes. A growing body of evidence supports the hypothesis that with increases in mixed use environments, density, and street connectivity, citizens’ physical activity (walking and bicycling) will intensify, resulting in reduced levels of obesity. On the other hand, low residential density (urban sprawl) promotes automobile use, a sedentary behavior that increases the probability of obesity (Frank et al. 2004a:87, 94).

At a presentation to the Obesity and Built Environment Conference of the National Institute of Environmental Health Sciences in Washington, DC, Lawrence Frank discussed the relationships between:

- Urban form and objective measures of physical activity.
- Urban form, self-reported activity patterns, and body mass index and obesity.
- Urban form, self-reported travel patterns, and air pollution.

Additionally, Frank reported that the results of recent analyses confirm that important relationships exist between community design and direct and indirect predictors of health and general well-being. He concluded that the results indicate “important synergies between strategies that would promote physical activity, weight loss, and potentially improve respiratory function” (Frank 2004).

In similar vein, the World Health Organization points out that, in addition to a need for physical exercise, walking allows older people to meet their local travel requirements and to participate “in economic activities as well as social networks” (WHO 2002:12). As a result, neighborhoods with compact, mixed-use development will foster attitudinal and
behavioral changes by generating shorter trip distances conducive to walking and cycling activities.

Evidence confirms that green environs have a pervasive impact on community health in the form of reduced stress, enhanced positive mood, improved cognitive skills, and even in “moderating the effects of ADHD [attention deficit hyperactivity disorder], autism, and other childhood illnesses.” A recent UK mental health study compared the effects of two walks — one in a shopping mall and the other in nature. Those walking in the shopping mall showed 44% decline in self-esteem while those in the nature walk showed 90% improvement in self-esteem. When measuring mood, which included “six factors… depression, anger, tension, confusion, fatigue, and vigor,” the greatest difference reflected was in tension. The mall walkers reported a 50% increase in tension while the nature walkers reported a 71% reduction in tension (Beatley 2011:4-6). The study concludes:

The new research…shows green exercise has particular benefits for people experiencing mental distress. It directly benefits mental health (lowering stress and boosting self-esteem), improves physical health (lowering blood pressure and helping to tackle obesity), provides a source of meaning and purpose, helps to develop skills and form social connections (MIND 2007:28).

Although recent research proves conclusively that successful urban design results in safer cities and encourages residents to participate in physical activity, there is a call for further research on “the independent effects of urban form on the creation of social capital, sense of community and mental health” and on “age-friendly” urban design that accommodates both the junior and senior members of the community” (Giles-Corti 2006). Perhaps the greatest challenge is to sustain those activities that imbue an area with vibrancy and hospitality, and will benefit future populations (Bosselmann 2008:217).
2.3.4.2 The urban form and physical activity patterns.

A major health risk that is a factor in the overall burden of morbidity and mortality is a lack of physical exercise. This alone results in increased chronic diseases and long-term health risks and can have economic consequences costing billions of dollars each year (Mackinnon et al. 2003:49; Robert 2000:3).

Research in Europe and the United States substantiates that urban form greatly influences overall household activity patterns, including walking and cycling. Thus, it is important to recognize the interconnection between public health, non-motorized transportation, and the built environment (Frank and Engelke 2001:204).

A neighborhood comprised of mixed use places: residences, offices, retail, schools, and recreation ensures that daily and weekly demands can be met close to home, and such compactness lessens the need for automobile use. Consequently, pedestrian and bicycle transport is safer and more appealing, and air quality is improved due to a reduction in vehicle emissions (Girling and Kellett 2005:98).

Urban environments often do not support physical activity due to their lack of green spaces, safe pedestrian walkways and bicycle paths. Furthermore, city areas of everyday pursuits (home, work, school, shopping and so forth) may not be connected in ways that allow urbanites to walk or cycle as a means of transportation (Robert 2000:3). However, mixed-use development and a connected grid of streets provide accessibility to pedestrians and cyclists (Robert 2000:A9). Evidence suggests that an increase in mixed land use will encourage pedestrian activity and the probability of a decline in obesity, but in areas of low residential density, there will be an increased probability of obesity due to escalated automobile use (Frank et al. 2004:87).
A recent study of a sample of Washington, DC urban neighborhoods, based on data from the Center for Neighborhood Technology, found that “residents of more walkable places have lower transportation costs and higher transit access”; however, these benefits are accompanied by higher housing costs. For transportation, the amount of income that residents of the more walkable areas spent was 12 percent versus 15 percent spent by residents of places with poor walkability. On the other hand, residents of walkable places spent 30 percent of their income on housing versus 18 percent spent by residents of less walkable places. The researchers also noted that residents of less walkable places are “generally less affluent and have lower educational attainment” than those residents of places with more walkability. Furthering the social inequity issue, researchers found there is a close correlation between walkable communities and improved public health outcomes (Leinberger and Alfonzo 2012:1-2, 11-12).

A United Kingdom (UK) study found that populations exposed to green space and green infrastructure experienced lower health inequalities related to income deficiencies, although it could not account for this anomaly. Nearly everyone (95%) across the social gradient values the proximity of a green space to where they live. Natural, enclosed areas can provide an opportunity for play between various groups and for the creation of various activities suitable for groups of diverse ages, resulting in improved mental and physical health. Because exercising in “green gyms” has more positive physical and mental health benefits than other forms of exercise, green spaces also have meaningful outcomes on community capital (Marmot 2010:130).

Given that walking and cycling are two common forms of moderate physical activity leading to sustained health benefits, the design and improvements of local green spaces are of great import since they affect the degree to which people participate in these activities. If a lack of safety is perceived — such as the presence of graffiti, unmaintained
areas, dense foliage, dog fouling, and vandalism — these spaces will suffer reduced use (Marmot 2010:131). For walking and cycling activities within the built environment, there are three aspects to consider:

(i) Transportation systems — “provide connections between activities.”

(ii) Land development patterns — “define the arrangement of activities and impact the proximity between trip origins and destinations.”

(iii) Micro-scale urban design — at the community level, this includes building design and placement, spaces for parking, and so forth (Frank and Engelke 2001:209-210).

Unquestionably, on neighborhood streets, sidewalk width is a factor in stationary and social activities. Jane Jacobs writes, “Lowly, unpurposeful and random as they may appear, sidewalk contacts are the small change from which a city’s wealth of public life may grow.” She is convinced that, in order for a city sidewalk “to serve its purposes pleasantly,” it must be sufficiently wide to accommodate the many needs of a vibrant and varied citizenry throughout the day, and she decries “the street wideners” who, over time, gradually lessen the width of existing sidewalks to accommodate the increases in automobile use (Jacobs [1961] 2002:87, 153). Jacobs warns against the effects of erosion of cities by automobiles, saying:

Because of vehicular congestion, a street is widened here, another is straightened there, a wide avenue is converted to one-way flow, staggered-signal systems are installed for faster movement, a bridge is double-decked as its capacity is reached, an expressway is cut through yonder, and finally whole webs of expressways. More and more land goes into parking to accommodate the ever increasing numbers of vehicles while they are idle ([1961] 2002:349).

Even though these events may be singularly uneventful, each one adds to the process of erosion, and given that the cumulative reactions to city erosion by automobiles are

While motorists have a “limited ability to process detail in the environment because speed demands concentration,” pedestrians and cyclists travel at a slower pace enabling them to maintain visual and sensory attention. Consequently, pedestrians and cyclists are more susceptible to the external stimulus of urban design features than are motorists (Frank and Engelke 2001:210). Public health research reveals that all modal choices, motorized and non-motorized, are not equal and that urban space designs oriented toward automobile use, “independent of air quality issues,” make for more dangerous walking conditions (Frank and Engelke 2001:214).

As cities have increased in size, so has dependence on the automobile and, as a result, concerns for personal safety have risen. These have placed limits on outdoor recreation and children’s outdoor play. And for non-motorized transportation to school, work, and stores, there are changes in routine pedestrian and cycling activity patterns within the neighborhoods (Mackinnon, Ritchie, Hooper, and Abernethy 2003:49).

However, Jacobs cautions against confronting city traffic problems simply as a case of pedestrians versus motorists ([1961] 2002:348). She argues that the needs of city pedestrians are closely linked to the need for “city diversity, vitality and concentration of use.” Diversity denotes mixed primary uses such as commercial storefronts, places of residence, and landmarks, along with a mix of building ages and styles, small blocks, wide sidewalks, and alleys. Jacobs is also a proponent of areas of “concentration” (dwelling densities\(^5\) complemented by other primary uses) within the city where a mass of people live, work, shop, and visit areas of activity throughout the day. These contribute

\(^5\) Density refers to the number of persons, families, or dwellings per unit of land. The more persons in an area, the higher the density (Source: City of Prince Albert).
to urban vitality for they allow people to communicate and work together, independent of socioeconomic status, in safe and productive public spaces (Jacobs [1961] 2002:150-151, 201, 301-302; Bosselmann 2008:144). In other words, high-density, mixed use, pedestrian-friendly neighborhoods provide the potentiality for constant positive human interaction, both intentional and unintentional (Harnik 2010:17), thus delivering significant public health benefits. In furthering her contention that human interaction on neighborhood streets would promote safety, Jacobs’ also argued that the provision of diverse housing stock would facilitate social stability and economic vitality, and that the inclusion of various types of businesses would act as a deterrent to, or at least lessen the impact of, an economic downturn (Bosselmann 2008:144).

Although Gans is one who steered Jacobs through Boston’s North End as she penned Death and Life of Great American Cities, he was not in total agreement with her points of view. He argued that since a preponderance of the urban population were middle-class, they did not necessarily place a high value on vitality and liveliness, stating, “They do not want the visible vitality of a North End, but rather the quiet and the privacy obtainable in low-density neighborhoods and elevator apartment houses” (as cited by Rybczynski 2010:90-91).

2.3.4.3. The urban form and green spaces

The strengthening of cities and the reduction of exurban sprawl are greatly impeded by a paucity of urban natural spaces (Harnik 2010:159). Harnik posits that parks are "immensely complicated," more so than highways, and require "math plus horticulture, hydrology, psychology, sociology, and communication" (Harnik 2010:5).

The park experience — sensory stimulation, psychic renewal, a sense of general well-being — is "entirely personal and can never be entirely quantified." Sue Donaldson, a former senior planner at the Portland Park and Recreation Department says, “People
seek and remember experiences. They may talk about a particular setting or an activity, but they usually mean they are seeking or have found an experience (Harnik 2010:23).

To determine the activities that each city park supports, Portland planners devised a three-way classification:

(i) “People-to-people” places—such as plazas, squares, playgrounds, golf courses, tennis courts, basketball courts, and all sports fields.

(ii) “Nature-to-nature” places—such as forests, swamps, and deserts.

(iii) “People-to-nature” places—such as greenways and trails, forests with through paths, community gardens, meadows, ponds and lakes.

And by calculating the total acreage in each category, the planners garner further information on costs and budgeting with regard to the creation and maintenance of existing and future green spaces (Harnik 2010:23-24).

Most recently, the government of Mexico City (metro population: 20,450,0006) instigated a multi-million dollar experiment in “how to soften urban sprawl.” Juan Carlos de Leo Gandara, head of the Iberoamerican University’s sustainable urban projects pronounced, “Today is about giving the city back to pedestrians” (Licon 2012).

In the midst of Mexico City’s cacophonous traffic volume and multitudinous billboards lies the Alameda Park. It occupies an area equivalent to two city blocks and dates back to the sixteenth century. Within the park, marble replaces concrete sidewalks, the omnipresent and crudely constructed vendor stands are no more, and newly-installed lighting and dancing-water fountains welcome families to “a sea of greenery and calm in the midst of racing traffic” where previously people had feared to go. Among the city’s completed projects are a large pedestrian plaza featuring multi-colored fountains that

---

6 According to 2010 census. (http://www.worldatlas.com/citypops.htm)
replaced a downtown parking lot, a pedestrian walkway converted from a street in the
city’s historic center, and a playground and taco joint installed under a popular bridge in
a trendy neighborhood (Licon 2012).

Reaffirming Jane Jacobs’ convictions, chief architect of Mexico City’s Public Areas Office
Daniel Escotto avers, "A city where people go out to the streets is safe, happier and
raises the quality of life" (Licon 2012).

In determining the need for neighborhood parks, population density is undoubtedly the
primary factor. Also, neighborhoods with community-friendly sidewalks may not need as
many parks since sidewalks provide some of the same social interaction functions as
parks (Harnik 2010:40). A case in point is that of residents in a low-income, mostly
immigrant neighborhood in East Los Angeles (Boyle Heights) that lacked a park in which
residents could pursue their exercise regimens. The residents took to jogging around
Evergreen Cemetery, a private graveyard in their vicinity, despite the many potholes and
overgrown tree roots that affected every part of the encircling pavement. Then, in 2003,
they formed the Evergreen Jogging Path Coalition and successfully lobbied the city for
an $800,000 appropriation in order to resurface the path “with a 1.5-mile, top-of-the-line
new rubberized sidewalk that has become the pride of the area.” As a result, although
not a park in the strictest sense, the sidewalk is close to being one since its use by
residents (joggers, pedestrians, dog-walkers, and socializers) has increased from 200 to
1,000 people per day (Harnik 2010:40-41).

Other examples of successful recreational areas developed in order to facilitate exercise
are five Los Angeles parks that were installed in 2007 in neighborhoods whose residents
were “disproportionately overweight and unhealthy.” County Supervisor Gloria Molina
joined forces with Kaiser Permanente and the Trust for Public Land to fund the project.
Above all, the equipment is durable, uses no electricity, and runs entirely on “exercise
power,” and the phenomenal success of the experiment has heralded numerous requests from other communities (Harnik 2010:34-35).

There is also evidence that different cultural and ethnic groups may have different needs with respect to open spaces. In a study of four public parks in Los Angeles, Hispanic family groups were identified as the most frequent users, often celebrating family events with balloons and streamers to mark their territories. African Americans went mostly with friends (50 percent of whom were male) and participated in organized sports. Large numbers of Caucasians visited the park alone and engaged in self-orientated activities. The smallest ethnic group was from the Chinese community, the majority being older men relaxing, socializing or practicing Tai Chi (Loukaitou-Sideris 1995, as cited in Woolley 2003:22).

While considering a typology of urban open spaces and their users, a simple one might consist of merely three groupings: domestic, neighborhood, and civic. Further consideration reveals the significance of the spaces’ distance from people’s homes, and the social interactions between people who meet or are simply seen in these spaces. Consequently, it is predictable that a transition of experiences takes place between them as shown in Table 2.5 (Woolley, 2003:56).

<table>
<thead>
<tr>
<th>(1) DOMESTIC OPEN SPACES</th>
<th>(2) NEIGHBORHOOD OPEN SPACES</th>
<th>(3) CIVIC OPEN SPACES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close to home.</td>
<td>Linked to community.</td>
<td>Often farthest from home and placed at strategic or specific locations.</td>
</tr>
<tr>
<td>Used mainly by family, friends and neighbors.</td>
<td>In addition to (1) users, also by others living in close proximity.</td>
<td>Used by people with varied backgrounds and from different parts of the larger urban area.</td>
</tr>
</tbody>
</table>
Within these open space groupings there are “three social levels of familiarity, sociability, and anonymity,” and with the transition between the groups, “there is an increasing likelihood that users will know a smaller percentage of the other users” (Woolley 2003:56). So, overall, the development of social ties and interactions appears to be affected by the characteristics of the space users and, perhaps equally so, by the characteristics of the open spaces themselves.

Neighborhood public spaces present social and cultural opportunities. “The potential for a lively city is strengthened when more people are invited to walk, bike and stay in city space” (Gehl 2010:6).

2.3.4.4. *The urban form and adaptive re-use*\(^7\).

Conservation of aged and outmoded architectural environments extends protection to people and their traditions while, in a certain sense, refuting the alienation and anomie characteristic of city life in the twentieth century with its “disruptive impacts of hostile, disorienting physical environments” Wiedenhoeft 1981:180). For example, the reclamation of disused industrial and commercial buildings in older cities, through adaptive reuse, can provide an abundance of residential units. As the number of new occupants multiplies, so does the number of retail establishments, restaurants, and entertainment spots, thus promoting urban vitality — the Jane Jacobs essential. Also crucial to the densification of such a neighborhood is the active support of government in facilitating permits in the early phases and providing improvements to infrastructure, transportation, and the construction of “public buildings such as libraries and schools… an important reinforcement in later stages of development” (Rybczynski 2010:154-5, 158, 162).

---

\(^7\) Adaptive reuse is the process of adapting old structures for new purposes. *Source: New Jersey Department of Environmental Protection. 2011.*
By avoiding the profligate process of demolition and reconstruction, adaptive reuse of existing buildings offers numerous environmental benefits. The social advantage of adaptively reusing older buildings, along with energy savings, makes adaptive reuse a fundamental component of sustainable development. In high density communities where there are few parks or open spaces, rooftops represent a singular resource. Clearly, the amounts of sunlight and precipitation remain the same as before development, but thereafter, to a large extent, the meteorological action is on rooftops and not at ground level. Admittedly, there are challenges, among which are the buildings’ structural integrity and the potential for water leakage, along with concerns of access and security. Nonetheless, given that a substantial number of rooftops are large, flat areas, such as those on public buildings, government buildings, convention centers, big box stores, warehouses, shopping centers, and bus stations, there are opportunities for a city to gain more space “with sun and air for public enjoyment” (Harnik 2010:104, 105, 109).

Another driving factor for a green roof is its facility to increase building performance by saving energy, conserving water and reducing costs. For example, on a sunny 70°F day, temperatures on different sides of the City-County Building in Chicago varied greatly. The soil-covered and planted Chicago City Hall side registered 74°F whereas the unimproved Cook County side registered 151°F (Harnik 2010:104-5).

There is a 2,000-sq.ft. green roof in Denver installed atop the Denver Botanic Garden’s café and gift shop that is devoted 75 percent to native and drought-tolerant plants, and 25 percent for visitors to enjoy them. The Garden’s literature and tours stress some of the benefits of its green roof — the reduced costs of heating and cooling, the extended lifespan of its roofing membrane “by protecting it from ultraviolet rays and temperature changes,” reduced noise, and an increased wildlife habitat (Harnik 2010:107).
For another green roof installation, noise abatement was a primary objective; its intent was to reduce sound transmission by as much as 50 decibels. The building was in the flight path of the San Francisco International Airport as well as being positioned next to a noisy freeway. In 1997, The Gap’s award-winning green roof installation on their Cherry Hill (California) office building was recognized for its achievement (Burke 2003).

So, consider the possibilities “for rooftop parks on redevelopment projects in dense, park-poor neighborhoods or on large public buildings.” Two of the most densely populated cities in the United States are New York and San Francisco. In New York, the 28-acre Riverbank State Park was built on the roof of a Hudson River sewage treatment plant and comprises “a pool, a skating rink, a theater, four tennis courts, four basketball courts, a wading pool, a softball field, a football field, four handball courts, a running track, two playgrounds, a weight room, a boat dock, and a restaurant” (Harnik 2010:107-108).

In San Francisco, St. Mary’s Square, in the midst of the Financial District high-rises, is adding a 5,000-sq.ft. additional rooftop as a direct result of its Proposition K. This 1989 ordinance “restricts any new construction that would block sunlight on a public park.” Because the original proposed office tower would have blocked some sunlight, and due to the importance of open spaces to workers and residents, the developer created a 5,000-sq.ft. public park on the building garage’s second floor roof, positioning it so that the sunlight it received was actually “40 times greater than the sunlight lost to the old park by the building’s shadow.” Also, the space “intersected with the ground plane of a portion of St. Mary’s Square,” negating the need for steps and fulfilling ADA (Americans with Disabilities Act) requirements (Harnik 2010:108).
There is substantial evidence that design and conversion can revitalize a city’s spaces, and whether at ground level or on rooftops, the presence of people attracts other people “to observe the activities that predictably take place out of necessity, {and this} is almost universally seen” (Gehl 1987:153; Bosselmann 2008:247).

2.3.4.5 Future directions.

If the basic concept is that the social, economic, and physical environments of a city are tantamount to the health of its urban dwellers, then the complexities of rapid urban growth, industrialization, political commitment, and institutional structure are among those issues to be considered.

As a challenge to urban sprawl, “smart growth” embodies a cross-disciplinary set of issues and compels leadership “from the top.” As an example, under the direction of Governor Parris Glendening (1996-2003), the state of Maryland put together a smart growth initiative that represented all the major state agencies — budget and management, community development, economic development, environment, general services, housing, natural resources, and planning (Frece 2005).

The health of a city depends on its ability to reduce its residents’ insecurity and unemployment, and to improve their education and housing standards (Wilkinson and Marmot 2003:9). According to WHO’s Regional Office for Europe, it is critical for policymakers to understand how the environment influences behavior. Consequently, addressing health through its social determinants is key to making informed modifications to the environment that would lead to more health-giving behavior (Wilkinson and Marmot 2003:11).

Within the context of multi-sectoral prevention, public health and urban planning are developing ways to control risk and make environmental changes that will ameliorate the
changing nature of health (from infectious diseases to chronic conditions) and the “new
disease-producing agents” generated by the modern industrialized world (Duhl and
Sanchez 1999:17).

Because urban form affects the incidence of walking and cycling as a mode of physical
exercise, it is incumbent on urban planners to consider the needs of public health in
future environments. It is possible for built environments to encourage or discourage
physical activity due to the results of land use and transportation decisions (Frank and
Engelke 2001:202-203). However, if environmental conditions are made safe,
convenient, and pleasurable for walking, it is a physical activity accessible to the
multitudinous many “regardless of age, gender, and social status” (WHO 2002:8). Also,
by walking and cycling rather than taking automobile trips, additional health benefits will
accrue through reductions in air pollution and noise. Consequently, the quality of urban
life will be improved (WHO 2002:8).

The anxiety and danger thrust upon pedestrians and cyclists by city traffic tends to
discourage many. If pedestrians and bicyclists perceive a risk of injury, they react
accordingly. Perceived risk differs from true risk because of cultural influences and
individual characteristics of the actors. Noise, air pollution, and vehicular exhaust are
also contributing factors to a fear of city traffic. Consequently, evidence of this behavior
indicates that the strongest relationship is an inverse correlation between the volume
and speed of traffic and observed levels of walking and cycling (Jacobsen, Facioppi, and

To slow an onslaught of traffic, raised crosswalks for pedestrians and roundabouts for
motorists could yield benefits for both (McCann and Ewing 2003:26). International
studies find that modern-day roundabout installation affords high capacity and
significantly improves overall safety performance. Reasons for installing roundabouts
include: traffic calming, safety improvements, operational benefits, and community enhancement.

There are significant differences between modern roundabouts and older traffic circles, both in their design and operation, the most important being “the reduction of absolute and relative speeds between users” (U.S. Dept. of Transportation 2000; Delaware 2000a). Furthermore, roundabouts are often smaller, less expensive to construct, and operate less complicatedly than old-style traffic circles. For example, vehicles circulating in a roundabout have right-of-way whereas those in a traffic circle are sometimes required to yield to entering vehicles. And pedestrian activity is not allowed on the center island in a roundabout whereas pedestrians crossing to, and activities on, the central island of a traffic circle are permitted (Delaware 2000 1).

The Delaware Department of Transportation cites a Maryland State Highway Administration study of 11 roundabouts in Maryland where “the average accident rate was reduced 60 percent and injury-related accidents reduced by 86 percent,” attributing this decrease in accident rates to slower speeds and fewer conflict points in the overall roundabout design (Delaware 2000: 2). Installing a modern roundabout instead of a signalized intersection results in shorter delays for motorists and, therefore, shorter vehicle idling periods. Consequently, in addition to lower fuel consumption, the environmental impact is improved due to lower emissions of pollutants (Delaware 2000a).

Most recently, on the island of Maui in Hawai‘i, the first county-owned roundabout “large enough to handle buses and trucks and other full-sized vehicles” was constructed and officially opened in April 2012. Government officials anticipate success in diminished traffic accidents and are considering the construction of more roundabouts throughout the island (County of Maui 2012). Meanwhile, Puna residents on the Big Island of
Hawai‘i are eagerly awaiting the construction of that district’s first roundabout which is scheduled for completion in 1913 (Sur 2011).

In short, urban design and planning strategies promotive of good health can be put into practice at the community level to advance the well-being of urban environments (Stokols 1992:15). Furthermore, there will be a positive impact on health if public funds are invested in the promotion of such measures as green spaces and active travel. Social class notwithstanding, living in close proximity to urban forestry and other green spaces can result in better health and stronger ties among a city’s residents. Indeed, these are indirect benefits to green spaces, not the least of which are improvements in air quality and a reduction in urban heat sinks (Marmot 2010:78-80, 151).

The largest consumers of energy are buildings, and by transitioning to free solar resources along with smart design, energy needs such as water heating, space heating and cooling, could be fulfilled with minimal waste. Additionally, with a significant reduction in the use of fossil fuels, greenhouse gas emissions would decrease considerably (IEA 2011:20-21).

2.3. INTERSECTORAL PARTNERSHIPS (ISPs):

Intersectoral Partnerships (ISPs) are collaborations between organizations based in three sectors:

(i) Government — the state.

(ii) Business — the market.

(iii) Civil Society — non-profits, NGOs, and so forth.

By producing activities in which “the whole is more than the sum of the parts,” ISPs can effectively tackle large and complex issues that require a broad range of resources and abilities; they can aid in preventing duplicative efforts that work at cross-purposes; and they can encourage “innovation and unusually creative solutions if the diverse goals of
participants can be addressed” (Waddell and Brown 1997:1). The intersecting circles in Figure 2.2 illustrate how intersectoral partnerships bridge and operate across intersecting circles.

![Intersectoral Partnerships Diagram](image)

**FIGURE 2.2. INTERSECTORAL PARTNERSHIPS COMBINE TWO OR MORE SECTORS**

Despite their interrelationship, these sectors possess somewhat different interests and concerns, namely:

**Government**

State institutions “are concerned with the creation and maintenance of public order and the distribution of public goods.” Include: various levels of government; bureaucracies (often departments or ministries); state-appointed bodies (judiciary, regulatory boards and councils; agencies that provide public services (housing and economic development); government-controlled enterprises (utilities, education systems, health care institutions).
Business……….. Institutions of the market “are concerned with the efficient production of goods and services.” Common market organizational forms: “public corporations, private companies, private partnerships, proprietorships, and franchises.”

Civil Society ……. Institutions of civil society “are concerned with the expression and preservation of core community values and beliefs.” Include “non-governmental organizations, people’s movements, citizens’ groups, consumer associations, religious institutions, women’s organizations, and indigenous people’s associations. Civil society organizations may be grassroots organizations directly serving individuals of their community, or networks of grassroots organizations like federations” (Waddell and Brown 1997:4).

Because the borders of the three sectors are permeable, intersectoral partnerships that involve all three sectors — in varying degrees — are quite common, especially for economic development purposes (Waddell and Brown 1997:6).

An important prerequisite for effective local action on health inequalities is an intersectoral and multidisciplinary partnership between local agencies and communities (Evans 2007:165). As an example, the Contra Costa Health Services (CCHS) in California, when addressing health disparities, pointed to social, economic, and neighborhood conditions, along with discrimination and limited educational opportunities as causal factors. Realizing that CCHS single-handedly could not achieve eradication of health disparities, they now:

…require collaboration among many sectors. Several CCHS divisions — such as Public Health, AODS [Alcohol and Other Drug Services], Environmental Health and Hazardous Materials — are engaged in efforts designed to impact community level factors related to health disparities, such as air and water quality, access to healthy foods, and communicable diseases (CCHS 2006:4).
Many cities already have wide-ranging information available on different geographic locations (electoral wards, parishes, postal districts), along with records of “deaths, births, unemployment, and benefit entitlements,” and possibly more on housing, transport, and education. Information shared among agencies often confirms the intersections of disadvantage across the city (Crown 2003:70).

A 1990 mid-term review of 29 cities in the Healthy Cities project concluded that intersectoral action for healthy public policy was less complicated in the smaller cities due to their smaller bureaucracies. Moreover, those cities that had achieved significant success had experienced qualities that included strong political support, effective leadership, adequate resources, strategic orientation, strong community participation, and political and managerial accountability (Hancock 1993). Presumably they had employed participatory planning — a “process by which a community undertakes to reach a given socio-economic goal by consciously diagnosing its problems and charting a course of action to resolve those problems.” Their strategy included “limited mediation by the next higher level of community aggregation” and, as needed, experts as facilitators (Pal 2006:505).

The World Summit on Sustainable Development (WSSD), with over 22,000 participants, was held in Johannesburg in 2002. A key message at the Summit was that sustainable development is unattainable where there is a high incidence of enervating disease or sickness, and the population’s health will decline without a healthy environment. The Summit recommended that governments at the local, national, and regional levels bear the primary responsibility for enacting and enforcing “clear and effective laws that support sustainable development, develop and strengthen the necessary infrastructure and promote public participation in implementation” (von Schirnding 2005:3, 5).
No matter the method of partnership, healthy cities and their residents are ultimately affected by policies made at local, national, and global levels. In some regions, wide variations in health measures have been detected and these have been linked, in addition to income inequality and poverty, to low levels of participation and trust and to lower levels of investment in health and welfare (Kawachi and Kennedy 1997).

When Paul Farmer, executive director of the American Planning Association (APA), spoke before New Orleans’ social, economic, and political representatives on the subject of rebuilding the city after Hurricane Katrina, he addressed the importance of comprehensive planning and public participation. He stressed that decision-making is one of local government’s critical responsibilities, and because the lives of every resident in the community are affected by planning, it is imperative that there is local involvement and control in order to maintain public trust and accountability. “Every resident must have a voice in the rebuilding process…. To truly rebuild communities of lasting value, residents, business interests and elected officials must make decisions about their community together” (Farmer 2005:3-4).

To aid in the recovery process, the APA launched a series of initiatives that included organizing a Katrina recovery workshop, issuing an electronic publication to help planners, and creating a Katrina website with educational resources (Farmer 2005:6).

Given the nature of intersectoral collaboration, proposed initiatives have the potential to foster exchange and collaboration among multidisciplinary teams from other countries. Subsequently, alliances would be formed with (i) stakeholders, and (ii) related research initiatives and networks across regions and sectors. The promotion of such collaborative intersectoral action should be viewed as a component of government’s fundamental stewardship responsibility in health.
2.4.1. Local

The Healthy Cities Program (HCP) differs from other community-level health promotion initiatives by its strong emphasis on the commitment and involvement of local government. A general framework is provided by the government, but the program has life locally. Hence, national governments have minimal involvement in the HCP. To join the initiative, local governments must pass motions to commit to the HCP and demonstrate support by forming intersectoral committees that include wide-ranging citizen representation (Waddell 1995:220). By emphasizing intersectoral committees, the "holistic" approach of HCP is underscored (Waddell 1995:222).

All of this serves to promote the entire objective of the "Inclusive City" as citizens make full use of their efforts to improve their social and economic conditions thereby allowing them to lead optimal socially and economically productive lives (de Leeuw 2001:36):

Also, this encompasses an overall strategy designed to build a strong local constituency of support, integrated into local activities, and with local objectives determined by citizens. This differs substantially from traditional ways of developing social indicators. Citizen-driven committees have replaced the isolated teams of researchers working for the central government. Furthermore, these citizen-driven committees exhibit independent viewpoints, do not depend on daily bureaucracy, and can meet with top government officials should they ever need to press their case (Waddell 1995:221).

Writer and civic activist Jane Jacobs, after studying the prevalence of street violence in some city areas against the street safety in others, found that public peace was kept primarily and almost unconsciously by a community network of voluntary controls and standards, and enforced by the residents themselves (Jacobs [1961] 2002:31-32).

Almost four decades later in 1998, the WHO issued a new definition for community action for health, stating that it "refers to collective efforts by communities which are
directed towards increasing community control over the determinants of health, and thereby improving health" (WHO 1998:6).

The social capital of a community is formed by its character and structure and the degree to which it achieves local and national recognition and acceptance. Community capital is built at a local level, ensuring that policies are created by those most affected by them. Causal associations between communities’ social capital and health include: multiple deprivation, stress, isolation, and depression (Marmot 2010:136).

Social capital may be divided into a structural component and a cognitive component. The structural component of social capital encompasses the extent, intensity, and activity in society whereas the cognitive component comprises perceptions of trust, reciprocity, and sharing (Harpham, Grant, and Thomas 2002). A further division can be made between bonding social capital that refers to the social connections within a given structure and bridging social capital that refers to the social connections that link diverse communities and groups within a society (Putnam 2000:22). However, Putnam laments the decline of social capital in the United States, arguing that an increasing dependence on the automobile for commuting to work and for everyday errands is reducing the processes of interaction in local communities. As a result, “community bondedness” is deteriorating (Putnam 2000:214).

In 1916, long before Putnam’s writings, Lyda Judson Hanifan, a state supervisor of West Virginia rural schools, applied the term “social capital” to education and community involvement, defining it thusly:

[T]hat in life which tends to make these tangible substances count for most in the daily lives of a people, namely, good will, fellowship, mutual sympathy and social intercourse among a group of individuals and families who make up a social unit . . . In community building as in business organization and expansion there must be an accumulation of capital before constructive work can be done. . . . The
individual is helpless socially, if left entirely to himself. . . . If he may come into contact with his neighbor, and they with other neighbors, there will be an accumulation of social capital, which may immediately satisfy his social needs and which may bear a social potentiality sufficient to the substantial improvement of living conditions in the whole community. . . . The community as a whole will benefit by the cooperation of all its parts . . . that is, when sufficient social capital has been accumulated, then by skilful leadership this social capital may easily be directed towards the general improvement of the community well-being (Hanifan, 1916:131-132).

Bourdieu defined social capital as a collective asset shared by members of a defined group. Cultural and hierarchical in conceptualization, Bourdieu’s interest lay in the non-material forms of exchange between French elites and how it is extracted in order to maintain members’ standings within the prevailing social structure. Bourdieu affirmed that, in addition to a network of ties, social capital encompasses the norms of trust and reciprocity that facilitate a collection of resources, thus “transforming contingent relations, such as those of neighborhood, the workplace, or even kinship, into relationships that are at once necessary and elective, implying durable obligations subjectively felt (feelings of gratitude, respect, friendship, etc.)” (Bourdieu 1983:249-250).

It is interesting to note that, due to the norms and sanctions imposed on those who break trust, an individual embedded in a group is likely to assign its members a degree of trustworthiness greater than that granted the average person (Paxton 1999:99).

Comparatively less tangible and due to the variety of forms in which it appears, social capital is more difficult to measure than other forms of capital. Thus, the measurement of the construct often requires a variety of approaches including aggregated responses from social surveys and direct observation. For example, the Community Survey of the Project on Human Development in Chicago Neighborhoods determined that after controlling for demographic and socioeconomic indicators at the individual level, statistically significant
neighborhood differences remained in the perceptions of trust, thus demonstrating social capital as a contextual construct (Subramanian, Lochner, and Kawachi 2003).

Social capital is linked to economic development, democracy, and crime prevention (Putnam 2000). Moreover, social capital has been extended to the field of population health as a means to explain the variation in the health achievement of societies at both the individual and community levels.

The exact connection between social capital and health outcomes remains the topic of ongoing research. However, there is epidemiological evidence to suggest social support is a determinant of longevity and quality of life. Kawachi and Berkman offer additional ways that social capital might influence health outcomes:

(i) A community’s ability to enforce healthy norms (“collective efficacy”).
(ii) Collective action to gain health-promoting services and amenities.
(iii) Dissemination of information and knowledge through information channels (Kawachi and Berkman 2000).

James Coleman also identified several forms of social capital including levels of trust, “appropriable” social organizations, norms and sanctions, and informal channels. Appropriable social organizations are voluntary and are usually established by individuals to address a specific problem, and subsequently, they may be appropriated to solve other problems via collective action (Coleman 1990:311, 312).

Approaches akin to the Healthy Cities project seek to improve systems and public policies, and to fortify a community’s capacity to tackle the social determinants of health at different levels. (Barten, Mitlin, Mulholland, Hardoy, and Stern, 2007: i171). Figure 2.3 illustrates the determinants of urban health and well-being and their inter-relationships.
More recently, the local governance concept has moved toward participatory processes of policy making in its attempt to level the social gradient of health equity and inclusive urban settings. This form of healthy governance has been accomplished by transferring influence and power to local communities (Barten et al. 2007:i165).

FIGURE 2.3. A HEALTH MAP FOR THE HUMAN HABITAT (Barton and Grant, 2006: 252-261).
2.4.1.1. **Social cohesion and social conflict.**

Community empowerment is a concept that is directly associated with the Ottawa Charter definition of Community Action for Health. Hence, in an empowered community, individuals and organizations apply their collective skills and resources to address their health priorities and needs. Through such involvement, they foster social support for health, manage conflicts within the community, and secure greater influence and control over the health determinants in the community (Nutbeam 354). Consequently, when a range of far-reaching governance institutions play an active part, they will build connections between themselves and other groups in urban settings, allowing the weak “to increase their resources for advocacy and upstream governance” (Burns 2007:i158).

For the most part, Healthy Community initiatives are multi-sectoral partnerships that focus on improving the physical and mental health of community residents — often necessitating improvement of the health of the community itself. Close attention is paid by healthy communities to the success rate of their efforts which are measured in terms of declines in negative statistics and improvement in positive statistics. Above all, accurate information is crucial to the sustainability of long-term community improvement (Norris 2003).

Prior research has sought to understand the many facets of social cohesion and how it affects health. Wilkinson argues that many steps are taken “from social class differences in health and the effects of income distribution on social cohesion and national mortality rates” (Wilkinson 1997:x). Additionally, the close correlation of greater income equality and improved health is that it appears to increase social cohesion and decrease social divisions (Wilkinson 1997:593; Kawachi and Kennedy 1997:1037).
Robert Park contended that changes in transportation and communication present burgeoning opportunities for an individual’s mobility through interaction and ties with others, however, “they have made these contacts and associations more transitory and less stable.” He likened city tenement and apartment dwellers to people living in an enormous hotel “meeting but not knowing one another,” which leads to casual and unplanned relationships. Additionally, he asserted that the processes of segregation within urban populations “establish moral distances which make the city a mosaic of little worlds which touch but do not interpenetrate.” Individuals in such settings might then choose to experience living simultaneously in various adjoining, but vastly separated, domains by journeying without difficulty “from one moral milieu to another.” It follows that social relationships would become more complicated and, in the superficiality of the urban scene, deviant types would emerge (Park 1925:40-41).

Also to consider is the residential segregation that results from the effects of gentrification and gated residential enclaves when the less affluent or displaced residents are forced into less desirable locations with inferior services (Labonté and Schrecker 2007a). When residential segregation takes place, the chances for social cohesion are lessened. There are spillover effects from income inequality — “increased rates of crime and violence, impeded productivity and economic growth, and the impaired functioning of representative democracy” (Kawachi and Kennedy 1997:1037).

In short, it is vital that efforts at the local and regional levels are not delayed due to a perception that the challenges of global environmental problems are too severe or too complex (Stokols 1992:6).
2.4.1.2  

Community-based intervention.

Social and cultural dimensions are directly related to health-promotion research and interventions within the community since social and cultural issues, such as socioeconomic status, ethnicity, gender, social relationships, affect both individual and collective well-being (Stokols 1992:11).

Those environments that are perceived as conducive to health are the ones that “provide environmental resources and interventions that promote enhanced well-being” among an area’s residents (Stokols 1992:6). They are identified according to the temporal dimensions of environmental health and health outcomes — the emotional, physical, and social well-being of individuals, groups, and populations (Stokols 199219; Frank and Engelke 2001:207). In other words, an environment’s health-promotive capacity must be described in terms of the number of health outcomes that result from people-environment interactions over a particular time period (Sokol 1992:8).

Following the Lisbon symposium and the Healthy Cities project, Ashton et al. commented on the various strategies of cities developing health plans and suggested that it might be advantageous to develop different entry points. Whereas one city might find it feasible to promote an anti-smoking program or develop a shift to a primary medical care system, another city might view economic or community developments that spread into health programs as its priority and point of entry (Ashton et al. 1986:322).

By placing an emphasis on assuming healthy lifestyles and reducing risk factors, individuals may be taught healthy behaviors within their natural environments and environments may be created that are conducive to health, such as a worksite intervention in which employees are provided nutritional counseling and healthy snack foods, weight loss programs, and an on-site gymnasium (Revenson and Schiaffino 2000:474). Among potential interventions to improve population health are those
directed at people who are especially at risk for mortality and morbidity due to their inactive lifestyles and for whom there is an undeniable and urgent need to increase physical activity (Sallis et al. 1998:392-393).

It is also necessary for community-based programs to reach underserved segments of the population. In order to be successful, health interventions must be placed within different cultural contexts. For example, a mass-media campaign designed to target a “population of less acculturated Spanish-speaking Hispanics” regarding the negative impact of smoking (Revenson and Schiaffino 2000:474). Within a community, as health information is presented, social norms are developed — namely, endorsement of healthy behaviors and disapproval of unhealthy behaviors (Revenson and Schiaffino 2000:477).

Stokols points out that most corporate and community health promotion programs have centered on modification of individuals’ health behaviors — exercise and nutrition — rather than the promotion of environmental resources and interventions such as improved ventilation systems, safe stairways, and workplace gyms (1992:7).

While change in individual behavior is important, societal and governmental responsibility are equally so in community-based prevention endeavors. Stokols suggests that complex interventions integrating complementary environmental and behavioral components and extending over several settings and levels of analysis will probably be more effectual in advancing individual and public health than those less complicated and more restricted in range (1992:18).

Just as recent legislative and economic strategies sought to safeguard environmental quality and population health, so did those initiated in the 1970s when McKinlay pointed out:
One stroke of effective-health legislation is equal to many separate health intervention endeavors and the cumulative efforts of innumerable health workers over long periods of time. . . . Greater changes will result from the continued politicization of illness than from the modification of specific individual behaviors. There are many opportunities for a reduction of at-riskness, and we ought to seize them. (1975:13).

2.4.2. National

The choice of strategies and policies and their implementation strongly influence the Millennium Development Goals’ progress. When the input of poor, marginalized populations is included in locally developed strategies, there is a distinct possibility that it will result in more effective and sustainable outcomes. MDG strategies have a stronger potential for success when the governments of countries “work closely with local governance institutions, civil society and the private sector, allowing each stakeholder to play an active role in the design, implementation and monitoring of national development policies and plans.” Recent reviews of various policy frameworks of bilateral programs found that there is an urgent need for further integration of the MDGs in national plans (UNDP 2010:20, 21).

2.4.3. Global

In the international arena, the connection between health and material living standards within countries indicates that those ranking lower on the social scale are destined to suffer higher mortality rates than those of higher socio-economic status (Wilkinson 1996:54). If society is to have a healthy population, an elevation of the general level of health and a leveling of the social gradient (proportionate universalism) are needed (Marmot 2010:18, 41). The Preamble to the Constitution of the World Health Organization, in asserting that its principles are basic to the “happiness, harmonious relations and security of all peoples,” expresses a “modern set of universal aspirations.” It proclaims
that the highest level of health — a fundamental right of every human being without distinction of any kind — is considered a crucial key to their attainment (Grad 2002).

However, David Evans argues that, in Britain today, inequalities in health are as evident as they were a century ago, pointing out that this is even with the creation of a welfare state and its supplemental eradication of poverty. The health of Britain’s poor, although having shown improvement over time, has not done so as fast as that of the general population. Hence, there is a still-widening gap between the rich and the poor. Moreover, this is only one aspect of their SES for there is also a widening gap apparent in income, education, housing, and other facets of social life. There are some countries where inequalities in health are much smaller. For example, “inequalities in health are markedly smaller in absolute terms in Sweden (which for many years has pursued equality orientated social and labour market policies) than in the UK,” implying that social policy may, indeed, impact health inequalities (2007:157).

The WHO Commission on Social Determinants of Health agenda calls for the gap in health differences between and within countries to be closed in a generation. It believes this to be attainable through economic, political, and social action on regional, national, and global bases (WHO 2008:26). The type of collaboration necessary for global health is exemplified by the Healthy Cities movement and regional health promotion networks that, when in close geographic proximity, share their expertise and pool their resources (Burris 2007:i158).

The 2010 MDG Assessment noted that challenges remain in terms of the reliability and timeliness that accompany various achievement reports and case studies collected at the global, regional and country levels. Observing that statistical systems often suffer from weak institutional capacity and human resource constraint, UNDP recommends that future action be taken “to support capacity for collecting regular and comprehensive
economic and social statistics" (UNDP 2010:3). The WHO maintains that it is a global responsibility to achieve the MDG goals, "not least because of the global-level determinants of health inequities between and within countries." Strong, focused efforts will be needed to attain these goals but it is possible with enough proactive measures (WHO 2008:197).

A report from the WHO Commission on Social Determinants of Health emphasized the fact that an improvement in populations' health "in genuine and lasting ways" is, in the end, dependent upon the ability to understand and address the causes of health inequities (WHO 2010:1).

2.5 GOVERNANCE

Urban and global health are dependent upon governance — the societal organizations and procedures through which the course of events is controlled.

Governance should not be viewed solely as the government’s duty since, in the urban arena, it is “the sum of the many ways individuals and institutions, public and private, plan and manage the common affairs of the city” (UNCHS 2000:2). Rather, governance is polycentric, involving a large number of interlocking and interacting interests and forms of power. For some, this means the decentralization of top-down management in favor of the development of governance systems that focus on social learning and coordination (Burris, Hancock, Lin, and Herzog 2007:i155). Ultimately, governance is an instrument of social coordination that relates to those who (i) have influence, (ii) make decisions, and (iii) are held accountable. It is a means of demarcating the rights and responsibilities of individuals or groups who encounter a specific common problem and then collectively seek a resolution.
Within the Preamble to the Constitution of the World Health Organization, there are indications of a need for government flexibility in developing health policies when assuming responsibility for the health of their people. Social and economic measures are needed if states are to fulfill this responsibility (Grad 2002).

In the context of equality for all and the ability to access benefits of urban citizenship, the United Nations Commission on Human Settlements (UNCHS) said this:

Good urban governance, based on the principle of urban citizenship, affirms that no man, woman, or child can be denied access to the necessities of urban life, including adequate shelter, security of tenure, safe water, sanitation, a clean environment, health, education and nutrition, employment and public safety and mobility. Through good urban governance, citizens are provided the platform which will allow them to use their talents to the full to improve their social and economic conditions (2000:2).

Therefore, assuming that governance refers to the systems and procedures of government, including mediations with various factions, then participatory governance will place emphasis on the presence of all people, more specifically the poor (Mitlin 2004:4).

Despite limited data on the link between politics, policy, and health, there are signs that countries regulated by “political parties with more egalitarian ideologies tend to have more economically redistributive policies and more equitable health outcomes.” There also is evidence suggesting that it may be healthy for individuals and communities to participate in governance (Burris 2007:i156). Consequently, by empowering individuals and local communities, effective participatory decisions may be made at the local level (Marmot 2010:15).

The writings of Trevor Hancock (a pioneer in the international healthy cities movement and architect of the Healthy Cities Project) stress the importance of decision-making processes at the local level — local governments, community organizations, and
businesses — in order to address the “broad social, environmental and economic
determinants of health, and ultimately to change the corporate and community culture by
incorporating health” (Hancock 1993).

The conclusion of the Preamble to the Constitution of the World Health Organization
calls for the acceptance of its principles by the member states in order to uphold and
protect the well-being of not only their own people but agreeing to “support WHO’s
cooperative initiatives to advance the health of all people in the world” (Grad 2002:982).

In urban settings, the world can be “re-imagined” — that is, recreated in a fundamentally
different way — where attempts at reform boost the progress of new ideas and further
action, and where new norms are structured. On a global basis, within the context of
urban settings, there is a great opportunity to carry out healthy public policy by way of
governance innovation (Burris 2007:i161).

2.5.1. Social

It is long-established that health follows a social gradient. Those higher in social position
have better health than those at a lower level. Furthermore, the social gradient indicates
how health is affected by social and economic factors (Marmot and Wilkinson 2005:2).

Neil Pearce points out the importance of recognizing that populations are not just
collections of conveniently-grouped individuals that epidemiologists study, but that each
population is unique in its “history, culture, organization, and economic and social
divisions,” all of which influence how and why they are affected by specific circumstances
(1996:681). To put it another way, it is social circumstances that bear influence on
behaviors related to health risk as is the case with smoking. There is a social gradient in
smoking in many rich countries wherein there is a higher rate of smoking among those in
lower socio-economic position (Marmot and Wilkinson 2005:3).
2.5.2. Economic

In view of the mortality burden related to income inequality, public and private sector strategies designed to lessen economic inequalities should take precedence (Lynch et al. 1998:1079). Although there is extensive evidence that individuals are to some extent sheltered by higher income, it remains that those living in a society with higher income inequality are predisposed to higher mortality (Wolfson et al. 1999:955). The degree to which social or economic disparity occurs in society is frequently a consequence of specific policies and public choice (Kawachi and Kennedy 1997:1037).

Thomas McKeown, a figure of dominance and a powerful critic in the public health field from the 1950s to the 1970s, championed the importance of economic growth along with the need for improved nutrition and improved living standards in developed nations (Szreter 2002:722, 723). Recent epidemiological research has confirmed the critical role played by socio-economic and environmental factors and McKeown’s analyses disclosed that changes in material living standards — food availability and economics — were the major impetus behind mortality reduction (Irwin et al. 2005:8; Szreter, 2002: 723). His thesis was primarily a critique of medicine’s contribution to society’s well-being. The industrialized world’s hefty population increase from approximately 1770 to contemporary times was ascribed by McKeown to the broad economic and social changes that took place instead of the “targeted public health or medical interventions” (Colgrove 2002:725-726). Nevertheless, scholarly skepticism ensued and in a recent reassessment of the enduring controversy, James Colgrove took issue with McKeown’s analyses from both theoretical and empirical perspectives, claiming that McKeown’s conclusions are flawed and, for the most part, have been discredited by later research. In 1988, Simon Szreter criticized McKeown’s research, claiming conceptual inaccuracies, and after conducting a new analysis of McKeown’s
own data on mortality trends in the nineteenth century, posited that McKeown misinterpreted death records. Furthermore, Szreter claimed that McKeown had allowed his political bias to influence his writing (Szreter 1988:1-38; Colgrove 2002:727).

On the other hand, if Colgrove is correct concerning the McKeown thesis, then social epidemiology remains with a large void in its “explanatory repertoire and a challenge to a cherished principle about the importance of social factors in health” (Link and Phelan 2002:730-732). When Colgrove argues that “... the rise in population was due less to human agency in the form of health-enhancing measures than to largely invisible economic forces that changed broad social conditions” (Colgrove 2002:725), Link and Phelan defend McKeown’s thesis, asserting that “as health-directed human agency gains explanatory prominence, so do social conditions” (Link and Phelan, 2002: 730-732). While Szreter acknowledges that McKeown was correct in his stance that material living standards — availability of food, and economics — are of great import to the health of populations, he censures McKeown for failing to emphasize the importance of “politics, ideologies, states, and institutions in producing the kind of societies that distribute their material wealth, food, and living standards in a health-enhancing way” (Szreter 2002:723, 724). Nonetheless, Szreter appears to laud McKeown’s contribution to public health research and policy since he notes that it has “vigorously animated” a discussion of the “practical and ethical challenges’ that will significantly advance the public health agenda” (Szreter 2002:724).

It was reported in The Marmot Review (England) that a reduction in health inequalities will provide economic benefits as well as social benefits. For example, losses from illness linked to health inequalities are currently responsible for “productivity losses, reduced tax revenue, higher welfare payments, and increased treatment costs.” And social benefits will derive from the “fair distribution of health, well-being and
sustainability.” Another way of looking at this is by measuring (i) the cost of health inequalities in terms of years of life and active-life lost, and (ii) the economic cost of additional illness (Marmot 2010:15, 18, 82).

2.5.3. Political

The process of developing and using indicators in evaluating health-related policies in cities is more a political than a technical problem (Costongs and Springett 1997). Although researchers like increasing specificity, politicians deal in ambiguities, and indicators are sensitive political issues because their evolution through the public policy process is closely tied to issues of political power. Waddell cites Henderson (1991) who points out that indicators “may be a [result of a] natural desire to see real results that can hold politicians accountable…. Power is inherent in the ability to name things and events and goals, and to choose the indicators by which they are judged.” The people working with social indicators are those influencing the basic terms of social discourse and debate, a field that politicians routinely dominate. Prerequisites to the development of successful social indicators are: understanding, consensus, and commitment. The social researcher, without addressing these issues, becomes merely a collector of irrelevant data. However, by addressing these issues, the social researcher becomes an agent of social change (Waddell 1995).

In the 2010 Millennium Development Goals (MDG) Assessment, it was noted that:

Conflict and political violence is commonly understood to “destroy a country’s economic, governance and administrative institutions” and create a situation of “institutional multiplicity” — that is, a situation, where a range of governance mechanisms and authorities compete with one another, vying for power and legitimacy (Mlambo, Kamara, and Nyende 2009:53; UNDP 2010:19).
2.5.3.1 Policy Interventions — Past and Present

Policies and environments may also be regarded as conciliators of intervention effects. McLeroy and others developed different approaches to hypothesize levels of behavioral influences of which the most relevant specified:

[F]ive levels of behavioral determinants...

1. Intrapersonal factors, including psychological and biological variables, as well as developmental history.
2. Interpersonal processes and primary social groups, including family, friends, and coworkers.
3. Institutional factors; organizations such as companies, schools, health agencies, or health care facilities.
4. Community factors, which includes relationships among organizations, institutions, and social networks in a defined area.
5. Public policy, which consists of laws and policies at the local, state, national, and supranational levels (McLeroy, Bibeau, Steckler, and Glanz 1988:370-371).

Although physical environment factors are not stated explicitly, they are critical components of the McLeroy et al.’s ecological model of physical activity. The type and degree of physical activity are likely to be influenced by certain physical environments (“behavior settings”). Therefore, whether behavior settings are designed for physical activity (e.g., sports fields) or to restrict physical activity (e.g., classrooms), recognizing their influence can help to enhance the effectiveness of interventions in those settings (McLeroy et al. 1988:370-371).

Above all, every environmental or policy intervention needs public support for the political change. Multiple studies show that public support has engendered policy changes to control alcohol, tobacco, unhealthful food consumption, and to promote physical activity (Sallis, Bauman, and Pratt 1998:381). However, Sallis and colleagues
call attention to inequities in the government’s financial support for different behaviors; for example, inactive behavior — driving, as opposed to active behavior — bicycling. While large government appropriations have been made for highway construction and maintenance, meager sums have been set aside to provide bicycle lanes or trails. Meanwhile, existing bicycle lanes are often noisy and dangerous because they run narrowly along the edges of heavily traveled streets (Sallis et al. 1998:383).

Joe Flower, founding member of the International Health Futures Network, is a healthcare writer and researcher with 30 years’ experience and his writings look at health and cities in a systemic and ecological way. His 1993 publication of an interview with renowned psychiatrist and university professor Leonard Duhl provided insights to public health and social change. After a career spanning some 40 years in government and academia, Duhl held that, "The policies that run our society, and in fact run our health systems, are not health policies — they are business policies, they are profit policies, they are power policies" (Flower 1993). In 1962, he and others felt that the only way to deal with physical or mental health was not by treatment with drugs or medication or by looking at psychotherapy since, for the most part, these were symptomatic responses, but rather to discover what created and perpetuated the illnesses. If one could begin to change policies in other areas, then a healthier populace would result. He was surprised to discover that planning treated each area as a self-contained unit independent of other areas and that resources were earmarked in a political process founded on power and that barely addressed human needs.

In 1964, Flower and his colleagues proposed a set of Demonstration Cities to President Johnson’s commission which, at that time, was setting up HUD (the U.S. Department of Housing and Urban Development). They showed Johnson that by “doing planning and policy holistically,” they could achieve better results. This was the origin of the Model Cities program. However, the Model Cities program failed because the politicians fought it. The
late Mayor Daley of Chicago was one who questioned, “Why should I pay for undermining my own political strength?” In other words, it weakened his power base (Flower 1993).

With regard to his volunteerism in the early 1950s for the Public Health Service in Contra Costa County in California, Duhl said:

…Among other things, we did a massive X-ray screening survey for tuberculosis and other lung conditions. And we did a study on the people who didn’t get X-rayed. The populations that needed it most didn’t get X-rayed. The ones that didn’t need it because they were pretty healthy, did get themselves X-rayed. The ones who didn't were poor; they lived in north Richmond, an unincorporated slum.

Duhl then elaborated on the difficulties experienced by the Health Department there as opposed to the positive experience of the Quakers who ran Neighborhood House and were involved in community organization and development. He recounted how, during the two years he was there, they set up “daycare programs, well-baby clinics, housing programs, community organizing chicken dinners, and a legal service, all coming from the Neighborhood House and the community organizers.” They found that the more they worked, the response by local residents to the Health Department was increasingly positive. In other words, if a health program stood by itself, there was little response from the local population, but if there was a community involvement, more people responded (Flower 1993).

2.5.3.2. Political determinants of health — Future.

There have been significant changes, globally, since the adoption of the Ottawa Charter in 1986. Following an increase in inequalities, the global debate on health promotion has intensified with regard to the social, political, and economic factors that determine public health development, both medical and technical. Today, it is driven by developments in
information technology, and health promotion is faced with linking well-being, sustainability and social investment to the health agenda (Kickbusch 2012:5-6).

There is a call for societies to be measured differently; economic factors are no longer adequate and the “sustainable use of resources, particularly with regard to the environment and the increased wellbeing of citizens and their quality of life” must be taken into account (Kickbusch 2012:5). Furthermore, due to increases in obesity, diabetes, and mental health problems, children born at the beginning of the twenty-first century could, for the first time, experience “a lower health and life expectancy than their parents,” signaling an indispensable need for greater investment in the health of the next generation (Kickbusch 2008:22).

In 2013 in Finland, the WHO will hold a global conference focusing on health promotion and public policy, and Kickbusch would like to propose that “what I like to call the 21st century determinants of health” be linked to the Ottawa Charter’s extant five action strategies. She enumerates them thusly:

(i) Unsustainable lifestyles: also includes “unsustainable lifestyles and unsustainable production and consumption patterns.”

(ii) The flow of people: includes tourism, migration, mobility, and displacement. Its impact on the health of individuals is not yet fully recognized, thus thwarting the “accurate assessment of the public health burden of disease and its distribution.”

(iii) The hurry virus: “The feeling of constantly having to rush” that affects both adults and children, creating increased stress, anxiety, and depression. Much is due to “modern media, new forms of work, women’s entry into the employment market,” and urbanization itself (Kickbusch 2012:6).

---

8 Refer to Section 2.1.2.
Although Kickbusch has introduced what she calls the political determinants of health, she states: “We must not forget though… that it is for the politician to find the means for their actual solution” (2012:6).

2.5.4. Relationships between Urban Form and Public Health

Ratified in 1791, the Tenth Amendment to the United States Constitution reads: “The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people,” thus affirming reserved powers (state police powers) that provide the authority to adopt laws ordinances, and regulations with regard to such purposes as “land management and the health, welfare, education, and policing of their own citizens” (Vile 2010:166-167). Its primary purpose is for the public's welfare to be maintained as well as its general health and safety. Police power ultimately rests with the people because their elected representatives create the various substantive laws (including land use and zoning regulations) that the police enforce (Arizona 2004:10; Hess 2008:67).

Zoning is the primary land use planning tool in the United States and is intended to give protection equally to all segments of the population. Zoning policies determine the “allowable uses to which land may be put,” and for this reason, influence what may have adverse impacts on public health and equity (Maantay 2001:1033, 1038).

Although zoning calls for the protection of citizens’ health, safety, and welfare, there is evidence of exclusionary practices and disparities in the protection offered to different segments of society. For example, Maantay maintains that a primary purpose of New York City’s 1916 Zoning Resolution was to “keep the factory worker rabble away from the wealthy ladies shopping on Fifth Avenue by creating an exclusive zone for the ‘better’ commercial and residential uses.” Furthermore, zoning was found to limit some groups’ options as to where they could live, again with evidence of exclusionary
practices. For example, areas in which poor and lower-income people already lived were rezoned to permit heavier industrial uses or noxious non-manufacturing uses, adversely impacting their health (Maantay 2001:1037).

In a 1954 Supreme Court decision, Justice William O. Douglas wrote:

> The concept of the public welfare is broad and inclusive. . . [t]he values it represents are spiritual as well as physical, aesthetic as well as monetary. It is within the power of the legislature to determine that the community should be beautiful as well as healthy, spacious as well as clean, well balanced as well as carefully patrolled (Arizona 2004:17; Curtin 2004; Zweben 2006:1).

In his report to the Albany City Council concerning plans for the city’s waterfront, city attorney Robert Zweben stated that “if changes to the regulatory structure are made, those changes should reflect the City’s best welfare and health interests. There is no reason for the community to approve any changes unless those changes are viewed as beneficial to the City.” Questions raised included how the proposed development of the waterfront would impact traffic patterns around the city, the impact of a retail component on business in the city, the extent to which a housing component would address the future housing needs of the city, and the ways in which a public park might serve the needs and interests of city’s residents (Zweben 2006:5).

In 1974, Justice Douglas, again speaking for the United States Supreme Court, upheld a village’s zoning ordinance restricting land use to single family dwelling units:

> A quiet place where yards are wide, people few, and motor vehicles restricted are legitimate guidelines in a land use project addressed to family needs. This goal is a permissible one within *Berman v. Parker*. ...The police power is not confined to elimination of filth, stench, and unhealthy places; it is ample to lay out zones

---

where family values, youth values, and the blessings of quiet seclusion and clean air make the area a sanctuary for people (Curtin 2004; Arizona 2004:17).

“Land use regulations must promote the common good.” To guard a California community against encroaching urbanization, the U.S. Supreme Court upheld the community’s low density zoning ordinance, finding that the “preservation of open space is a legitimate use of the police power.” Additionally, the Court determined that the ordinance substantially advanced “the legitimate government goal of discouraging premature and unnecessary conversion of open space to urban land uses” (Arizona 2004:18, 20).

Zoning deals with both what exists and what future uses might be (Arizona 2004:86). Aiming to promote health, safety, and welfare within the community, zoning ordinances address many objectives, such as:

- Conserving the value of neighborhoods.
- Stabilizing neighborhoods.
- Assuring orderly growth.
- Managing densities.
- Moving traffic efficiently and safely.
- Protecting cultural, historical, natural, or environmentally sensitive areas.
- Controlling aesthetics.
- Preserving the community health, safety, or other values through the establishment of special zones and regulatory development standards (Arizona 2004:80).

Traditional zoning practices that separate land uses have been criticized by some because, it is argued, they (i) cause increased traffic congestion since people commute to different areas, (ii) lack safety for pedestrians, and (iii) hasten the demise of character in neighborhoods and downtown areas as homogeneity befalls them. Hence some communities are responding by combining mixed-use zoning and overlay districts to deal

---

12 Agins v. City of Tiburon, 447 U.S. 255 (1979),
with “the negative effects of separated uses and to achieve other community goals” (Arizona 2004:80).

Given that differences in morbidity and mortality are more often caused by psychosocial variables such as lack of social support, lack of sense of control, and disconnection from “biological and cultural heritage,” population health research puts forth that multi-sectoral prevention measures might be developed to present a more comprehensive perspective — one that bonds the functions of urban planning with the creation of strong, healthy and vibrant cities (Duhl and Sanchez 1999:17; Wilkinson 2005:60). A new model of urban transformation envisages inner city blocks developed in “an incremental fashion,” with architecture committed to diversity and offering regular access at short intervals.

Thus, the pedestrian experience would be richer when coming across such pleasant and well-functioning sidewalks (Bosselmann 2008:220). Previously, in 1980, Danish architect and urban design consultant Jan Gehl had proposed that facades should consist of “narrow units and many doors,” saying:

> The concentration of activities depends on active and closely spaced exchange zones between street and facade and on short distances between entrances and other functions, which contribute to activating the public environment (Gehl 1987:95, 97).

An urban center’s ability to draw high concentrations of people other than nine-to-five workday employees is essential. The dispersal of an excessive number of retail establishments or offices along main thoroughfares would mitigate the single-use or monofunctional streets and allow more continuous use, 24/7, if restaurants, residences, offices, theaters, and so forth, were interspersed (Wiedenhoeft 1981:723).

High building density needs to be balanced with concern for the human landscape (the small scale); this is key to forming “lively, safe, sustainable, and healthy cities.” The
challenge is for cities to be interesting at eye level, so it is important for individual buildings to advance the primacy of their architecture at street level. After all, promenading city streets was once a “rich, intense and multifaceted sensory experience” due to the architectural attention and detailing bestowed on ground floors (Gehl 2010:203, 205, 207).

Yet density, being a relative measure, can be perceived differently, depending on social and physical variables, as in the case of residential streets of matching density (i.e., housing units or people per acre). Research suggests that people characterize residential density according to architectural detailing and fenestration. In other words, if the façade articulation is high and the number of windows is low, they perceive residential density to be less than it is in reality (Bosselman 2008:148).

Sociologist and urban planner Herbert Gans was critical of city architecture, arguing that, traditionally, architects were more absorbed in the aesthetics or philosophical statements of a building than its effects on and use by society (1991:9, 11). He cited Jane Jacobs’ placement of responsibility on two theories of city form — “Ebenezer Howard’s low-density Garden City and Le Corbusier’s high-rise apartment complex, the Radiant City” — along with the city planner as “an artist who wants to restructure life by principles applicable only to art” (Gans 1968:27). However, Gans believed Jacobs overstated “the power of planning in American society,” writing that “the new forms of residential building… are not products of orthodox planning theory, but expressions of middle-class culture which guides the housing market, and which planners also serve.” Thus, ultimately, the public’s likes and dislikes preside over city planning (Rybczynski 2010:91). But until the abolishment of poverty and discrimination, low-income ghettos will continue to be built by the government (Gans 1968:32).

Architect, professor, and writer Witold Rybczynski takes issue with Jane Jacobs’ analysis of urban decline stating that poor planning did not cause the cities’ troubles, but
rather that before World War I, the middle classes fled the crime, poverty, and racial
tensions of cities for the promises held by suburbia. As a result, the dense downtown
neighborhoods eulogized by Jacobs in *The Death and Life of Great American Cities*
were abandoned (Rybczynski 2010:64).

While Lewis Mumford conceded that Jacobs was “a perceptive observer of urban life,”
he disputed her claim that “high-density housing, pedestrian-filled streets, and a mixture
of economic activities” alone could fight crime and violence, naming one of New York’s
most dangerous neighborhoods at that time (Harlem) which possessed all three
elements (Rybczynski 2010:62-63). Rybczynski lauds the advantages of urban
densification, many of which Jacobs documented:

> … more people on the street (which usually offers a safe environment), more
> shops, more amenities, more choices, more efficient mass transit, higher
> property values … a larger municipal tax base (Rybczynski 2010:145).

Possibly the most widespread change to an urban landscape *is* densification.

However, the success of amenities such as “downtowns, cultural districts, parks, and
waterfronts” and the extent to which they brim with people depends also on design,
community acceptance, and “a sense of place.” Anything less — empty streets,
desolate parks, unwelcoming waterfronts — can engender feelings of risk (Rybczynski
2010:146).

2.5.4.1 *Land Use and Public Health*

Land use planning surfaced during the nineteenth century. The widespread incidence of
cholera and tuberculosis at that time were deemed due to the pervasive overcrowding,
the long hours toiled in factories and mills, a lack of sanitation, and insufficient water
supplies. The first comprehensive public health act was passed in England in 1843.

Although it did not include specific zoning as it is known today, it did require the mapping
of sewage facilities to make certain that new living units were “equipped with drains and lavatories” (Ashe et al. 2003).

In the 1890s in the United States, New York City created the precursor of modern zoning regulations when it established design standards for the city’s tenements, thus assuring residents of air, light, and water availability, along with sewage disposal.

In 1921, Herbert Hoover, as Secretary of Commerce, played an important part in the development of planning and zoning, proclaiming:

> The lack of adequate open spaces, of playgrounds and parks, the congestion of streets, the misery of tenement life and its repercussions upon each new generation, are an untold charge against our American life. Our cities do not produce their full contribution to the sinews of American life and national character. The moral and social issues can only be solved by a new conception of city building (Knack et al. 1996:3).

That same year, the U.S. Department of Commerce established the Standard State Zoning Enabling Act (SSZEA), and after several revisions, it was published in 1926. An excerpt follows:

> SECTION 1. GRANT OF POWER. — For the purpose of promoting health, safety, morals, or the general welfare of the community, the legislative body of cities and incorporated villages is hereby empowered to regulate and restrict the height, number of stories, and size of buildings and other structures, the percentage of lot, that may be occupied the size of yards, courts, and other open spaces, the density of population, and the location and use of buildings structures, and land for trade, industry, residence, or other purposes (U.S. Dept. of Commerce 1926:4-5).

After stipulating that local legislative bodies be allowed to divide municipalities into districts in such ways that are best suited to carry out the purposes of the SSZEA, it continued thusly:
SECTION 3. PURPOSES IN VIEW. — Such regulations shall be made in accordance with a comprehensive plan and designed to lessen congestion in the streets; to secure safety from fire, panic, and other dangers; to promote health and the general welfare; to provide adequate light and air; to prevent the overcrowding of land; to avoid undue concentration of population; to facilitate the adequate provision of transportation, water, sewerage, schools parks, and other public requirements . . . (U.S. Dept. of Commerce 1926:6-7).

The SSZEA, in due course enacted in the majority of U.S. municipalities, aided in the delegation and distribution of zoning powers from state to local governments (Ashe et al. 2003). Consequently, in a natural progression to city regulation, the Standard City Planning Enabling Act (SCPEA) was first released in 1927 with a final version being published in 1928 that included:

SECTION 7. PURPOSES IN VIEW. — . . . The plan shall be made with the general purpose of guiding and accomplishing a coordinated, adjusted, and harmonious development of the municipality and its environs which will, in accordance with present and future needs, best promote health, safety, morals, order, convenience, prosperity, and general welfare, as well as efficiency and economy in the process of development; including, among other things, adequate provision for traffic, the promotion of safety from fire and other dangers, adequate provision for light and air, the promotion of the healthful and convenience distribution of population, the promotion of good civic design and arrangement, wise and efficient expenditure of public funds, and the adequate provision of public utilities and other public requirements (U.S. Dept. of Commerce 1928:16-17).

These two standard state enabling acts are the underpinnings of zoning and planning in the United States, and still supply the institutional structure despite the fact that some procedural and substantive components may have been amended (Meck 1996:1).

When the standard acts were drafted in the 1920s, the United States was vastly different from how it is today since land use was considered a local, and primarily, an urban
problem (Knack et al. 1996:8). Hence, the land-use system was aimed at rectifying urban conflicts such as industrial air pollution, and the height of high-density buildings in lower-density neighborhoods (Knack et al. 1996:7). And in 1926, the U.S. Supreme Court verified that cities and counties had the necessary police powers of the state to control public and private land uses for the “health, safety, welfare, and morals” of the people within those areas over which their legal authority extended (Ashe et al. 2003).

Nevertheless, in 1968, Gans penned these cautionary words:

> By focusing on neighborhoods as spatial units, planners are naturally drawn to what is most visible in them — the land uses, buildings, and major institutions — and their attention is diverted from what is hardest to see, the people — and social conditions — with problems" (240).

2.5.4.2. **Land Use and Alcohol Control**

Of critical public health concern is the need to identify those factors that influence alcohol consumption and associated health outcomes.

The use of alcohol is related to a wide range of mental, physical, and social harms (WHO 2004:35). From a public health viewpoint, the “use of alcoholic beverages can potentially be an agent of illness and mortality . . . can elevate the drinker's risk of health problems . . . as well as social problems” (WHO 2004:22). In a social context, its harmful consequences include workplace problems, family problems, poverty, and domestic violence (WHO 2004:59).

At the environmental level, studies show a connection between alcohol outlet densities and the geographic distribution of assaultive violence (Scribner et al. 1995:338; Duhl and Sanchez 1999:12; Franklin et al. 2010). Also, there is evidence that alcohol outlet density is an identifiable community characteristic that is a stronger predictor of homicide and violence than the population’s racial or ethnic makeup (Alaniz 1998:287-288). Furthermore,
in a study on the status of alcohol as a factor in global health, the WHO concludes that a reduction in the physical availability of alcohol through limitations on the number and placement of outlets will result in reductions in alcohol-related problems (WHO 2011a:101).

The relationship between city size and alcohol outlets indicates that small community convenience and liquor stores serve a broader social role than do larger community off-sale outlets that are de-emphasized within a larger context of other types of commercial establishments such as shopping malls (Scribner et al. 1995:339).

Rising rates of assaultive violence in the United States are viewed as a public health emergency and "epidemiologic studies find that over 50% of all reported acts of assaultive violence involve alcohol" (Scribner et al. 1995:335). An analysis of emergency department data in the Washington, DC area revealed that among alcohol-dependent injuries, violence and "clinically identified trauma-related injuries" are the most strongly correlated, thus indicating a probability that alcohol, more than any other drug, is implicated in substance-related violence (Franklin et al. 2010).

Using Washington, DC census tract data from the 2000 Census, it was determined that outlets were "significantly related to robbery, assault, and sexual offenses" and that, clearly, limits should be placed on outlet density in an endeavor to lessen the related adverse health consequences (Franklin et al. 2010).

One approach to understanding assaultive violence suggests that poverty and lack of opportunity predispose individuals to aggressive behavior. Another consideration relates to the size of the city; "small cities . . . tend to have lower crime rates than large cities and metropolitan areas" (Scribner et al. 1995:336).

In many studies, alcohol outlet density has been associated with community levels of alcohol consumption. Hence, accessibility to alcohol has been associated with both
alcohol consumption and alcohol-related harms. A study of alcohol availability conducted in Los Angeles County and southern Louisiana, revealed that alcohol outlets are more likely to be massed in lower-income and minority neighborhoods rather than randomly distributed throughout communities (Bluthenthal et al. 2008). Thus, because the results of excessive consumption of alcohol can have significantly negative effects on public health and social objectives, one of the targets of alcohol legislation is to control the physical availability of alcohol (WHO 2011a:5-6, 29).

Historically, many grassroots movements across the United States have targeted high densities of alcohol outlets in racial and ethnic neighborhoods while attempting to prevent the accompanying alcohol-related problems. For instance, a 1993 study ascertained that West Oakland in California (its residents a concentration of racial and ethnic minorities along with disadvantaged) had one alcohol outlet for every 298 residents whereas Piedmont, also an area in Oakland (but more affluent and predominantly white), had one alcohol outlet for every 3,000 residents. In an attempt to reduce alcohol-related problems in the minority communities, citizens formed the Coalition on Alcohol Outlet Issues (CAOI) to reduce the density of alcohol outlets. This resulted in the passage of an ordinance that established operating standards, and mandated that alcohol outlets “avoid creating a public nuisance, endangering public health or safety, or violating criminal laws.” Due to the success of the program, it was duly adopted citywide (Alaniz 1998:288).

The relationship between outlet density and increased alcohol consumption with its attendant problems (crime, injury, medical harms, and violence), has spurred research that reveals the significance of zoning decisions with regard to individual outlets within a particular community location (Ashe et al. 2003). Correspondingly, the World Health Organization points out that it is crucial for the public to be aware of and to have
confidence in any proposed new legislation as it relates to public health and safety (WHO 2011a:101).

2.5.4.3 *Land Use and Tobacco Control.*

Major causes of coronary heart disease (CHD), stroke, and peripheral arterial disease (PAD) are cigarette smoking and involuntary exposure to smoke (CDC et al. 2010). Also, there is a positive correlation between tobacco use and cerebrovascular disease, and cigarette smoking predisposes populations to atherosclerotic peripheral artery disease (Bolego, Poli, and Paoletti 2002:568). Furthermore, in 2004, a report of the U.S. Surgeon General concluded that there is sufficient evidence “to infer a causal relationship between smoking and cancers” and noted that “each puff of each cigarette contains a mixture of thousands of compounds, including more than 60 well-established carcinogens” (CDC 2010). The WHO also reports there is convincing evidence on a “wide geographical and racial range of populations that second-hand smoke (SHS) causes both fatal and non-fatal heart disease,” and that it has been linked to lung cancer, breast cancer, and respiratory illnesses (WHO 2007a:5).

In the United States alone, ~100,000 deaths per annum are ascribed to active cigarette smoking (Morb Mortal Weekly Report 1993, as cited in Bolego et al. 2002:569). Moreover, the estimated rate that smokers are at risk of an acute CHD event is twice that of non-smokers (Jousilahti et al. 1999, as cited in Bolego et al. 2002:569). The number of cigarettes smoked and the duration of such smoking directly impact the cardiovascular risks (CDC 2010).

At a somewhat lesser risk are persons involuntarily exposed to SHS, but epidemiological studies indicate that their risk of ischemic heart disease is increased by 30 percent, “almost half that of smoking 20 cigarettes per day” (Law et al. 1997; Glantz and Parmley 1995; Kawachi et al. 1997, as cited in Bolego et al. 2002:572). Consequently, the degree
to which SHS affects non-smokers is significant, taking into account their low systemic exposure to tobacco smoke when measured against that of active smokers (CDC 2010).

The high prevalence and increased cardiovascular risk for both active and passive smokers, even at low levels of exposure, beg for cessation of smoking as a “key element in both primary and secondary prevention of CVD” (CDC 2919; Bolega et al. 2002:574).

Therefore, since there are laws regulating retail sales of tobacco (e.g., prohibiting sales to minors, regulating tobacco minimum prices, etc.), it is reasonable for local governments to employ their “zoning powers” to regulate tobacco retail locations, and consequently, youth accessibility. “The best predictor of adolescent experimentation with cigarettes is the perception that they are easily available” (Ashe et al. 2003).

2.5.4.4 Land Use and Nutrition

A cause for increasing concern is the prevalence of obesity in industrialized countries and the factors that contribute to obesogenic environments. Many researchers have found a connection between area deprivation and the higher density of fast-food outlets in such areas.

Apart from individual risk factors such as race, ethnicity, and SES, there is a strong correlation between low income communities and poor health outcomes, including increased levels of obesity and mortality (California 2008:2).

Given the disparity among communities regarding the accessibility to unhealthy food environments, considerations must be given to the negative impact on the eating behaviors of children, adolescents, and adults.

Recent studies highlight the relationship between the density of fast-food outlets and SES. Findings were that residents of the poorest SES category experience 2.5 times the exposure that residents in the most affluent category experience (Reidpath et al. 2002).
In an endeavor to reduce the destructive effects of food access disparities, the American Planning Association (APA) is conducting a study to “identify and evaluate the development, adoption and implementation of food access goals and policies of comprehensive and sustainability plans across the U.S.” (APA 2011).

There have been numerous studies to investigate the correlation between the built and food environments, and excessive food intake and sedentary behavior. Furthermore, a study by the National Heart, Lung, and Blood Institute (NHLBI) reported on a 15-year study that concluded fast food intensifies the risk of obesity and Type 2 diabetes. This study of CVD risk factor evolution included 3,031 young black and white adults (age 18-30 years in 1985-1986) whose frequency of fast-food visits, changes in body weight and insulin resistance were monitored and measured over a period of 15 years. The study centers were located in Birmingham, AL, Chicago, IL, Minneapolis, MN, and Oakland, CA (NIH 2004).

A program named Bridging the Gap (BTG), established by the Robert Wood Johnson (RWJ) Foundation in 1997, registered concern for the obesity epidemic and has most recently studied the effects of policies and “environmental factors on youth physical activity, diet, and weight outcomes” (Chaloupka and Powell 2009:1). Based on U.S. data and data from other countries, BTG researchers concluded that lower-income, larger proportion minority neighborhoods lacked access to healthy foods and recreational/physical activities. Besides the BTG, the RWJ Foundation has partnered with others in an effort to promote healthier environments. As a result, suggestions were made that governments adopt various flexible standards — from land use policies and zoning ordinances to fiscal policies — that effectively have the capacity to promote or discourage food outlets on the basis of whether they provide healthy foods. Likewise, governments could promote opportunities for physical activity by developing local
recreation facilities, parks, open spaces, and other resources in underserved communities (Prevention 2008:20; Chaloupka and Powell 2009:4-5).

In a similar study of the relationship between the geographic distribution of fast food restaurants and neighborhood socio-demographics within 156 census tracts (with 155 fast food outlets), it was found that predominantly black neighborhoods have 2.4 fast-food restaurants per square mile versus 1.5 restaurants in predominantly white neighborhoods (Block et al. 2004).

Another study conducted in the inner-city community of East Harlem, New York, suggests how local food environment factors into the childhood obesity epidemic. Of the 323 children, six to eight years of age, enrolled in the study, 67% were Hispanic, 18% black, and 15% black-Hispanic. Of the census blocks in which the study participant lived, convenience stores were present in 55% and fast food restaurants were present in 41%. It concluded that “the presence of convenience stores within the same Census block as a child’s residence was associated with a higher BMI [body mass index] percentile.” Moreover, those children living in close proximity to fast-food restaurants or on a block with one to six convenience stores were at higher risk of having a BMI-percentile “in the top tertile (OR 1.90, 95% CI 1.15-3.15, p value 0.01)” compared to children living on a block with no convenience stores. As a result, this bears a potential for community level interventions pertaining to child obesity (Galvez et al. 2009).

A study associated with obesity in adults conducted in Edmonton, Canada had similar findings; namely, that the lower the incidence of fast-food restaurants and convenience stores near the home, the lower the probability of being obese. As a result, this further indicates that area density of fast-food outlets is related to mortality and acute coronary outcomes. The authors posited that the retail food environment might be improved by zoning laws (Spence et al. 2009).
The greater availability of convenience stores is “statistically significant associated with higher BMI and obesity.” The relationship between supermarket availability and bodyweight was stronger for black students than for Hispanic or white students; it was also stronger for students in families where the mother worked full-time (Powell et al. 2007).

Another factor related to healthy eating may be the interaction of car ownership as those residents without cars may be most vulnerable to eating fast food in their neighborhoods. This suggests that placing constraints on fast food outlet density may play an important part in controlling the obesity epidemic (Inagami et al. 2009). Indeed, in 2008, challenged by higher levels of diabetes and obesity and one of the highest concentrations of fast food outlets, the City Council imposed a moratorium on new fast food units in South Los Angeles. In December 2010, the Los Angeles City Council voted unanimously to ban new “stand-alone” fast food restaurants from launching new outlets within a half-mile radius of existing ones (Hennessy-Fiske 2008; Daily 2010).

Poor nutrition and lifestyles lacking in physical activity account “for more preventable deaths in the United States than AIDS, violence, drugs, alcohol, and car crashes combined.” Child and adolescent obesity is an epidemic. Therefore, land use regulations that control alcohol and tobacco outlets, logically might be extended to issues of nutrition. Police powers of local governments (including public health authorities and advocates) may logically extend their control to regulate and attach conditions to land use (Ashe et al. 2003).

2.6 SUMMARY

The concept of healthy cities is addressed from a wide variety of perspectives. Most works cited are of a qualitative nature. However, in the context of the WHO Healthy Cities Project, the consensus appears to be that by specifically linking health
determinants and environmental theories (social and physical), a stronger basis for decision-making could be formed in order to bolster intersectoral collaboration.

There appears to be support for the notion that a greater reduction of inequalities will result in the general improvement of health. While arguing that more needs to be done than just to reduce the inequalities in SES, it remains that an improvement in populations’ lasting health is dependent upon the ability to understand and address the causes of health inequities. Recent research evidence suggests it is almost axiomatic that social environmental factors, social policy for education, work, and housing are critical ways in which to reduce inequality. Also, the coordinative aspects of the Healthy Cities movement may hasten the redirection of inequalities.

Nevertheless, questions remain unanswered with regard to the generation of indicators for evaluating healthy cities. Currently, there is no single list of indicators to draw on to perform Healthy Cities’ evaluations. Hence, this cannot be a consensus-driven effort because there is, in fact, no global consensus and the research in this area will always be fraught with challenges.
CHAPTER 3
METHODS

3.1. DATA

Data for this research is largely dependent upon geographic areas defined by the U.S. Census Bureau (USCB). The following section offers a brief overview.

3.1.1. Geographic areas

USCB geographic areas may be divided into two categories: (i) legal and administrative, and (ii) statistical. Both legal and administrative areas have legally described boundaries. However, legal areas tend to have elected officials and provide government services whereas administrative areas are designed to administer elections and conduct other government functions. Both USCB categories are subject to reformulation. Congressional apportionment\(^{13}\) and redistricting\(^{14}\) exemplify routine legal and administrative reformulation. Statistical standards may also be redefined and created. For example, “definition” refers to the geographic delineation of a metropolitan or micropolitan statistical area or a list of geographic measures at a specific juncture. Thus, definitions are subject to change over time (Office of Management and Budget, 2000) and researchers must be cautious when comparing data from statistical areas of different dates.

\(^{13}\) Congressional apportionment refers to the process of determining the number of representatives to which a state is entitled in the U.S. House of Representatives based on the decennial census (U.S. Census Bureau 2009).

\(^{14}\) Congressional redistricting refers to the process of revising the geographic boundaries of areas from which people elect representatives to the U.S. House of Representatives. In turn, the outcome of the redistricting process may affect a state legislature, a county or city council, a school board, etc. By law, redistricting data must be submitted to the states by April 1\(^{15}\) of the following year of the decennial census (U.S. Census Bureau 2009).
Legal and administrative area examples would include the nation, individual states, counties, congressional districts, voting districts, ZIP Code tabulation areas, school districts, and minor civil divisions.

Statistical geographic areas are demarcated principally for data tabulation. Urban areas (UAs) consist of urbanized areas with 50,000 or more people and urban clusters of at least 2,500 people but less than 50,000 people; metropolitan statistical areas (MSAs) and micropolitan statistical areas (µSAs) represent discernible geographic concepts, such as urbanization and the less obvious social and economic processes. Statistical area examples would include regions and divisions, census county divisions, census designated places, metropolitan and micropolitan statistical areas, urban and rural areas, census tracts, census block groups, and Public Use Microdata Areas (PUMAs).

Select legal and administrative areas have statistical area equivalents. The generic term “county subdivision” refers to both the census country division and its statistical counterpart minor civil division. “Places” refers to census designated places and its statistical equal incorporated places.

Small geographic areas are the fundamental building blocks of census geography. Such areas include census tracts, census block groups (BGs), and zip code tabulation areas (ZCTAs™). ZCTAs™ are a new statistical entity developed by the U.S. Census Bureau for tabulating summary statistics from Census 2000. There is no correlation between U.S. Postal Service (USPS) ZIP Codes and USCB geography due to the ability of individual ZIP Codes to cross state, place, county, census tract, block group, and census block boundaries. USPS ZIP Codes tend to be flexible since their intention is to promote the day-to-day operational efficiency associated with mail delivery. In contrast, ZCTAs are built upon relatively permanent census tracts and, thereby solve any operational difficulties by using census blocks (and the addresses found in them) as the basis for the ZCTAs.
Figure 3.1 depicts the nested geographic hierarchy used by the USCB in data collection. The central axis comprises a set of hierarchal relationships. The nation consists of four census regions and each region is divided into two or three census divisions. Each division comprises between three (Middle Atlantic Division) states and eight (South Atlantic Division) states plus the District of Columbia. Within states reside a number of counties. Counties disaggregate into census tracts that disaggregate into block groups that disaggregate into census blocks. Thus, a series of nested areal relationships — smaller geographic entities existing within larger geographic entities — construct the principal hierarchy.
As a result of these nested relationships, a block group will not cross a census tract boundary, a tract boundary will not cross a county boundary, nor will a county boundary cross a state boundary and so forth.

On both sides of the central axis are geographic areas that do not embed within the principal geographic hierarchy. Note that an urban area or metropolitan area may cross any geographic boundary except the Nation’s boundary. For example, El Paso, Texas and Ciudad Juárez, Chihuahua, Mexico comprise a binational metropolitan area known as El Paso-Juárez, Juárez-El Paso or Paseo del Norte (Figure 3.2). This conurbation has a combined population in excess of 2.4 million people. Nevertheless, the USCB only defines and produces data for the portion of the population residing within the United States — 751,296 people (USCB 2009). Included in the region is nearby Las Cruces, New Mexico, then referred to as El Paso-Juárez-Las Cruces or El Paso-Juárez-Southern New Mexico (BHC 2010); the Greater El Paso-Greater Las Cruces urbanized area is in both the South and West regions.

Just offset from the central axis, observe the entity places. The vertical line that connects the lowest-level census blocks to the higher-level state indicates that places may not cross a state boundary but may cross counties, census tracts, and so on. For example, Chaparral, New Mexico is a census-designated place (CDP) in Doña Ana County, New Mexico with a population of 6,117 people (USCB 2000). A portion of Chaparral is also in Otero County, New Mexico. With few employment opportunities, Chaparral is primarily a bedroom community for neighboring El Paso, Texas, and the military installations of the White Sands Missile Range and Fort Bliss. Officially, Chaparral is part of the Las Cruces Metropolitan Statistical Area. Figure 3.2 illustrates the geographic relationships between (1) Chaparral, NM, (2) Las Cruces, NM, (3) El Paso, TX, and (4) Ciudad Juárez, Chihuahua, Mexico.
Metropolitan statistical areas and micropolitan statistical areas are geographic entities defined by the U.S. Office of Management and Budget (OMB) for the purpose of collecting, and tabulating Federal statistics. Collectively, MSAs and μSAs are referred to as Core Based Statistical Areas (CBSAs). (See Figure 3.3.)
Each CBSA must consist of at least one county. Should the population equal or exceed 50,000 people, it is designated as an MSA. Otherwise, with a minimum population of 10,000, but less than 50,000 people, it is designated as a μSA. CBSAs may include adjacent counties with robust social and economic integration with the urban core. The USCB measures integration by commuting to work patterns.

As a rule, CBSAs are designated by their principal city — typically, the most populace city in their area. CDPs can be principal cities. The title of a CBSA may encompass up to three of its principal cities and the state into which each CBSA extends. For example,
the Minneapolis-St. Paul-Bloomington, MN-WI Metropolitan Statistical Area encompasses 11 counties in Minnesota and two neighboring counties in Wisconsin and represents a populace of over three million people.

3.1.2. Study areas — level of measurement

Study areas are MSAs with populations equal to or exceeding a 175,000 populace. Excluding the Commonwealth of Puerto Rico, 231 of the 366 MSAs in the United States met the population criteria (U.S. Census Bureau, Population Division 2012).

3.2. DATA SOURCES, VARIABLES, AND MANAGEMENT.

Secondary data produced by the Gallup Inc., U.S. Census Bureau, and US2010 were the primary sources for this study.

3.2.1. Gallup-Healthways

In conjunction with Gallup® Daily tracking, 1000 U.S. adults are surveyed each day, 350 days per year, on wellbeing topics.

Gallup® Daily tracking methodology comprises live interviewers, dual-frame telephone sampling, and a multi-call design to solicit respondents. As a result, listed landlines and cellular phone-only households are included in the sampling frame.

Data are weighted using targets from the U.S. Census Bureau for age, sex, region, gender, education, ethnicity, and race. Consequently, “[t]he resulting sample represents an estimated 95% of all U.S. households” (Gallup 2012:6).

At the Metropolitan Statistical Area (MSA) level, data are summarized and weighted annually to ensure sample representativeness.

Gallup contributed the following seven variables (refer to 3.2.1.1 to 3.2.1.7 below) to the data frame used in the study.
3.2.1.1. **Well-Being Index**

The Gallup-Healthways Well-Being Index® score is an average of six sub-indices, namely Life Evaluation Index, Physical Health Index, Emotional Health Index, Healthy Behavior Index, Work Environment Index, and Basic Access Index (Gallup 2012:4).

3.2.1.2. **Percentage non-diabetic (derived)**

Gallup provides “[t]he percentage of Americans who say that their physician or nurse told them that they have diabetes” (Gallup 2011). Data derived by deducting the preceding percentage from 100 yields the percentage of non-diabetics.

3.2.1.3. **Percentage non-obese (derived)**

Deducting “[t]he percentage of Americans whose Body Mass Index score, based on self-reported height and weight, is 30 or higher” (Gallup 2011) from 100 equals the percentage non-obese.

3.2.1.4. **Percentage engaging in frequent exercise**

Gallup made available “[t]he percentage of Americans who report exercising for at least 30 minutes 3 of more days per week” (Gallup 2011).

3.2.1.5. **Percentage eating produce frequently**

This data is the value of “[t]he percentage of Americans who report eating five or more servings of fruits and vegetables 4 or more days per week” (Gallup 2011).

3.2.1.6. **Percentage optimistic**

Data reflects “[t]he percentage of Americans who say the city or area where they live is getting better as a place to live” (Gallup 2011).
3.2.1.7. *Percentage with health insurance (derived)*

Deducting “[t]he percentage of Americans who say they do not have health insurance coverage” (Gallup 2011) from 100 results in the percentage of Americans with health insurance.

3.2.2. **USCB American Community Survey**

The USCB’s American Community Survey (ACS) is an annual nationwide survey designed to provide every community with important and timely demographic, social, economic, and housing data. It provides small-area information that is crucial to decision-makers in states, congressional districts, counties, and other localities.

ACS data used in this study are based on people and households that responded in years 2006 through 2010. ACS five-year estimates are distinguished from lesser estimates by being most reliable, having the largest sample size, and offering data from all areas. Therefore, the key advantages of using multi-year estimates is increased statistical reliability and precision (U.S. Census Bureau 2008:9). The resulting estimates are representative of the entire population.

3.2.2.1. *Gini Index*

The ACS Gini Index provides a summary measure of income inequality. Each Gini coefficient varies between zero and one. Should all households within a geographic area have equal income, a Gini coefficient value of zero would indicate perfect equality. In contrast, should only one household with a geographic area have income, a Gini coefficient value of one would indicate perfect inequality.
3.2.2.2. Percentage of households receiving public assistance income or food stamps/snap (derived)

Derived as a percentage of the total population, this measure encompasses public assistance income that includes general assistance and Temporary Assistance to Needy Families (TANF). Separate payments received for hospital or other medical care and Supplemental Security Income (SSI) are excluded from the calculation.

3.2.2.3. Median age

The median age separates the population into two groups of equal size resulting in one-half of the population being older than the median and one-half of the population being younger.

3.2.2.4. Median selected monthly owner costs as a percentage of household income

Based on owner-occupied housing units with a mortgage, this measure reflects selected monthly expenditures as a percentage of household income. The value of this measure is derived from the midpoint of the distribution with one-half of the observations rising above the median selected monthly owner costs as percentage of household income and the remaining one-half of cases below.

3.2.3. US2010

Supported by the Russell Sage Foundation and the American Communities Project of Brown University, US2010 is a program to research recent changes in American society. Specific US2010 research areas comprise “…immigration, segregation, economics, education, aging, and the changing American family…” (US2010 Project 2012). Data sources utilized by US2010 include the American Community Survey (ACS), Current Population Survey (CPS), and “…more specialized sources” (US2010 Project 2012).
3.2.3.1. *Racial and ethnic diversity — Entropy Index*

It is important to distinguish between racial and ethnic diversity and residential segregation. While the latter refers to the degree various groups reside in different neighborhoods within a larger community, racial and ethnic diversity represents the number of racial-ethnic groups in the community population along with the population of the groups relative to one another. Put another way, racial and ethnic diversity measures how uniformly members of a population are distributed.

Racial and ethnic diversity is measured by the entropy index, symbolized by $E$ in equation 3.1:

$$
E = \sum_{r=1}^{n} p_r \ln \left( \frac{1}{p_r} \right)
$$

(3.1)

where $p_r$ denotes racial-ethnic group $r$’s proportion of the population within a geographic area with $n$ representing the number of groups being measured.

A perfectly homogeneous community population, without any diversity, would have an entropy index value of zero as all population members would belong to a single racial-ethnic group. Alternatively, a perfectly heterogeneous community population consisting of many varied groups of equivalent size would have an entropy index value of one as all racial-ethnic groups would occupy equal proportions of the population.

3.2.4. **U.S. Bureau of Labor Statistics**

3.2.4.1. *Unemployment Rate (U3)*

Sponsored jointly by the U.S. Census Bureau and the U.S. Bureau of Labor Statistics, the Current Population Survey (CPS) is the principal source of labor force statistics, including the official unemployment rate or U3 measure of unemployment.
3.3. PROCEDURES

3.3.1. Polar area diagram

Modern forms of statistical graphics and data visualization are relatively recent developments beginning only in the early 1800s. Recognition of the importance of systematic data collection, advances in statistical theory and statistical thinking, facilitated novel methods to convey statistical data. Among her many distinctions discussed in Chapter 1, Florence Nightingale was a pioneer in the uses of social statistics and in their graphic representation.

Polar area diagram techniques allow for a richer understanding of the relationships among indexed variables as the area of each colored wedge, measured from the center, is proportional to the statistic being represented (see Appendix B).

Therefore, to give reason to the holistic health perspective, polar area diagrams can be visually more accessible to interpretation by synthesizing the extent to which individual health measures contribute to the overall urban health.

3.3.2. Data Envelopment Analysis (DEA)

Data Envelopment Analysis (DEA) is a relatively new “data oriented” nonparametric method useful in the evaluation of performance of peer entities referred to as Decision Making Units (DMUs) in the DEA literature. While its origin is in operations research and economics, recent years have testified to the prodigious variety of applications of DEA across diverse types of entities engaged in numerous dissimilar activities in countless unlike contexts around the globe.

DEA has flourished due to its ability to overcome the complex and typically unknown relationship between multiple inputs and multiple outputs — usually in non-commensurable units.
Examples of DEA applications to DMUs include various sectors such as U.S. Air Force maintenance activities on bases in different geographical locations, police forces activities in England and Wales, and those of branch banks in Cyprus and Canada, U.S. universities in education and research activities, agricultural and natural resource management in England and France, and others. These types of application extend to evaluating the performance of cities, regions, and countries with many different kinds of inputs and outputs that include “social” and “safety-net” expenditures as inputs and various “quality-of-life” dimensions as outputs.

3.3.2.1. Conceptual framework

The conceptual foundation for DEA can be gained by looking at a single input and single output case. In a hypothetical example, suppose eight hospitals yield the data in the following table:

<table>
<thead>
<tr>
<th>Hospital</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Patient</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Patient ÷ Nurse</td>
<td>0.50</td>
<td>1.00</td>
<td>0.67</td>
<td>0.75</td>
<td>0.80</td>
<td>0.40</td>
<td>0.50</td>
<td>0.63</td>
</tr>
</tbody>
</table>

The number of nurses and patients (measured in hundreds) is recorded in each column. Note the last row uses a commonly used measure of efficiency when used to evaluate worker performance — output per worker employed:

\[
\frac{Output}{Input} \quad (3.2)
\]
Figure 3.4 (below) represents this data by plotting Number of Patients against Number of Nurses. The slope of the line connecting each data point to the origin (0,0) corresponds to the Number of Patients.

Observe that Hospital B (3,3) attains the highest slope, thus graphically confirming it is the most efficient hospital with a Patient-to-Nurse ratio of 1.00 (Table 3.5). The slope of this line represents the “efficient frontier.” As a result, at least one point resides on the “efficient frontier” and remaining points lie beneath this line indicating some inefficiency. The name Data Envelopment Analysis comes from this property as the frontier is said to “envelop” these points.
Given these data, a linear regression line may be drawn to illustrate the key difference between DEA and statistical regression. Under ordinary least squares (OLS) regression, this method minimizes the sum of squared vertical distances between the observed responses in the dataset, and the responses predicted by the linear approximation. This establishes a “middle of the road” from the data points with points above the regression line ranking as “superior” to points below the regression line which would be ranked “inferior.” Note that the degree of superiority or inferiority of these data points is determined by the magnitude of the deviation from the fitted line. In contrast, the efficient frontier line designates the performance of the best hospital (B) and measures the efficiency of other hospitals by deviations from the most efficient hospital (B).

The fundamental difference between typical regression analysis and DEA is that the former reflects “average” or “central tendency” behavior of the observations while the latter directly addresses best performance and evaluates all performances by deviations from the frontier line. These two perspectives can result in major differences when used as a method of evaluation and, accordingly, different approaches to improvement. DEA identifies a DMU, like Hospital B, for future examination or to serve as a benchmark in seeking improvements. Alternatively, the statistical approach would average Hospital B along with the other observations, such as the worst performing hospital (F), as a basis for suggesting where improvements might be sought.

3.3.2.2. Efficiency measurement

The definition of efficiency varies by discipline — engineering-science definitions of efficiency may not be suited to the social sciences. Consider Pareto optimality, used in “welfare economics” and formulated by the Swiss-Italian engineer, sociologist, economist, and philosopher Vilfredo Federico Damaso Pareto (15 July 1848 — 19 August 1923), described thusly:
A Pareto optimum is a welfare maximum defined as a position [in an economy] from which it is impossible to improve anyone’s welfare by altering production or exchange without impairing someone else’s welfare (Pearce, 1986: 319).

Accordingly, this definition becomes a measure of social welfare, a situation judged to be optimal only if no individuals can be made better off without making someone else worse off. From this, an ensuing variant of a “welfare optimum” defines efficiency:

**DEFINITION 1 (Pareto-Koopmans Definition of Efficiency).**

The performance of a DMU is efficient if and only if it is not possible to improve any input or output without worsening any other input or output (Cooper et al., 2006: xxii).

From this, it follows:

**DEFINITION 2 (Definition of Inefficiency).**

The performance of a DMU is inefficient if and only if it is possible to improve some input or output without worsening some other input and output (Cooper et al., 2006: xxii).

The “conceptual power” of the Pareto-Koopmans definition can be incorporated into a DEA model that is directed to “effectiveness” rather than “efficiency” and in which these concepts differ as follows:

\[
\begin{align*}
\text{Effectiveness} & \quad \{ \begin{array}{l}
\text{Ability to state goals.} \\
\text{Ability to achieve goals.}
\end{array} \\
\text{Efficiency} & \quad \{ \begin{array}{l}
\text{Benefits secured.} \\
\text{Resources used.}
\end{array}
\end{align*}
\]

(Source: Cooper et al., 2006: xxiii)

Thus effectiveness refers to goal achievement and, in contrast to efficiency, produces its evaluations without reference to the resources used. This greatly extends the ability of
DEA to deal with a wider range of problems. For example, a study recommending a relocation of the Japanese capital (Tokyo) to a new site (considered by the National Diet of Japan) considered inputs like “susceptibility to earthquakes” and outputs like “ability to recover from earthquakes” (Takamura and Tone, 2003). These are not inputs or outputs in the ordinary sense of the terms and are therefore referred to as goods and bads.

3.3.2.3. Strengths and Limitations of Data Envelopment Analysis (DEA)

Several characteristics make Data Envelopment Analysis a powerful tool for researchers. These include, but are not limited to the following:

(i) DEA is non-parametric. As a distribution free method, it does not rely on assumptions that the data are following a given probability distribution.

(ii) DEA can incorporate multiple inputs and multiple outputs models.

(iii) DEA models do not require their functional form to be specified.

(iv) DEA models allow inputs and outputs to be in dissimilar units.

(v) DEA DMUs are directly compared against peers or subgroups of peers.

As with any powerful tool, researchers must be mindful of the limitations of the Data Envelopment Analysis method:

(i) DEA is an extreme point technique. Therefore, it is susceptible to measurement error and other noise.

(ii) DEA is excellent at estimating empirical DMU relationships. However, it cannot estimate against a theoretical maximum.

(iii) DEA is a non-parametric technique making statistical hypothesis tests problematic.
(iv) DEA requires a separate linear program for each DMU. Depending on the complexity of the problem, this can be computationally intensive.

3.3.3. Literature Review

Data Envelopment Analysis is an active ever-growing field of operations research and performance measurement. In this section, a brief review of the application of DEA to healthcare is provided. This review is not intended to be comprehensive, but to provide references to selected publications in the aforementioned areas of DEA application.

3.3.3.1. Healthcare applications of Data Envelopment Analysis

Of special import are health care DEA applications. These studies are often limited to the control of health care costs while maintaining high quality services and improving access. Improvements in health care performance are desirable as they can boost the well-being, standard of living, and economic growth of any nation (Cooper et al., 2004: 481).

For the purpose of DEA, no theoretically correct or precise measures of “health” exist and the thrust of inquiry has been in studying and understanding health care costs, outcomes, and utilization. Despite the absence of precise measures of health care performance, “…many seem convinced that the industry’s performance falls short” (Newhouse 2002: 14). This conclusion is supported by examples such as the continual 14-year funding of a particular English Supra Regional Service center for pediatric cardiac care despite having significantly higher mortality and morbidity rates, and poor physician performance (Bristol Royal Infirmary Inquiry Final Report, 2001).

Over the past 20 years, in countries such as Austria, Finland, the Netherlands, Norway, Spain, Sweden, the United Kingdom, and the United States, several hundred studies have promoted DEA as a preferred methodology when determining best practices and evaluating health care performance.
3.3.3.2. *Strengths and Limitations of Healthcare Applications in Data Envelopment Analysis*

Again, DEA offers many advantages when applied to the problem of evaluating performance of health care organizations. First, DEA models are non-parametric and do not require a functional form to be prescribed explicitly (i.e., linear, non-linear, log-linear, and so on) (Charnes et al., 1994). Second, unlike statistical regressions that average performance across many service providers, DEA estimates best practice by evaluating the performance behavior of each individual provider, comparing each provider with every other provider in a sample. Third, unlike regression and other statistical methods, DEA is able to handle multiple variables, so the analysis produces a single overall measure of best results observed.

Finally, in order to identify those providers who achieved the best results, DEA groups providers into homogenous sub-groups. Providers that lie on the frontiers achieved the best possible results and are rated 100-percent efficient. Providers that do not lie on the surface underperformed and their performance is measured by the distance from the frontier. The analysis not only provides a measure of their relative performance but also uncovers sub-groups of providers similar in their behaviors or foci in their attention to performance.

Cooper et al. (2004: 491) suggest that DEA is capable of producing new knowledge advancing the science of health care management. Their enthusiasm is balanced by the following cautions when applying DEA to health services research:

(i) DEA studies lose credibility when inputs and outputs are defined differently from study-to-study.
(ii) The lack of stability in results (e.g., a variable like *quality of care*) as a consequence of heterogeneity in categories of inputs and outputs.

Rarely have two researchers studied the same problem employing the exact same categories of inputs and outputs.
CHAPTER 4

RESULTS

4.1. DISPARITY OF INDIVIDUAL MEASURES OF URBAN HEALTH

4.1.1. Descriptive statistics

Two hundred and thirty-one Metropolitan Statistical Areas (MSAs) met or exceeded a population of 175,000 persons. Of these, 43 MSAs were withdrawn from analysis due to insufficient data leaving the total sample size at 188 MSAs.

A sample of 188 MSAs represents over 81-percent of all MSAs meeting the stated population criteria and over 51-percent of all MSAs within the United States. Table 4.1 presents descriptive statistics of individual health measures.

<table>
<thead>
<tr>
<th></th>
<th>MIN</th>
<th>MAX</th>
<th>MEAN</th>
<th>STD DEV</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-diabetic</td>
<td>79.70</td>
<td>95.30</td>
<td>88.64</td>
<td>2.53</td>
<td>188</td>
</tr>
<tr>
<td>Non-obese</td>
<td>62.20</td>
<td>87.10</td>
<td>73.99</td>
<td>4.07</td>
<td>188</td>
</tr>
<tr>
<td>Frequent Exercise</td>
<td>42.90</td>
<td>65.20</td>
<td>52.11</td>
<td>3.95</td>
<td>188</td>
</tr>
<tr>
<td>Eat Produce Frequently</td>
<td>46.60</td>
<td>68.60</td>
<td>57.33</td>
<td>3.75</td>
<td>188</td>
</tr>
<tr>
<td>City Optimism</td>
<td>31.00</td>
<td>76.90</td>
<td>55.65</td>
<td>8.24</td>
<td>188</td>
</tr>
<tr>
<td>Health Insured</td>
<td>53.90</td>
<td>95.30</td>
<td>83.09</td>
<td>6.28</td>
<td>188</td>
</tr>
</tbody>
</table>

4.1.2. Enhanced Polar Area Diagram

Data visualization is a graphical means not only to communicate information clearly and efficiently, but also to generate attention and engagement by providing insights into complex data sets.
Figure 4.1 communicates key-aspects of urban health in an intuitive method by using an enhanced polar area diagram. Note the legend in the bottom-right corner of the figure. This “full-circle” represents the utopian ideal of perfect qualities — no one has diabetes; there is no obesity; everyone exercises at least 30 minutes three or more days per week; eats five or more servings of fruits and vegetables four or more days per week; believes their area is becoming a better place in which to live, and all inhabitants enjoy health insurance coverage.

Based on the 188 MSAs within the data set, the polar area diagram is enhanced by employing a normalized rank transformation. Consequently, within each health quality, the highest ranked MSA receives a perfect score of 100 and the lowest ranked MSA score is reduced to 0.

Ranked by MSA, the percentage of Americans who do not suffer knowingly from diabetes is presented in Table 4.2. As indicated in Figure 4.1, the MSA with the lowest percentage of diabetics (symbolized by the largest dark cyan wedge) is Santa Rosa-Petaluma, CA. In contrast, the MSA with the greatest percentage of diabetics is Charleston, WV. Among the sample of 188 MSAs, Honolulu, HI ranked 22.

<table>
<thead>
<tr>
<th>RANK</th>
<th>METROPOLITAN STATISTICAL AREA</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Santa Rosa-Petaluma, CA</td>
<td>95.3</td>
</tr>
<tr>
<td>22</td>
<td>Honolulu, HI</td>
<td>91.2</td>
</tr>
<tr>
<td>188</td>
<td>Charleston, WV</td>
<td>79.7</td>
</tr>
</tbody>
</table>
FIGURE 4-1. ENHANCED POLAR AREA DIAGRAMS OF INDIVIDUAL HEALTH MEASURES BY MSA.
Among Americans whose Body Mass Index score is equal to or less than 30, the greatest percentage is found in Boulder, CO. Observing the hot pink wedges in Figure 4.1, the lowest rate of obesity occurred in Boulder, CO while the highest rate of obesity occurred in the Evansville, IN-KY MSA. Table 4.3 offers Honolulu, HI the rank of 4 in non-obesity.

<table>
<thead>
<tr>
<th>RANK</th>
<th>METROPOLITAN STATISTICAL AREA</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Boulder, CO</td>
<td>87.1</td>
</tr>
<tr>
<td>4</td>
<td>Honolulu, HI</td>
<td>82.4</td>
</tr>
<tr>
<td>188</td>
<td>Evansville, IN-KY</td>
<td>62.2</td>
</tr>
</tbody>
</table>

Table 4.4 confirms Boulder, CO leads the percentage of Americans who report exercising for a minimum duration of 30 minutes at least three days per week. Represented by turquoise wedges, Figure 4.1 illustrates Boulder’s full rank. Given Roanoke, VA ranked last in exercise engagement, its turquoise wedge is empty. In this category, Honolulu, HI held the 42nd position.

<table>
<thead>
<tr>
<th>RANK</th>
<th>METROPOLITAN STATISTICAL AREA</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Boulder, CO</td>
<td>65.2</td>
</tr>
<tr>
<td>42</td>
<td>Honolulu, HI</td>
<td>55.2</td>
</tr>
<tr>
<td>188</td>
<td>Roanoke, VA</td>
<td>42.9</td>
</tr>
</tbody>
</table>

Table 4.5 reports selected ranks and percentages of Americans who report consuming five or more servings of fruits and vegetables at least four days per week. As shown in Figure 4.1, Burlington-South Burlington, VT leads with a complete yellow wedge while last-placed Mobile, AL’s wedge is null. The 95th rank is occupied by Honolulu, HI.
TABLE 4.5. RANK AND PERCENTAGE OF EATING PRODUCE FREQUENTLY BY MSA.

<table>
<thead>
<tr>
<th>RANK</th>
<th>METROPOLITAN STATISTICAL AREA</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Burlington-South Burlington, VT</td>
<td>68.6</td>
</tr>
<tr>
<td>95</td>
<td>Honolulu, HI</td>
<td>57.5</td>
</tr>
<tr>
<td>188</td>
<td>Mobile, AL</td>
<td>46.6</td>
</tr>
</tbody>
</table>

From Table 4.6, Provo-Orem, UT ranked highest among those who hold the opinion that where they live is becoming increasingly livable. As a result, this MSA earns the whole coral wedge in Figure 4.1. In contrast, less than one-third of Binghamton, NY residents believe their area is becoming more livable ranking their MSA last. Honolulu, HI ranks 66th in optimism since just under 60-percent believe that their area is improving as a place to live.

TABLE 4.6. RANK AND PERCENTAGE OF CITY OPTIMISM BY MSA.

<table>
<thead>
<tr>
<th>RANK</th>
<th>METROPOLITAN STATISTICAL AREA</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Provo-Orem, UT</td>
<td>76.9</td>
</tr>
<tr>
<td>66</td>
<td>Honolulu, HI</td>
<td>59.3</td>
</tr>
<tr>
<td>188</td>
<td>Binghamton, NY</td>
<td>31.0</td>
</tr>
</tbody>
</table>

Among Americans who confirm health insurance coverage, Worcester, MA is first-ranked and McAllen-Edinburg-Mission, TX is last-ranked. Figure 4.1 simplifies the numerical ranks offered in Table 4.7 with a fully occupied light green wedge and void wedge, respectively.
TABLE 4.7. RANK AND PERCENTAGE OF HEALTH INSURANCE BY MSA.

<table>
<thead>
<tr>
<th>RANK</th>
<th>METROPOLITAN STATISTICAL AREA</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Worcester, MA</td>
<td>95.3</td>
</tr>
<tr>
<td>7</td>
<td>Honolulu, HI</td>
<td>92.4</td>
</tr>
<tr>
<td>188</td>
<td>McAllen-Edinburg-Mission, TX</td>
<td>53.9</td>
</tr>
</tbody>
</table>

4.2. URBAN HEALTH ON INCOME INEQUALITY

4.2.1 Correlation of urban health on income inequality

The Gallup-Healthways Well-Being Index (GHWBI) score reflects an average of six sub-indexes, which individually examine life evaluation, emotional health, physical health, healthy behavior, work environment, and basic access.

The U.S. Census Bureau Gini Index affords a summary measure of income inequality. Table 4.8 provides a summary of the analysis variables.

TABLE 4.8. DESCRIPTION OF VARIABLES

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallup-Healthways Well-Being Index</td>
<td>Composite score reflecting life evaluation, emotional health, physical health, healthy behavior, work environment, and basic access.</td>
</tr>
<tr>
<td>U.S. Census Bureau Gini Index</td>
<td>A measure of inequality of income variance.</td>
</tr>
</tbody>
</table>

Descriptive statistics are provided in Table 4.9.

TABLE 4.9 DESCRIPTIVE STATISTICS BY MSA.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>MIN</th>
<th>MAX</th>
<th>AVERAGE</th>
<th>STD DEV</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-Being Index</td>
<td>58.1</td>
<td>73.7</td>
<td>66.3</td>
<td>2.3</td>
<td>188</td>
</tr>
<tr>
<td>Gini index</td>
<td>0.391</td>
<td>0.537</td>
<td>0.448</td>
<td>0.022</td>
<td>188</td>
</tr>
</tbody>
</table>
Figure 4.2 presents an enhanced scatterplot. The horizontal line through the center of the scatterplot represents the ordinary least squares (OLS) regression line.

4.2.2 Testing of Hypotheses

4.2.2.1 Correlation

While causal effect is undertaken within a multivariate context and, consequently, more complex than correlation analysis, correlation can determine the statistical association between two intervals or ratio measured variables.
The Pearson product-moment correlation coefficient (PPMCC) provides a measure of the correlation (linear dependence) between the Well-being Composite Score and the Gini Index.

At an estimated value of -0.015, the PPMCC would indicate almost no linear dependence between the two variables. Nevertheless, the sign of the correlation indicates an expected inverse relationship between the variables — as income inequality declines (Gini coefficient drops), urban health increases (Well-being Composite Score rises).

Regardless, as demonstrated in Table 4.10, a hypothesis test failed to reject the null hypothesis of true correlation equal to zero at the 95-percent level of confidence.

\[
H_0 : r = 0 \\
H_1 : r \neq 0
\]  

(4.1)

<table>
<thead>
<tr>
<th>TABLE 4.10. PPMCC ESTIMATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESTIMATE</td>
</tr>
<tr>
<td>PPMCC</td>
</tr>
</tbody>
</table>

4.2.2.2 *Homoskedasticity (homoscedasticity)*

Important to cross-sectional data is the assumption of homoskedasticity, or homogeneity of variance. Violations in homoskedasticity, known as heteroskedasticity, may result in the overestimation of the goodness of fit as measured by PPMCC.

The homoskedastic assumption was checked using the studentized Breusch-Pagan test (Koenker 1981). Under the null hypothesis of homoskedasticity, the test statistic of the Breusch-Pagan test approximately follows a chi-squared distribution where \( q \) equates to the number of regressors or degrees of freedom:
Figure 4.3 illustrates the Pearson residuals of the linear regression model on the data index.

Absent of any discernible pattern, the data appears to be homoskedastic.

\[
H_0 : \chi^2_q = 0 \\
H_1 : \chi^2_q > 0 
\]

(4.2)

**Studentized Breusch-Pagan test**

FIGURE 4.3. STUDENTIZED BREUSCH-PAGAN TEST
Results from the studentized Breusch-Pagan test confirms homoskedasicity as the null hypothesis fails to be rejected (Table 4.11).

<table>
<thead>
<tr>
<th>TABLE 4.11 . RESULTS FROM THE STUDENTIZED BREUSCH-PAGAN TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Studentized Breusch-Pagan</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

4.2.2.3 **Linearity**

Basic diagnostic statistical graphs plot residuals against fitted values and residuals against each predictor. When correctly specified, *Pearson residuals* are independent of fitted values and the predictors. Consequently, the resulting statistical graphs are null plots reflecting the absence of any systematic features.

Figure 4.4 indicates the presence of systematic features; the plot of residuals has a curved general trend, suggesting the linear model of dependence is not adequate to describe the data.
FIGURE 4.4. RESIDUAL PLOT OF PEARSON RESIDUALS ON FITTED VALUES.
Figure 4.5 offers a plot of residuals against the Gini Index. Again, the presence of systematic features reinforces the evidence that the specified model does not match the data.

![Residual Plot](image)

**FIGURE 4.5. RESIDUAL PLOT OF PEARSON RESIDUALS ON GINI INDEX.**

A curvature or *lack-of-fit test* adds a quadratic term to the function, represented by the curved line in Figure 4.5, and then tests the quadratic to be zero:

\[
H_0 : \lambda = 0 \\
H_1 : \lambda \neq 0
\]  

(4.3)
As provided in Table 4.12, the null hypothesis was soundly rejected at a 95-percent level of confidence signifying curvature in the data.

<table>
<thead>
<tr>
<th>TABLE 4.12. RESULTS OF THE LACK OF FITNESS TEST.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gini Index</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Gini Index</td>
</tr>
</tbody>
</table>

Given the curvature in the data, a nonparametric measure of statistical dependence, namely Spearman’s rank correlation coefficient or Spearman’s rho, was employed.

The null hypothesis indicates no association between the two variables and the alternative hypothesis indicates an associate between the two variables (equation 4.4):

\[
\begin{align*}
H_0: \rho &= 0 \\
H_1: \rho &\neq 0
\end{align*}
\]

(4.4)

As offered in Table 4.13, the null hypothesis of no association between Well-being Index and the Gini Index failed to reject at the 95-percent level of confidence.

<table>
<thead>
<tr>
<th>TABLE 4.13. RESULTS OF THE SPEARMAN’S RHO TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESTIMATE</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Spearman’s rho</td>
</tr>
</tbody>
</table>

1: $d^2$
4.3 RACIAL AND ETHNIC DIVERSITY ON URBAN HEALTH

4.3.1 Correlation of Urban Health on Racial and Ethnic Diversity

The Gallup-Healthways Well-Being Index (GHWBI) score reflects an average of six sub-indexes, which individually examine life evaluation, emotional health, physical health, healthy behavior, work environment, and basic access.

The Entropy Index offers a measure of uniformity of racial and ethnic diversity within a geographic area. Table 4.14 provides a summary of the analysis variables.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallup-Healthways Well-Being Index</td>
<td>Composite score reflecting life evaluation, emotional health, physical health, healthy behavior, work environment, and basic access.</td>
</tr>
<tr>
<td>Entropy Index</td>
<td>A measure of racial and ethnic heterogeneity.</td>
</tr>
</tbody>
</table>

Descriptive statistics are provided in Table 4.15.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>MIN</th>
<th>MAX</th>
<th>AVERAGE</th>
<th>STD DEV</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-Being Index</td>
<td>58.1</td>
<td>73.7</td>
<td>66.3</td>
<td>2.3</td>
<td>188</td>
</tr>
<tr>
<td>Entropy Index</td>
<td>16.5</td>
<td>89.3</td>
<td>52.9</td>
<td>14.7</td>
<td>188</td>
</tr>
</tbody>
</table>
Figure 4.6 presents an enhanced scatterplot. The horizontal line through the center of the scatterplot represents the ordinary least squares (OLS) regression line.

4.3.2 Testing of Hypotheses

4.3.2.1 Correlation

As employed in the previous section, the PPMCC is estimated to provide a measure of the correlation (linear dependence) between the Well-being Composite Score and the Entropy Index.
At an estimated value of 0.152, the PPMCC indicates a statistically significant small positive correlation between urban health and racial and ethnic diversity as measured by the Well-being Index and the Entropy Index. The sign of the correlation indicates as racial and ethnic diversity increases (Entropy Index grows), urban health increases (Well-being Composite Score rises).

Additionally, correlation coefficients are a measure of reliability. Reliability refers to consistency. Within the social sciences, the rule of thumb is that a PPMCC of 0.80 or greater indicates reliability — a numerical value indicating this association’s shortcoming.

Regardless, as presented in Table 4.16, a hypothesis test rejected the null hypothesis of true correlation equal to zero at the 95-percent level of confidence.

\[
H_0 : r = 0 \\
H_1 : r \neq 0
\]  

\text{(4.5)}

<table>
<thead>
<tr>
<th>TABLE 4.16. PPMCC ESTIMATES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ESTIMATE</strong></td>
</tr>
<tr>
<td>PPMCC</td>
</tr>
</tbody>
</table>

4.3.2.2 Homoskedasticity

As in the previous section, the homoskedastic assumption was explored using the studentized Breusch-Pagan test (Koenker 1981):

\[
H_0 : \chi^2_q = 0 \\
H_1 : \chi^2_q > 0
\]  

\text{(4.6)}
Figure 4.7 illustrates the Pearson residuals of the linear regression model on the data index.

![Figure 4.7. STUDENTIZED BREUSCH-PAGAN TEST](image)

Table 4.17 presents the results from the studentized Breusch-Pagan test. Thus, heteroskedasticity is confirmed as the null hypothesis is rejected at the 95-percent level of confidence.

<table>
<thead>
<tr>
<th>TABLE 4.17. RESULTS FROM THE STUDENTIZED BREUSCH-PAGAN TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP</td>
</tr>
<tr>
<td>------------------------------</td>
</tr>
<tr>
<td>Studentized Breusch-Pagan</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>
While heteroskedasticity does not cause ordinary least squares (OLS) coefficient estimates to be biased, it can lead OLS estimates of the variance of the coefficients to be biased resulting in estimates above or below the true variance. Regression analysis with heteroskedastic data will provide an unbiased estimate for the relationship between the independent variable and the dependent variable, but standard errors remain suspect. Biased standard errors may lead to incorrect results of hypothesis tests.

Employing “White-corrected” or “White-Huber” covariance matrices, the heteroskedastic-corrected test statistic is offered in Table 4.18. Having now corrected for heteroskedasticity, the null hypothesis of true correlation equal to zero cannot be rejected at the 95-percent level of confidence.

<table>
<thead>
<tr>
<th>PPMCC</th>
<th>0.1516</th>
<th>1.7729</th>
<th>0.0779</th>
</tr>
</thead>
</table>

TABLE 4.18. PPMCC ESTIMATES
4.3.2.3 Linearity

The diagnostic statistical graph in Figure 4.8 indicates the absence of any systematic features as the *Pearson residuals* appear independent of fitted values.

![Figure 4.8. Plot of Pearson residuals on fitted values.](image)

**FIGURE 4.8. PLOT OF PEARSON RESIDUALS ON FITTED VALUES.**
Figure 4.9 offers a plot of residuals against the Entropy Index. For a second time, the diagnostic statistical graph illustrates the absence of systematic features underpins the evidence that the *Pearson residuals* appear independent of the predictor.

![Residual Plot of Pearson Residuals on Entropy Index](image)

**FIGURE 4.9. RESIDUAL PLOT OF PEARSON RESIDUALS ON ENTROPY INDEX.**

Represented in Figure 4.9, a curvature or *lack-of-fit test* represented by the red curved line tests for curvature in the data by adding quadratic terms and then testing these to be zero:

\[
H_0 : \lambda = 0 \\
H_1 : \lambda \neq 0
\]  

(4.7)
As supported in Table 4.19, the null hypothesis failed to be rejected at a 95-percent level of confidence confirming linearity in the data.

<table>
<thead>
<tr>
<th>TABLE 4.19. RESULTS OF THE LACK OF FITNESS TEST.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAMBDA</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Entropy Index</td>
</tr>
</tbody>
</table>

4.3.3 Estimated parameters

4.3.3.1 Coefficient of determination

The Pearson product-moment correlation coefficient is the basis of the coefficient of determination:

\[
\text{Coefficient of determination} = r^2
\]

The coefficient of determination indicates the proportion of variance shared by two variables in a bivariate distribution. Consequently, the proportion of variance in the Well-being Composite Scores that is associated with the variance in the Entropy Index is \( r^2 \). Figure 4.10 illustrates approximately 2.3 percent of variance is shared between urban health and the racial and ethnic diversity in a given geographic area.
4.3.3.2 *Explained variance*

![Graph showing explained variance]

FIGURE 4.10. ILLUSTRATION OF COMMON VARIANCE.

4.4 **Empirical Results of the Data Envelopment Analysis (DEA)**

4.4.1 **DEA model of the 2010 U.S. Metropolitan Statistical Areas**

Data from over 51 percent of all Metropolitan Statistical Areas (MSAs) are represented in Data Envelopment Analysis (DEA). After review of the information presented in the previous chapter, consideration was given to the selection and availability of reliable measures needed to balance a sufficient number of observations. Table 4.20 offers a description of the DEA variables.
TABLE 4.20. DESCRIPTION OF INPUT AND OUTPUT-SPECIFIC VARIABLES

<table>
<thead>
<tr>
<th>INPUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entropy Index</td>
<td>This is a measure of racial and ethnic diversity indicating how uniformly members of a population are distributed. When there is only one racial-ethnic group in the population, the index will be 0 (zero). The maximum is realized when many varied groups are equally present and is calculated as 1 (one).</td>
</tr>
<tr>
<td>Median Housing Cost (%)</td>
<td>Based on owner-occupied housing units with a mortgage, this measure reflects selected monthly expenditures as a percentage of household income.</td>
</tr>
<tr>
<td>Median Age (years)</td>
<td>This splits the population into two groups of equal size resulting in one-half of the population being older than the median and one-half of the population being younger.</td>
</tr>
<tr>
<td>Public Assistance (%)</td>
<td>Derived as a percentage of the total population, this measure encompasses public assistance income that includes general assistance and Temporary Assistance to Needy Families (TANF). Separate payments received for hospital or other medical care and Supplemental Security Income (SSI) are excluded from the calculation.</td>
</tr>
<tr>
<td>U3 Unemployment (%)</td>
<td>Sponsored jointly by the U.S. Census Bureau and the U.S. Bureau of Labor Statistics, the Current Population Survey (CPS) is the principal source of labor force statistics, including the official unemployment rate or U3 measure of unemployment.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUTPUT</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-Being Index</td>
<td>The Gallup-Healthways Well-Being Index® score is an average of six sub-indices: (i) Life Evaluation Index, (ii) Physical Health Index, (iii) Emotional Health Index, (iv) Healthy Behavior Index, (v) Work Environment Index, and (vi) Basic Access Index.</td>
</tr>
</tbody>
</table>
As described in Chapter 3, the output of each MSA is reflected in the dependent variable *well-being index* composed of six sub-indices. Descriptive statistics of the 2010 data set are provided in Table 4.21.

| TABLE 4.21. DESCRIPTIVE STATISTICS OF THE 2010 DEA. |
|-------------------------------------|---|---|---|---|---|
| INPUT                               | MIN | MAX  | MEAN | STD DEV | n  |
| Entropy Index                       | 16.46 | 89.33 | 52.941 | 14.702 | 188 |
| Median Housing Cost (%)             | 18.9 | 33.6  | 25.04 | 3.20 | 188 |
| Median Age (years)                  | 24.3 | 48.7  | 37.04 | 3.70 | 188 |
| Public Assistance (%)               | 4.2 | 30.07 | 9.89 | 3.39 | 188 |
| U3 Unemployment (%)                 | 4.2 | 17.3  | 9.59 | 2.37 | 188 |

<table>
<thead>
<tr>
<th>OUTPUT</th>
<th>MEAN</th>
<th>STD DEV</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-Being Index</td>
<td>66.33</td>
<td>2.26</td>
<td>188</td>
</tr>
</tbody>
</table>

Given DEA is a non-parametric method, it does not rely on assumptions of the data belonging to any particular distribution. Consequently, as non-parametric methods make fewer assumptions, they have an attractive quality to situations where less is known about the application to which they are being applied. Due to this simplicity, non-parametric methods are considered to be “user friendly” as there is less opportunity for misuse and misunderstanding.

Nevertheless, having extolled the non-parametric method, linear regression analysis offers itself as a valuable diagnostic tool both in terms of model specification and variable selection. Appendix C provides a linear regression analysis on the DEA model.
4.4.2 Technical efficiency of the 2010 U.S. Metropolitan Statistical Areas

Under the assumption of variable returns to scale\(^{16}\) (VRS), the sample of 188 MSAs attained an estimated technical efficiency between 0.71 and 1.00. Table 4.22 provides a summary of these efficiencies.

<table>
<thead>
<tr>
<th>EFFICIENCY RANGE</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7 ≤ E &lt; 0.8</td>
<td>10</td>
<td>5.3</td>
</tr>
<tr>
<td>0.8 ≤ E &lt; 0.9</td>
<td>62</td>
<td>33.0</td>
</tr>
<tr>
<td>0.9 ≤ E &lt; 1.0</td>
<td>95</td>
<td>50.5</td>
</tr>
<tr>
<td>E = 1</td>
<td>21</td>
<td>11.2</td>
</tr>
<tr>
<td><strong>188</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

Note that the largest portion of MSAs earned an index ranking in the 0.90s (51%), followed by 0.80s (33%), thereby indicating 84 percent of the MSAs had a technical efficiency index of at least 0.80 but less than 1.00. Out of 188 MSAs, 21 (11%) MSAs are efficient.

The mean technical efficiency is calculated to be 0.91. Table 4.23 offers the descriptive statistics of the MSAs estimate technical efficiencies.

<table>
<thead>
<tr>
<th>MIN</th>
<th>MAX</th>
<th>MEAN</th>
<th>STD DEV</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSA Efficiency</td>
<td>0.7086</td>
<td>1.0000</td>
<td>0.9134</td>
<td>0.0633</td>
</tr>
</tbody>
</table>

\(^{16}\) Returns to scale refers to the concept of levels of change in output with respect to the levels of change in inputs. Scale returns can be variable (VRS), either increasing or decreasing, or constant. Therefore, increasing levels of input associated with a more than proportional change in outputs signals increasing returns to scale (IRS); the inverse would be decreasing returns to scale (DRS). An increase in inputs associated with a proportional change in output denotes constant returns to scale (CRS).
4.4.3 DEA Frontier

The MSA DEA frontier is plotted in Figure 4.11. When examining the plot it is useful to recognize that a two-dimensional plot is best suited to analyses with one output and one input as the interpretation is straightforward — DMUs (i.e., MSAs) on the frontier, and thereby deemed technically efficient, can be easily distinguished from those beneath the frontier or not technically efficient. Given the DEA model has not one but five inputs, it may be best to imagine the plot having an additional four planes that, due to the limitation of two-dimensional representation, can be thought of as being curved. As a result, points adjacent to the frontier may actually be on the frontier.
Efficiency Data are listed in Table 4.24. Observe that 13 MSAs are efficient when CRS is assumed (i.e., on the CRS frontier in Figure 4.11; $\text{TE}_{\text{CRS}} = 1.0$ in Table 4.24), but 21 MSAs are efficient when VRS is assumed (i.e., on the VRS frontier in Figure 4.11; $\text{TE}_{\text{VRS}} = 1.0$ in Table 4.24).

The CRS assumption is applicable should all MSAs be operating at an optimal scale. However, government regulations, finance constraints, and so forth may cause MSAs to not operate optimally.

Scale efficiency (SE) measures are calculated for each MSA by employing both a CRS and VRS DEA. The technical efficiency (TE) scores obtained from the CRS DEA can be deconstructed into two components. The first component is due to scale inefficiency, and the second component “… due to ‘pure’ technical inefficiency (i.e., VRS TE)” (Coelli et al. 2005:172) denoted as $\text{TE}_{\text{VRS}}$. Accordingly, any difference between a MSA’s $\text{TE}_{\text{CRS}}$ and $\text{TE}_{\text{VRS}}$ scores indicates scale inefficiency.

As a result, should a MSA be at its most productive scale size (MPSS), or equivalently at the technical optional productive scale (TOPS), a scale efficiency measure may be used to indicate the level of productivity that can be achieved (Coelli et al. 2005:59).

Most important to this study, the rank of each MSA has been calculated based on the $\text{TE}_{\text{VRS}}$. Each MSA will have a ranked value of 1 through 188 as indicated in Table 4.24.
<table>
<thead>
<tr>
<th>#</th>
<th>RANK</th>
<th>MSA</th>
<th>TE\text{VRS}</th>
<th>TE\text{CRS}</th>
<th>(TE\text{CRS}+TE\text{VRS})/SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>118</td>
<td>Akron, OH</td>
<td>0.8981</td>
<td>0.8343</td>
<td>0.9290</td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>Albany-Schenectady-Troy, NY</td>
<td>0.9376</td>
<td>0.8776</td>
<td>0.9360</td>
</tr>
<tr>
<td>3</td>
<td>123</td>
<td>Albuquerque, NM</td>
<td>0.8932</td>
<td>0.8557</td>
<td>0.9580</td>
</tr>
<tr>
<td>4</td>
<td>133</td>
<td>Allentown-Bethlehem-Easton, PA-NJ</td>
<td>0.8804</td>
<td>0.7973</td>
<td>0.9056</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Amarillo, TX</td>
<td>1.0000</td>
<td>0.9454</td>
<td>0.9454</td>
</tr>
<tr>
<td>6</td>
<td>96</td>
<td>Anchorage, AK</td>
<td>0.9213</td>
<td>0.8758</td>
<td>0.9505</td>
</tr>
<tr>
<td>7</td>
<td>91</td>
<td>Ann Arbor, MI</td>
<td>0.9264</td>
<td>0.8894</td>
<td>0.9600</td>
</tr>
<tr>
<td>8</td>
<td>106</td>
<td>Asheville, NC</td>
<td>0.9152</td>
<td>0.8368</td>
<td>0.9143</td>
</tr>
<tr>
<td>9</td>
<td>117</td>
<td>Atlanta-Sandy Springs-Marietta, GA</td>
<td>0.9000</td>
<td>0.8600</td>
<td>0.9556</td>
</tr>
<tr>
<td>10</td>
<td>77</td>
<td>Augusta-Richmond County, GA-SC</td>
<td>0.9336</td>
<td>0.8920</td>
<td>0.9554</td>
</tr>
<tr>
<td>11</td>
<td>59</td>
<td>Austin-Round Rock-San Marcos, TX</td>
<td>0.9526</td>
<td>0.9289</td>
<td>0.9752</td>
</tr>
<tr>
<td>12</td>
<td>141</td>
<td>Bakersfield-Delano, CA</td>
<td>0.8675</td>
<td>0.7986</td>
<td>0.9206</td>
</tr>
<tr>
<td>13</td>
<td>121</td>
<td>Baltimore-Towson, MD</td>
<td>0.8958</td>
<td>0.8428</td>
<td>0.9407</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Barnstable Town, MA</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>Baton Rouge, LA</td>
<td>1.0000</td>
<td>0.9535</td>
<td>0.9535</td>
</tr>
<tr>
<td>16</td>
<td>29</td>
<td>Beaumont-Port Arthur, TX</td>
<td>0.9913</td>
<td>0.8973</td>
<td>0.9052</td>
</tr>
<tr>
<td>17</td>
<td>168</td>
<td>Bellingham, WA</td>
<td>0.8317</td>
<td>0.7998</td>
<td>0.9617</td>
</tr>
<tr>
<td>18</td>
<td>44</td>
<td>Binghamton, NY</td>
<td>0.9612</td>
<td>0.9195</td>
<td>0.9566</td>
</tr>
<tr>
<td>19</td>
<td>99</td>
<td>Birmingham-Hoover, AL</td>
<td>0.9194</td>
<td>0.8607</td>
<td>0.9361</td>
</tr>
<tr>
<td>20</td>
<td>88</td>
<td>Boise City-Nampa, ID</td>
<td>0.9281</td>
<td>0.8652</td>
<td>0.9322</td>
</tr>
<tr>
<td>21</td>
<td>157</td>
<td>Boston-Cambridge-Quincy, MA-NH</td>
<td>0.8492</td>
<td>0.8129</td>
<td>0.9572</td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td>Boulder, CO</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>23</td>
<td>146</td>
<td>North Port-Bradenton-Sarasota, FL</td>
<td>0.8613</td>
<td>0.7926</td>
<td>0.9203</td>
</tr>
<tr>
<td>24</td>
<td>162</td>
<td>Bremerton-Silverdale, WA</td>
<td>0.8393</td>
<td>0.8002</td>
<td>0.9534</td>
</tr>
<tr>
<td>25</td>
<td>151</td>
<td>Bridgeport-Stamford-Norwalk, CT</td>
<td>0.8528</td>
<td>0.8231</td>
<td>0.9651</td>
</tr>
<tr>
<td>26</td>
<td>110</td>
<td>Buffalo-Niagara Falls, NY</td>
<td>0.9141</td>
<td>0.8841</td>
<td>0.9672</td>
</tr>
<tr>
<td>27</td>
<td>1</td>
<td>Burlington-South Burlington, VT</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>28</td>
<td>107</td>
<td>Canton-Massillon, OH</td>
<td>0.9149</td>
<td>0.8749</td>
<td>0.9562</td>
</tr>
<tr>
<td>29</td>
<td>182</td>
<td>Cape Coral-Fort Myers, FL</td>
<td>0.7884</td>
<td>0.7022</td>
<td>0.8907</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
<td>Cedar Rapids, IA</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>31</td>
<td>1</td>
<td>Charleston, WV</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>32</td>
<td>131</td>
<td>Charleston-North Charleston-Summerville, SC</td>
<td>0.8810</td>
<td>0.8565</td>
<td>0.9722</td>
</tr>
<tr>
<td>33</td>
<td>80</td>
<td>Charlotte-Gastonia-Rock Hill, NC-SC</td>
<td>0.9331</td>
<td>0.8988</td>
<td>0.9633</td>
</tr>
<tr>
<td>34</td>
<td>1</td>
<td>Charlottesville, VA</td>
<td>1.0000</td>
<td>0.9372</td>
<td>0.9372</td>
</tr>
<tr>
<td>35</td>
<td>109</td>
<td>Chattanooga, TN-GA</td>
<td>0.9142</td>
<td>0.8823</td>
<td>0.9651</td>
</tr>
<tr>
<td>36</td>
<td>166</td>
<td>Chicago-Joliet-Naperville, IL-IN-WI</td>
<td>0.8319</td>
<td>0.7840</td>
<td>0.9425</td>
</tr>
<tr>
<td>37</td>
<td>176</td>
<td>Chico, CA</td>
<td>0.8079</td>
<td>0.7337</td>
<td>0.9082</td>
</tr>
<tr>
<td>#</td>
<td>TE_{VRS} RANK</td>
<td>MSA</td>
<td>TE_{VRS}</td>
<td>TE_{CRS}</td>
<td>(TE_{CRS}+TE_{VRS}) SE</td>
</tr>
<tr>
<td>----</td>
<td>--------------</td>
<td>------------------------------</td>
<td>----------</td>
<td>----------</td>
<td>------------------------</td>
</tr>
<tr>
<td>38</td>
<td>71</td>
<td>Cincinnati-Middletown, OH-KY-IN</td>
<td>0.9369</td>
<td>0.8706</td>
<td>0.9292</td>
</tr>
<tr>
<td>39</td>
<td>1</td>
<td>Clarksville, TN-KY</td>
<td>1.0000</td>
<td>0.9084</td>
<td>0.9084</td>
</tr>
<tr>
<td>40</td>
<td>145</td>
<td>Cleveland-Elyria-Mentor, OH</td>
<td>0.8625</td>
<td>0.7908</td>
<td>0.9169</td>
</tr>
<tr>
<td>41</td>
<td>87</td>
<td>Colorado Springs, CO</td>
<td>0.9282</td>
<td>0.8672</td>
<td>0.9342</td>
</tr>
<tr>
<td>42</td>
<td>46</td>
<td>Columbus, SC</td>
<td>0.9593</td>
<td>0.8808</td>
<td>0.9182</td>
</tr>
<tr>
<td>43</td>
<td>86</td>
<td>Columbus, OH</td>
<td>0.9285</td>
<td>0.8591</td>
<td>0.9253</td>
</tr>
<tr>
<td>44</td>
<td>111</td>
<td>Corpus Christi, TX</td>
<td>0.9132</td>
<td>0.8309</td>
<td>0.9099</td>
</tr>
<tr>
<td>45</td>
<td>72</td>
<td>Dallas-Fort Worth-Arlington, TX</td>
<td>0.9368</td>
<td>0.8871</td>
<td>0.9470</td>
</tr>
<tr>
<td>46</td>
<td>57</td>
<td>Davenport-Moline-Rock Island, IA-IL</td>
<td>0.9541</td>
<td>0.9097</td>
<td>0.9535</td>
</tr>
<tr>
<td>47</td>
<td>105</td>
<td>Dayton, OH</td>
<td>0.9152</td>
<td>0.8370</td>
<td>0.9145</td>
</tr>
<tr>
<td>48</td>
<td>177</td>
<td>Deltona-Daytona Beach-Ormond Beach, FL</td>
<td>0.8070</td>
<td>0.7192</td>
<td>0.8912</td>
</tr>
<tr>
<td>49</td>
<td>75</td>
<td>Denver-Aurora-Broomfield, CO</td>
<td>0.9343</td>
<td>0.8787</td>
<td>0.9405</td>
</tr>
<tr>
<td>50</td>
<td>36</td>
<td>Des Moines-West Des Moines, IA</td>
<td>0.9797</td>
<td>0.9271</td>
<td>0.9464</td>
</tr>
<tr>
<td>51</td>
<td>148</td>
<td>Detroit-Warren-Livonia, MI</td>
<td>0.8563</td>
<td>0.7805</td>
<td>0.9114</td>
</tr>
<tr>
<td>52</td>
<td>1</td>
<td>Duluth, MN-WI</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>53</td>
<td>62</td>
<td>Durham-Chapel Hill, NC</td>
<td>0.9467</td>
<td>0.9232</td>
<td>0.9752</td>
</tr>
<tr>
<td>54</td>
<td>53</td>
<td>El Paso, TX</td>
<td>0.9557</td>
<td>0.9069</td>
<td>0.9490</td>
</tr>
<tr>
<td>55</td>
<td>85</td>
<td>Erie, PA</td>
<td>0.9291</td>
<td>0.8654</td>
<td>0.9315</td>
</tr>
<tr>
<td>56</td>
<td>161</td>
<td>Eugene-Springfield, OR</td>
<td>0.8408</td>
<td>0.8011</td>
<td>0.9528</td>
</tr>
<tr>
<td>57</td>
<td>1</td>
<td>Evansville, IN-KY</td>
<td>1.0000</td>
<td>0.9313</td>
<td>0.9313</td>
</tr>
<tr>
<td>58</td>
<td>52</td>
<td>Fayetteville, NC</td>
<td>0.9560</td>
<td>0.8686</td>
<td>0.9086</td>
</tr>
<tr>
<td>59</td>
<td>26</td>
<td>Fayetteville-Springdale-Rogers, AR-MO</td>
<td>0.9964</td>
<td>0.9138</td>
<td>0.9172</td>
</tr>
<tr>
<td>60</td>
<td>135</td>
<td>Flint, MI</td>
<td>0.8752</td>
<td>0.7996</td>
<td>0.9136</td>
</tr>
<tr>
<td>61</td>
<td>1</td>
<td>Fort Collins-Loveland, CO</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>62</td>
<td>30</td>
<td>Fort Smith, AR-OK</td>
<td>0.9911</td>
<td>0.9073</td>
<td>0.9154</td>
</tr>
<tr>
<td>63</td>
<td>22</td>
<td>Fort Wayne, IN</td>
<td>0.9986</td>
<td>0.9405</td>
<td>0.9418</td>
</tr>
<tr>
<td>64</td>
<td>137</td>
<td>Fresno, CA</td>
<td>0.8715</td>
<td>0.7997</td>
<td>0.9176</td>
</tr>
<tr>
<td>65</td>
<td>63</td>
<td>Gainesville, FL</td>
<td>0.9462</td>
<td>0.9313</td>
<td>0.9842</td>
</tr>
<tr>
<td>66</td>
<td>100</td>
<td>Grand Rapids-Wyoming, MI</td>
<td>0.9188</td>
<td>0.8740</td>
<td>0.9512</td>
</tr>
<tr>
<td>67</td>
<td>58</td>
<td>Green Bay, WI</td>
<td>0.9533</td>
<td>0.8691</td>
<td>0.9117</td>
</tr>
<tr>
<td>68</td>
<td>89</td>
<td>Greeley, CO</td>
<td>0.9278</td>
<td>0.8275</td>
<td>0.8918</td>
</tr>
<tr>
<td>69</td>
<td>115</td>
<td>Greensboro-High Point, NC</td>
<td>0.9053</td>
<td>0.8458</td>
<td>0.9343</td>
</tr>
<tr>
<td>70</td>
<td>61</td>
<td>Greenville-Mauldin-Easley, SC</td>
<td>0.9473</td>
<td>0.8947</td>
<td>0.9445</td>
</tr>
<tr>
<td>71</td>
<td>113</td>
<td>Hagerstown-Martinsburg, MD-WV</td>
<td>0.9099</td>
<td>0.8320</td>
<td>0.9143</td>
</tr>
<tr>
<td>72</td>
<td>48</td>
<td>Harrisburg-Carlisle, PA</td>
<td>0.9580</td>
<td>0.9008</td>
<td>0.9403</td>
</tr>
<tr>
<td>73</td>
<td>159</td>
<td>Hartford-West Hartford-East Hartford, CT</td>
<td>0.8486</td>
<td>0.8268</td>
<td>0.9743</td>
</tr>
<tr>
<td>74</td>
<td>97</td>
<td>Hickory-Lenoir-Morganton, NC</td>
<td>0.9198</td>
<td>0.8298</td>
<td>0.9021</td>
</tr>
<tr>
<td>#</td>
<td>TE\textsubscript{VRS} RANK</td>
<td>MSA</td>
<td>TE\textsubscript{VRS}</td>
<td>TE\textsubscript{CRS}</td>
<td>(TE\textsubscript{CRS}+TE\textsubscript{VRS}) SE</td>
</tr>
<tr>
<td>----</td>
<td>---------------------------</td>
<td>------------------------------</td>
<td>------------------------</td>
<td>------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>75</td>
<td>51</td>
<td>Holland-Grand Haven, MI</td>
<td>0.9562</td>
<td>0.9099</td>
<td>0.9516</td>
</tr>
<tr>
<td>76</td>
<td>136</td>
<td>Honolulu, HI</td>
<td>0.8750</td>
<td>0.8589</td>
<td>0.9815</td>
</tr>
<tr>
<td>77</td>
<td>1</td>
<td>Huntington-Ashland, WV-KY-OH</td>
<td>1.0000</td>
<td>0.9316</td>
<td>0.9316</td>
</tr>
<tr>
<td>78</td>
<td>1</td>
<td>Huntsville, AL</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>79</td>
<td>66</td>
<td>Houston-Sugar Land-Baytown, TX</td>
<td>0.9444</td>
<td>0.8921</td>
<td>0.9446</td>
</tr>
<tr>
<td>80</td>
<td>49</td>
<td>Indianapolis-Carmel, IN</td>
<td>0.9569</td>
<td>0.9029</td>
<td>0.9436</td>
</tr>
<tr>
<td>81</td>
<td>47</td>
<td>Jackson, MS</td>
<td>0.9590</td>
<td>0.9083</td>
<td>0.9472</td>
</tr>
<tr>
<td>82</td>
<td>142</td>
<td>Jacksonville, FL</td>
<td>0.8643</td>
<td>0.7911</td>
<td>0.9153</td>
</tr>
<tr>
<td>83</td>
<td>74</td>
<td>Kalamazoo-Portage, MI</td>
<td>0.9354</td>
<td>0.8711</td>
<td>0.9312</td>
</tr>
<tr>
<td>84</td>
<td>73</td>
<td>Kansas City, MO-KS</td>
<td>0.9361</td>
<td>0.9065</td>
<td>0.9684</td>
</tr>
<tr>
<td>85</td>
<td>25</td>
<td>Kennewick-Pasco-Richland, WA</td>
<td>0.9974</td>
<td>0.9543</td>
<td>0.9567</td>
</tr>
<tr>
<td>86</td>
<td>1</td>
<td>Killeen-Temple-Fort Hood, TX</td>
<td>1.0000</td>
<td>0.9325</td>
<td>0.9325</td>
</tr>
<tr>
<td>87</td>
<td>1</td>
<td>Kingsport-Bristol-Bristol, TN-VA</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>88</td>
<td>76</td>
<td>Knoxville, TN</td>
<td>0.9340</td>
<td>0.8597</td>
<td>0.9204</td>
</tr>
<tr>
<td>89</td>
<td>186</td>
<td>Lake Havasu City-Kingman, AZ</td>
<td>0.7649</td>
<td>0.6774</td>
<td>0.8856</td>
</tr>
<tr>
<td>90</td>
<td>174</td>
<td>Lakeland-Winter Haven, FL</td>
<td>0.8157</td>
<td>0.7460</td>
<td>0.9145</td>
</tr>
<tr>
<td>91</td>
<td>42</td>
<td>Lancaster, PA</td>
<td>0.9642</td>
<td>0.9271</td>
<td>0.9615</td>
</tr>
<tr>
<td>92</td>
<td>82</td>
<td>Lansing-East Lansing, MI</td>
<td>0.9302</td>
<td>0.8876</td>
<td>0.9543</td>
</tr>
<tr>
<td>93</td>
<td>165</td>
<td>Las Vegas-Paradise, NV</td>
<td>0.8358</td>
<td>0.7432</td>
<td>0.8893</td>
</tr>
<tr>
<td>94</td>
<td>33</td>
<td>Lexington-Fayette, KY</td>
<td>0.9852</td>
<td>0.9301</td>
<td>0.9440</td>
</tr>
<tr>
<td>95</td>
<td>1</td>
<td>Lincoln, NE</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>96</td>
<td>23</td>
<td>Little Rock-North Little Rock-Conway, AR</td>
<td>0.9979</td>
<td>0.9746</td>
<td>0.9766</td>
</tr>
<tr>
<td>97</td>
<td>152</td>
<td>Los Angeles-Long Beach-Santa Ana, CA</td>
<td>0.8527</td>
<td>0.7888</td>
<td>0.9251</td>
</tr>
<tr>
<td>98</td>
<td>78</td>
<td>Louisville/Jefferson County, KY-IN</td>
<td>0.9334</td>
<td>0.8546</td>
<td>0.9156</td>
</tr>
<tr>
<td>99</td>
<td>103</td>
<td>Lynchburg, VA</td>
<td>0.9171</td>
<td>0.8425</td>
<td>0.9187</td>
</tr>
<tr>
<td>100</td>
<td>43</td>
<td>Madison, WI</td>
<td>0.9625</td>
<td>0.9351</td>
<td>0.9715</td>
</tr>
<tr>
<td>101</td>
<td>40</td>
<td>Manchester-Nashua, NH</td>
<td>0.9657</td>
<td>0.9203</td>
<td>0.9530</td>
</tr>
<tr>
<td>102</td>
<td>1</td>
<td>McAllen-Edinburg-Mission, TX</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>103</td>
<td>185</td>
<td>Medford, OR</td>
<td>0.7796</td>
<td>0.7429</td>
<td>0.9529</td>
</tr>
<tr>
<td>104</td>
<td>116</td>
<td>Memphis, TN-MS-AR</td>
<td>0.9052</td>
<td>0.8243</td>
<td>0.9107</td>
</tr>
<tr>
<td>105</td>
<td>188</td>
<td>Miami-Fort Lauderdale-Pompano Beach, FL</td>
<td>0.7086</td>
<td>0.6504</td>
<td>0.9178</td>
</tr>
<tr>
<td>106</td>
<td>132</td>
<td>Milwaukee-Waukesha-West Allis, WI</td>
<td>0.8804</td>
<td>0.8236</td>
<td>0.9355</td>
</tr>
<tr>
<td>107</td>
<td>84</td>
<td>Minneapolis-St. Paul-Bloomington, MN-WI</td>
<td>0.9296</td>
<td>0.8883</td>
<td>0.9556</td>
</tr>
<tr>
<td>108</td>
<td>94</td>
<td>Mobile, AL</td>
<td>0.9225</td>
<td>0.8377</td>
<td>0.9080</td>
</tr>
<tr>
<td>109</td>
<td>179</td>
<td>Modesto, CA</td>
<td>0.7958</td>
<td>0.7375</td>
<td>0.9269</td>
</tr>
<tr>
<td>110</td>
<td>60</td>
<td>Montgomery, AL</td>
<td>0.9486</td>
<td>0.9205</td>
<td>0.9703</td>
</tr>
<tr>
<td>111</td>
<td>163</td>
<td>Myrtle Beach-North Myrtle Beach-Conway, SC</td>
<td>0.8386</td>
<td>0.7685</td>
<td>0.9165</td>
</tr>
<tr>
<td>#</td>
<td>TE_{VRS} RANK</td>
<td>MSA</td>
<td>TE_{VRS}</td>
<td>TE_{CRS}</td>
<td>(TE_{CRS}÷TE_{VRS}) SE</td>
</tr>
<tr>
<td>----</td>
<td>--------------</td>
<td>------------------------------------------</td>
<td>----------</td>
<td>----------</td>
<td>------------------------</td>
</tr>
<tr>
<td>112</td>
<td>112</td>
<td>Naples-Marco Island, FL</td>
<td>0.9130</td>
<td>0.8424</td>
<td>0.9227</td>
</tr>
<tr>
<td>113</td>
<td>101</td>
<td>Nashville-Davidson--Murfreesboro--Franklin, TN</td>
<td>0.9187</td>
<td>0.8675</td>
<td>0.9443</td>
</tr>
<tr>
<td>114</td>
<td>173</td>
<td>New Haven-Milford, CT</td>
<td>0.8178</td>
<td>0.7702</td>
<td>0.9417</td>
</tr>
<tr>
<td>115</td>
<td>127</td>
<td>New Orleans-Metairie-Kenner, LA</td>
<td>0.8850</td>
<td>0.8332</td>
<td>0.9415</td>
</tr>
<tr>
<td>116</td>
<td>184</td>
<td>New York-Northern New Jersey-Long Island, NY-NJ-PA</td>
<td>0.7849</td>
<td>0.7354</td>
<td>0.9369</td>
</tr>
<tr>
<td>117</td>
<td>128</td>
<td>Norwich-New London, CT</td>
<td>0.8847</td>
<td>0.8245</td>
<td>0.9320</td>
</tr>
<tr>
<td>118</td>
<td>181</td>
<td>Ocala, FL</td>
<td>0.7895</td>
<td>0.7399</td>
<td>0.9372</td>
</tr>
<tr>
<td>119</td>
<td>28</td>
<td>Ogden-Clearfield, UT</td>
<td>0.9925</td>
<td>0.9270</td>
<td>0.9340</td>
</tr>
<tr>
<td>120</td>
<td>37</td>
<td>Oklahoma City, OK</td>
<td>0.9764</td>
<td>0.9162</td>
<td>0.9383</td>
</tr>
<tr>
<td>121</td>
<td>149</td>
<td>Olympia, WA</td>
<td>0.8544</td>
<td>0.8210</td>
<td>0.9609</td>
</tr>
<tr>
<td>122</td>
<td>38</td>
<td>Omaha-Council Bluffs, NE-IA</td>
<td>0.9708</td>
<td>0.9218</td>
<td>0.9495</td>
</tr>
<tr>
<td>123</td>
<td>170</td>
<td>Orlando-Kissimmee-Sanford, FL</td>
<td>0.8266</td>
<td>0.7591</td>
<td>0.9183</td>
</tr>
<tr>
<td>124</td>
<td>95</td>
<td>Oxnard-Thousand Oaks-Ventura, CA</td>
<td>0.9218</td>
<td>0.8598</td>
<td>0.9327</td>
</tr>
<tr>
<td>125</td>
<td>155</td>
<td>Palm Bay-Melbourne-Titusville, FL</td>
<td>0.8511</td>
<td>0.7559</td>
<td>0.8882</td>
</tr>
<tr>
<td>126</td>
<td>156</td>
<td>Pensacola-Ferry Pass-Brent, FL</td>
<td>0.8500</td>
<td>0.7976</td>
<td>0.9384</td>
</tr>
<tr>
<td>127</td>
<td>24</td>
<td>Peoria, IL</td>
<td>0.9975</td>
<td>0.9969</td>
<td>0.9993</td>
</tr>
<tr>
<td>128</td>
<td>147</td>
<td>Philadelphia-Camden-Wilmington, PA-NJ-DE-MD</td>
<td>0.8603</td>
<td>0.8123</td>
<td>0.9442</td>
</tr>
<tr>
<td>129</td>
<td>139</td>
<td>Phoenix-Mesa-Glendale, AZ</td>
<td>0.8699</td>
<td>0.8204</td>
<td>0.9431</td>
</tr>
<tr>
<td>130</td>
<td>67</td>
<td>Pittsburgh, PA</td>
<td>0.9427</td>
<td>0.9033</td>
<td>0.9582</td>
</tr>
<tr>
<td>131</td>
<td>187</td>
<td>Port St. Lucie, FL</td>
<td>0.7546</td>
<td>0.6934</td>
<td>0.9190</td>
</tr>
<tr>
<td>132</td>
<td>1</td>
<td>Portland-South Portland-Biddeford, ME</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>133</td>
<td>160</td>
<td>Portland-Vancouver-Hillsboro, OR-WA</td>
<td>0.8455</td>
<td>0.7922</td>
<td>0.9369</td>
</tr>
<tr>
<td>134</td>
<td>158</td>
<td>Poughkeepsie-Newburgh-Middletown, NY</td>
<td>0.8488</td>
<td>0.7852</td>
<td>0.9250</td>
</tr>
<tr>
<td>135</td>
<td>167</td>
<td>Prescott, AZ</td>
<td>0.8318</td>
<td>0.7330</td>
<td>0.8812</td>
</tr>
<tr>
<td>136</td>
<td>172</td>
<td>Providence-New Bedford-Fall River, RI-MA</td>
<td>0.8182</td>
<td>0.7399</td>
<td>0.9042</td>
</tr>
<tr>
<td>137</td>
<td>1</td>
<td>Provo-Orem, UT</td>
<td>1.0000</td>
<td>1.0000</td>
<td>1.0000</td>
</tr>
<tr>
<td>138</td>
<td>35</td>
<td>Raleigh-Cary, NC</td>
<td>0.9807</td>
<td>0.9545</td>
<td>0.9733</td>
</tr>
<tr>
<td>139</td>
<td>130</td>
<td>Reading, PA</td>
<td>0.8829</td>
<td>0.8215</td>
<td>0.9305</td>
</tr>
<tr>
<td>140</td>
<td>175</td>
<td>Redding, CA</td>
<td>0.8101</td>
<td>0.6979</td>
<td>0.8615</td>
</tr>
<tr>
<td>141</td>
<td>150</td>
<td>Reno-Sparks, NV</td>
<td>0.8533</td>
<td>0.7649</td>
<td>0.8965</td>
</tr>
<tr>
<td>142</td>
<td>122</td>
<td>Richmond, VA</td>
<td>0.8947</td>
<td>0.8517</td>
<td>0.9520</td>
</tr>
<tr>
<td>143</td>
<td>178</td>
<td>Riverside-San Bernardino-Ontario, CA</td>
<td>0.8066</td>
<td>0.7304</td>
<td>0.9056</td>
</tr>
<tr>
<td>144</td>
<td>120</td>
<td>Roanoke, VA</td>
<td>0.8973</td>
<td>0.8143</td>
<td>0.9076</td>
</tr>
<tr>
<td>145</td>
<td>102</td>
<td>Rochester, NY</td>
<td>0.9182</td>
<td>0.8870</td>
<td>0.9660</td>
</tr>
<tr>
<td>146</td>
<td>125</td>
<td>Rockford, IL</td>
<td>0.8900</td>
<td>0.8514</td>
<td>0.9566</td>
</tr>
<tr>
<td>147</td>
<td>171</td>
<td>Sacramento--Arden-Arcade--Roseville, CA</td>
<td>0.8207</td>
<td>0.7641</td>
<td>0.9310</td>
</tr>
<tr>
<td>#</td>
<td>TEVRS RANK</td>
<td>MSA</td>
<td>TEVRS</td>
<td>TECRS</td>
<td>(TECRS + TEVRS) SE</td>
</tr>
<tr>
<td>-----</td>
<td>------------</td>
<td>----------------------------</td>
<td>-------</td>
<td>-------</td>
<td>--------------------</td>
</tr>
<tr>
<td>148</td>
<td>154</td>
<td>Salem, OR</td>
<td>0.8518</td>
<td>0.8019</td>
<td>0.9414</td>
</tr>
<tr>
<td>149</td>
<td>138</td>
<td>Salinas, CA</td>
<td>0.8714</td>
<td>0.8073</td>
<td>0.9265</td>
</tr>
<tr>
<td>150</td>
<td>39</td>
<td>Salt Lake City, UT</td>
<td>0.9680</td>
<td>0.9040</td>
<td>0.9339</td>
</tr>
<tr>
<td>151</td>
<td>54</td>
<td>San Antonio-New Braunfels, TX</td>
<td>0.9548</td>
<td>0.9099</td>
<td>0.9530</td>
</tr>
<tr>
<td>152</td>
<td>1</td>
<td>San Diego-Carlsbad-San Marcos, CA</td>
<td>1.0000</td>
<td>0.9390</td>
<td>0.9390</td>
</tr>
<tr>
<td>153</td>
<td>55</td>
<td>San Francisco-Oakland-Fremont, CA</td>
<td>0.9545</td>
<td>0.8950</td>
<td>0.9376</td>
</tr>
<tr>
<td>154</td>
<td>34</td>
<td>San Jose-Sunnyvale-Santa Clara, CA</td>
<td>0.9815</td>
<td>0.9296</td>
<td>0.9471</td>
</tr>
<tr>
<td>155</td>
<td>79</td>
<td>San Luis Obispo-Paso Robles, CA</td>
<td>0.9333</td>
<td>0.8396</td>
<td>0.8996</td>
</tr>
<tr>
<td>156</td>
<td>93</td>
<td>Santa Barbara-Santa Maria-Goleta, CA</td>
<td>0.9225</td>
<td>0.8532</td>
<td>0.9248</td>
</tr>
<tr>
<td>157</td>
<td>124</td>
<td>Santa Cruz-Watsonville, CA</td>
<td>0.8923</td>
<td>0.8229</td>
<td>0.9222</td>
</tr>
<tr>
<td>158</td>
<td>56</td>
<td>Santa Rosa-Petaluma, CA</td>
<td>0.9545</td>
<td>0.8989</td>
<td>0.9417</td>
</tr>
<tr>
<td>159</td>
<td>83</td>
<td>Savannah, GA</td>
<td>0.9297</td>
<td>0.8723</td>
<td>0.9383</td>
</tr>
<tr>
<td>160</td>
<td>114</td>
<td>Scranton--Wilkes-Barre, PA</td>
<td>0.9080</td>
<td>0.8375</td>
<td>0.9224</td>
</tr>
<tr>
<td>161</td>
<td>169</td>
<td>Seattle-Tacoma-Bellevue, WA</td>
<td>0.8287</td>
<td>0.8057</td>
<td>0.9722</td>
</tr>
<tr>
<td>162</td>
<td>45</td>
<td>Shreveport-Bossier City, LA</td>
<td>0.9611</td>
<td>0.8740</td>
<td>0.9093</td>
</tr>
<tr>
<td>163</td>
<td>65</td>
<td>South Bend-Mishawaka, IN-MI</td>
<td>0.9446</td>
<td>0.8576</td>
<td>0.9079</td>
</tr>
<tr>
<td>164</td>
<td>90</td>
<td>Spartanburg, SC</td>
<td>0.9273</td>
<td>0.8345</td>
<td>0.8999</td>
</tr>
<tr>
<td>165</td>
<td>119</td>
<td>Spokane, WA</td>
<td>0.8977</td>
<td>0.8434</td>
<td>0.9396</td>
</tr>
<tr>
<td>166</td>
<td>143</td>
<td>Springfield, MA</td>
<td>0.8640</td>
<td>0.7972</td>
<td>0.9227</td>
</tr>
<tr>
<td>167</td>
<td>27</td>
<td>Springfield, MO</td>
<td>0.9952</td>
<td>0.9664</td>
<td>0.9710</td>
</tr>
<tr>
<td>168</td>
<td>92</td>
<td>St. Louis, MO-IL</td>
<td>0.9243</td>
<td>0.8882</td>
<td>0.9610</td>
</tr>
<tr>
<td>169</td>
<td>183</td>
<td>Stockton, CA</td>
<td>0.7878</td>
<td>0.7126</td>
<td>0.9045</td>
</tr>
<tr>
<td>170</td>
<td>68</td>
<td>Syracuse, NY</td>
<td>0.9411</td>
<td>0.8877</td>
<td>0.9433</td>
</tr>
<tr>
<td>171</td>
<td>81</td>
<td>Tallahassee, FL</td>
<td>0.9315</td>
<td>0.8904</td>
<td>0.9558</td>
</tr>
<tr>
<td>172</td>
<td>180</td>
<td>Tampa-St. Petersburg-Clearwater, FL</td>
<td>0.7932</td>
<td>0.7220</td>
<td>0.9102</td>
</tr>
<tr>
<td>173</td>
<td>108</td>
<td>Toledo, OH</td>
<td>0.9147</td>
<td>0.8205</td>
<td>0.8970</td>
</tr>
<tr>
<td>174</td>
<td>64</td>
<td>Topeka, KS</td>
<td>0.9449</td>
<td>0.9403</td>
<td>0.9952</td>
</tr>
<tr>
<td>175</td>
<td>104</td>
<td>Trenton-Ewing, NJ</td>
<td>0.9167</td>
<td>0.8709</td>
<td>0.9501</td>
</tr>
<tr>
<td>176</td>
<td>144</td>
<td>Tucson, AZ</td>
<td>0.8625</td>
<td>0.8104</td>
<td>0.9396</td>
</tr>
<tr>
<td>177</td>
<td>50</td>
<td>Tulsa, OK</td>
<td>0.9566</td>
<td>0.9040</td>
<td>0.9450</td>
</tr>
<tr>
<td>178</td>
<td>69</td>
<td>Utica-Rome, NY</td>
<td>0.9406</td>
<td>0.8750</td>
<td>0.9303</td>
</tr>
<tr>
<td>179</td>
<td>164</td>
<td>Vallejo-Fairfield, CA</td>
<td>0.8366</td>
<td>0.7610</td>
<td>0.9096</td>
</tr>
<tr>
<td>180</td>
<td>126</td>
<td>Virginia Beach-Norfolk-Newport News, VA-NC</td>
<td>0.8860</td>
<td>0.8268</td>
<td>0.9332</td>
</tr>
<tr>
<td>181</td>
<td>134</td>
<td>Visalia-Porterville, CA</td>
<td>0.8764</td>
<td>0.8058</td>
<td>0.9195</td>
</tr>
<tr>
<td>182</td>
<td>31</td>
<td>Washington-Arlington-Alexandria, DC-VA-MD-WV</td>
<td>0.9870</td>
<td>0.9390</td>
<td>0.9514</td>
</tr>
<tr>
<td>183</td>
<td>32</td>
<td>Wichita, KS</td>
<td>0.9860</td>
<td>0.9640</td>
<td>0.9777</td>
</tr>
</tbody>
</table>
### TABLE 4-24. DEA RESULTS OF THE MSAs (Continued)

<table>
<thead>
<tr>
<th>#</th>
<th>RANK</th>
<th>MSA</th>
<th>TEVRS</th>
<th>TECRS</th>
<th>(TECRS÷TEVRS SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>184</td>
<td>153</td>
<td>Wilmington, NC</td>
<td>0.8524</td>
<td>0.7855</td>
<td>0.9215</td>
</tr>
<tr>
<td>185</td>
<td>98</td>
<td>Winston-Salem, NC</td>
<td>0.9195</td>
<td>0.9098</td>
<td>0.9895</td>
</tr>
<tr>
<td>186</td>
<td>140</td>
<td>Worcester, MA</td>
<td>0.8685</td>
<td>0.8097</td>
<td>0.9324</td>
</tr>
<tr>
<td>187</td>
<td>41</td>
<td>York-Hanover, PA</td>
<td>0.9655</td>
<td>0.8869</td>
<td>0.9186</td>
</tr>
<tr>
<td>188</td>
<td>129</td>
<td>Youngstown-Warren-Boardman, OH-PA</td>
<td>0.8844</td>
<td>0.7906</td>
<td>0.8940</td>
</tr>
</tbody>
</table>

Note: By definition, should TEVRS equal TECR, the DMU is operating under CRS.

#### 4.4.4 Peers

The intended use of the any measurement is crucial to any evaluation procedure. In this study, the exact efficiency score of a MSA is of less import than the relevance of identified peers. In accordance linear programming (LP) theory and VRS DEA models, the “…number of possible peers units for a given firm is equal to the number of inputs plus the number of outputs…” (Bogetoft and Otto 2011:94).

Table 4.25 names the identified peers. For example, Akron, OH (1) is being compared with Baton, Rouge, LA (15), Charleston, WV (31), Huntsville, AL(78), and Provo-Orem, UT (137). Likewise, Honolulu, HI (76) is being compared to Boulder, CO (22), Lincoln, NE (95), and Provo-Orem, UT (137). Note Barnstable Town, MA (14) is being compared to itself. Given Barnstable Town, MA (14) is efficient (TEVRS= 1.0), this is an expected outcome.

---

17 “According to LP theory, if there exists an optimal solution, there exists a basis optimal solution for which the number of positive variables is at modest equal to the number of linear restrictions” (Bogetoft and Otto 2011:94).
<table>
<thead>
<tr>
<th>#</th>
<th>MSA</th>
<th>Peer 1</th>
<th>Peer 2</th>
<th>Peer 3</th>
<th>Peer 4</th>
<th>Peer 5</th>
<th>Peer 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Akron, OH</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Albany-Schenectady-Troy, NY</td>
<td>22</td>
<td>30</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Albuquerque, NM</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Allentown-Bethlehem-Easton, PA-NJ</td>
<td>22</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Amarillo, TX</td>
<td>5</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Anchorage, AK</td>
<td>5</td>
<td>15</td>
<td>86</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Ann Arbor, MI</td>
<td>5</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>95</td>
<td>137</td>
</tr>
<tr>
<td>8</td>
<td>Asheville, NC</td>
<td>22</td>
<td>30</td>
<td>57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Atlanta-Sandy Springs-Marietta, GA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Augusta-Richmond County, GA-SC</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Austin-Round Rock-San Marcos, TX</td>
<td>78</td>
<td>86</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Bakersfield-Delano, CA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Baltimore-Towson, MD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Barnstable Town, MA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Baton Rouge, LA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Beaumont-Port Arthur, TX</td>
<td>15</td>
<td>78</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Bellingham, WA</td>
<td>15</td>
<td>31</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Binghamton, NY</td>
<td>31</td>
<td>57</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Birmingham-Hoover, AL</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Boise City-Nampa, ID</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Boston-Cambridge-Quincy, MA-NH</td>
<td>22</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Boulder, CO</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>North Port-Bradenton-Sarasota, FL</td>
<td>14</td>
<td>22</td>
<td>61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Bremerton-Silverdale, WA</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Bridgeport-Stamford-Norwalk, CT</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Buffalo-Niagara Falls, NY</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Burlington-South Burlington, VT</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Canton-Massillon, OH</td>
<td>30</td>
<td>31</td>
<td>57</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Cape Coral-Fort Myers, FL</td>
<td>22</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Cedar Rapids, IA</td>
<td>30</td>
<td>31</td>
<td>95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Charleston, WV</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Charleston-North Charleston-Summerville, SC</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Charlotte-Gastonia-Rock Hill, NC-SC</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Charlottesville, VA</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Chattanooga, TN-GA</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Chicago-Joliet-Naperville, IL-IN-WI</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Chico, CA</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 4-25. PEER MSAs (Continued)

<table>
<thead>
<tr>
<th>#</th>
<th>MSA</th>
<th>Peer 1</th>
<th>Peer 2</th>
<th>Peer 3</th>
<th>Peer 4</th>
<th>Peer 5</th>
<th>Peer 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>Cincinnati-Middletown, OH-KY-IN</td>
<td>31</td>
<td>57</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Clarksville, TN-KY</td>
<td>15</td>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Cleveland-Elyria-Mentor, OH</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Colorado Springs, CO</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Columbia, SC</td>
<td>5</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Columbus, OH</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Corpus Christi, TX</td>
<td>15</td>
<td>31</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Dallas-Fort Worth-Arlington, TX</td>
<td>78</td>
<td>86</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Davenport-Moline-Rock Island, IA-IL</td>
<td>31</td>
<td>57</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Dayton, OH</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Deltona-Daytona Beach-Ormond Beach, FL</td>
<td>22</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Denver-Aurora-Broomfield, CO</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Des Moines-West Des Moines, IA</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Detroit-Warren-Livonia, MI</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Duluth, MN-WI</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Durham-Chapel Hill, NC</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>El Paso, TX</td>
<td>15</td>
<td>31</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>Erie, PA</td>
<td>15</td>
<td>31</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Eugene-Springfield, OR</td>
<td>15</td>
<td>31</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>Evansville, IN-KY</td>
<td>57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Fayetteville, NC</td>
<td>39</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Fayetteville-Springdale-Rogers, AR-MO</td>
<td>5</td>
<td>15</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Flint, MI</td>
<td>15</td>
<td>31</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Fort Collins-Loveland, CO</td>
<td>61</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Fort Smith, AR-OK</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Fort Wayne, IN</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Fresno, CA</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>Gainesville, FL</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Grand Rapids-Wyoming, MI</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Green Bay, WI</td>
<td>22</td>
<td>30</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Greeley, CO</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Greensboro-High Point, NC</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Greenville-Mauldin-Easley, SC</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Hagerstown-Martinsburg, MD-WV</td>
<td>22</td>
<td>30</td>
<td>57</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Harrisburg-Carlisle, PA</td>
<td>22</td>
<td>30</td>
<td>57</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>Hartford-West Hartford-East Hartford, CT</td>
<td>30</td>
<td>31</td>
<td>57</td>
<td>78</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>Hickory-Lenoir-Morganton, NC</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>MSA</td>
<td>Peer 1</td>
<td>Peer 2</td>
<td>Peer 3</td>
<td>Peer 4</td>
<td>Peer 5</td>
<td>Peer 6</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>75</td>
<td>Holland-Grand Haven, MI</td>
<td>30</td>
<td>57</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>Honolulu, HI</td>
<td>22</td>
<td>95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>Huntington-Ashland, WV-KY-OH</td>
<td>77</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>Huntsville, AL</td>
<td>78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>Houston-Sugar Land-Baytown, TX</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>Indianapolis-Carmel, IN</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Jackson, MS</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>Jacksonville, FL</td>
<td>78</td>
<td>86</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>Kalamazoo-Portage, MI</td>
<td>15</td>
<td>31</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>Kansas City, MO-KS</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>Kennewick-Pasco-Richland, WA</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>Killeen-Temple-Fort Hood, TX</td>
<td>86</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>Kingsport-Bristol-Bristol, TN-VA</td>
<td>87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>Knoxville, TN</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>Lake Havasu City-Kingman, AZ</td>
<td>31</td>
<td>57</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>Lakeland-Winter Haven, FL</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>Lancaster, PA</td>
<td>22</td>
<td>30</td>
<td>52</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>Lansing-East Lansing, MI</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>93</td>
<td>Las Vegas-Paradise, NV</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>94</td>
<td>Lexington-Fayette, KY</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>Lincoln, NE</td>
<td>95</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>Little Rock-North Little Rock-Conway, AR</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Los Angeles-Long Beach-Santa Ana, CA</td>
<td>22</td>
<td>137</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>98</td>
<td>Louisville/Jefferson County, KY-IN</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>Lynchburg, VA</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Madison, WI</td>
<td>22</td>
<td>61</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>101</td>
<td>Manchester-Nashua, NH</td>
<td>14</td>
<td>27</td>
<td>61</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>McAllen-Edinburg-Mission, TX</td>
<td>102</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>Medford, OR</td>
<td>31</td>
<td>77</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Memphis, TN-MS-AR</td>
<td>15</td>
<td>39</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>Miami-Fort Lauderdale-Pompano Beach, FL</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>Milwaukee-Waukesha-West Allis, WI</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>107</td>
<td>Minneapolis-St. Paul-Bloomington, MN-WI</td>
<td>22</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>108</td>
<td>Mobile, AL</td>
<td>15</td>
<td>31</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>109</td>
<td>Modesto, CA</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>Montgomery, AL</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>111</td>
<td>Myrtle Beach-North Myrtle Beach-Conway, SC</td>
<td>31</td>
<td>57</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>MSA</td>
<td>Peer 1</td>
<td>Peer 2</td>
<td>Peer 3</td>
<td>Peer 4</td>
<td>Peer 5</td>
<td>Peer 6</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>112</td>
<td>Naples-Marco Island, FL</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>Nashville-Davidson--Murfreesboro--Franklin, TN</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>114</td>
<td>New Haven-Milford, CT</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>New Orleans-Metairie-Kenner, LA</td>
<td>5</td>
<td>15</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>New York-Northern New Jersey-Long Island, NY-</td>
<td>86</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NJ-PA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>Norwich-New London, CT</td>
<td>22</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>118</td>
<td>Ocala, FL</td>
<td>22</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>119</td>
<td>Ogden-Clearfield, UT</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Oklahoma City, OK</td>
<td>5</td>
<td>15</td>
<td>86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>121</td>
<td>Olympia, WA</td>
<td>31</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>122</td>
<td>Omaha-Council Bluffs, NE-IA</td>
<td>5</td>
<td>15</td>
<td>78</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>123</td>
<td>Orlando-Kissimmee-Sanford, FL</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>124</td>
<td>Oxnard-Thousand Oaks-Ventura, CA</td>
<td>22</td>
<td>137</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>Palm Bay-Melbourne-Titusville, FL</td>
<td>22</td>
<td>57</td>
<td>78</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>126</td>
<td>Pensacola-Ferry Pass-Brent, FL</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127</td>
<td>Peoria, IL</td>
<td>22</td>
<td>30</td>
<td>78</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>128</td>
<td>Philadelphia-Camden-Wilmington, PA-NJ-DE-MD</td>
<td>5</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>129</td>
<td>Phoenix-Mesa-Glendale, AZ</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>Pittsburgh, PA</td>
<td>30</td>
<td>31</td>
<td>57</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>131</td>
<td>Port St. Lucie, FL</td>
<td>22</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>132</td>
<td>Portland-South Portland-Biddeford, ME</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>132</td>
</tr>
<tr>
<td>133</td>
<td>Portland-Vancouver-Hillsboro, OR-WA</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>134</td>
<td>Poughkeepsie-Newburgh-Middletown, NY</td>
<td>22</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>Prescott, AZ</td>
<td>22</td>
<td>52</td>
<td>61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>136</td>
<td>Providence-New Bedford-Fall River, RI-MA</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>137</td>
<td>Provo-Orem, UT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>137</td>
</tr>
<tr>
<td>138</td>
<td>Raleigh-Cary, NC</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>139</td>
<td>Reading, PA</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>Redding, CA</td>
<td>30</td>
<td>52</td>
<td>61</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>141</td>
<td>Reno-Sparks, NV</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>142</td>
<td>Richmond, VA</td>
<td>22</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>143</td>
<td>Riverside-San Bernardino-Ontario, CA</td>
<td>22</td>
<td>137</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>144</td>
<td>Roanoke, VA</td>
<td>22</td>
<td>30</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>145</td>
<td>Rochester, NY</td>
<td>5</td>
<td>31</td>
<td>78</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>146</td>
<td>Rockford, IL</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>147</td>
<td>Sacramento--Arden-Arcade--Roseville, CA</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>148</td>
<td>Salem, OR</td>
<td>15</td>
<td>31</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MSA</td>
<td>Peer 1</td>
<td>Peer 2</td>
<td>Peer 3</td>
<td>Peer 4</td>
<td>Peer 5</td>
<td>Peer 6</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>149</td>
<td>Salinas, CA</td>
<td>137</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>Salt Lake City, UT</td>
<td>22</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>151</td>
<td>San Antonio-New Braunfels, TX</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>152</td>
<td>San Diego-Carlsbad-San Marcos, CA</td>
<td>22</td>
<td>137</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>153</td>
<td>San Francisco-Oakland-Fremont, CA</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>154</td>
<td>San Jose-Sunnyvale-Santa Clara, CA</td>
<td>22</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>San Luis Obispo-Paso Robles, CA</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>156</td>
<td>Santa Barbara-Santa Maria-Goleta, CA</td>
<td>22</td>
<td>137</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>157</td>
<td>Santa Cruz-Watsonville, CA</td>
<td>22</td>
<td>137</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>158</td>
<td>Santa Rosa-Petaluma, CA</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>159</td>
<td>Savannah, GA</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>Scranton--Wilkes-Barre, PA</td>
<td>30</td>
<td>31</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161</td>
<td>Seattle-Tacoma-Bellevue, WA</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>162</td>
<td>Shreveport-Bossier City, LA</td>
<td>5</td>
<td>15</td>
<td>78</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>163</td>
<td>South Bend-Mishawaka, IN-MI</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>164</td>
<td>Spartanburg, SC</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>Spokane, WA</td>
<td>15</td>
<td>31</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>166</td>
<td>Springfield, MA</td>
<td>15</td>
<td>31</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>167</td>
<td>Springfield, MO</td>
<td>30</td>
<td>77</td>
<td>87</td>
<td>102</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>168</td>
<td>St. Louis, MO-IL</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>169</td>
<td>Stockton, CA</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>Syracuse, NY</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>171</td>
<td>Tallahassee, FL</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>172</td>
<td>Tampa-St. Petersburg-Clearwater, FL</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>173</td>
<td>Toledo, OH</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>174</td>
<td>Topeka, KS</td>
<td>31</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>Trenton-Ewing, NJ</td>
<td>22</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>176</td>
<td>Tucson, AZ</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>177</td>
<td>Tulsa, OK</td>
<td>5</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>178</td>
<td>Utica-Rome, NY</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>179</td>
<td>Vallejo-Fairfield, CA</td>
<td>22</td>
<td>137</td>
<td>152</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>Virginia Beach-Norfolk-Newport News, VA-NC</td>
<td>22</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>181</td>
<td>Visalia-Porterville, CA</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>182</td>
<td>Washington-Arlington-Alexandria, DC-VA-MD-WV</td>
<td>22</td>
<td>95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>183</td>
<td>Wichita, KS</td>
<td>15</td>
<td>78</td>
<td>86</td>
<td>137</td>
<td></td>
<td></td>
</tr>
<tr>
<td>184</td>
<td>Wilmington, NC</td>
<td>31</td>
<td>57</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 4-25. PEER MSAs (Continued)

<table>
<thead>
<tr>
<th>#</th>
<th>MSA</th>
<th>Peer 1</th>
<th>Peer 2</th>
<th>Peer 3</th>
<th>Peer 4</th>
<th>Peer 5</th>
<th>Peer 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>185</td>
<td>Winston-Salem, NC</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>186</td>
<td>Worcester, MA</td>
<td>31</td>
<td>57</td>
<td>78</td>
<td>95</td>
<td>137</td>
<td></td>
</tr>
<tr>
<td>187</td>
<td>York-Hanover, PA</td>
<td>22</td>
<td>30</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>188</td>
<td>Youngstown-Warren-Boardman, OH-PA</td>
<td>15</td>
<td>31</td>
<td>78</td>
<td>137</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.4.5 Peer Weights (λ)

Table 4.26 offers the relative importance of peers represented by their lambda values (λ).

Note that L5 (=λ⁵) denotes Amarillo, TX (5), L14 (=λ¹⁴) denotes Barnstable Town, MA (14), and so forth through L152 (=λ¹²⁵) denoting San Diego-Carlsbad-San Marcos, CA.

Continuing from the previous example, Akron, OH (1) is compared to a weighted average of Baton, Rouge, LA (L15), Charleston, WV (L31), Huntsville, AL (L78), and Provo-Orem, UT (L137), with each accounting for approximately 5 percent, 44 percent, 19 percent, and 32 percent, respectively.

Similarly, the weighted average for Honolulu, HI (76) is derived from Boulder, CO (L22) at 24 percent, Lincoln, NE (L95) at 70 percent, and Provo-Orem, UT (L137) with 6 percent. Again, Barnstable Town, MA (L14) is being compared to itself with 100 percent.
| #   | Location                        | L5   | L14  | L15  | L22  | L30  | L31  | L34  | L39  | L52  | L57  | L61  | L77  | L78  | L86  | L87  | L95  | L102 | L132 | L137 | L152 |
|-----|---------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1   | Akron, OH                       | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.44 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.32 | 0.00 |
| 2   | Albany-Schenectady-Troy, NY     | 0.00 | 0.00 | 0.00 | 0.29 | 0.00 | 0.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 |
| 3   | Albuquerque, NM                 | 0.00 | 0.00 | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.34 | 0.29 | 0.00 | 0.07 | 0.00 | 0.16 |
| 4   | Allentown-Bethlehem-Easton, PA-NJ| 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 |
| 5   | Anchorage, AK                   | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 6   | Austin-Round Rock-San Marcos, TX| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.39 | 0.00 |
| 7   | Bakersfield-Delano, CA          | 0.00 | 0.00 | 0.56 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 8   | Baltimore-Towson, MD            | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 9   | Barnstable Town, MA             | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10  | Baton Rouge, LA                 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11  | Beaumont-Port Arthur, TX        | 0.00 | 0.00 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 12  | Bellingham, WA                  | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 |
| 13  | Birmingham-Hoover, AL           | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 14  | Boise City-Nampa, ID            | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 15  | Charleston, SC                  | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 16  | Chicago, IL                     | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 17  | Cleveland, OH                   | 0.00 | 0.00 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 18  | Cincinnati, OH                  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 19  | Columbus, OH                    | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 20  | Dallas-Ft. Worth, TX            | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| #       | L5 | L14 | L15 | L22 | L27 | L30 | L31 | L34 | L39 | L52 | L57 | L61 | L77 | L78 | L86 | L87 | L95 | L102 | L132 | L137 | L152 |
|---------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 21      |    | 0.00| 0.00| 0.00| 0.17| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.27| 0.00| 0.00| 0.32| 0.00| 0.00| 0.24| 0.00 |
| Boston-Cambridge-Quincy, MA-NH | 22 | 0.00| 0.00| 0.00| 1.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00 |
| Boulder, CO                              | 23 | 0.00| 0.22| 0.00| 0.64| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.13| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00 |
| North Port-Bradenton-Sarasota, FL        | 24 | 0.00| 0.00| 0.05| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.15| 0.00| 0.00| 0.00| 0.00| 0.25| 0.00| 0.00| 0.24| 0.00| 0.00| 0.31| 0.00 |
| Bremerton-Silverdale, WA                 | 25 | 0.00| 0.00| 0.00| 0.61| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.13| 0.00| 0.00| 0.00| 0.00| 0.18| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.21| 0.00 |
| Bridgeport-Stamford-Norwalk, CT          | 26 | 0.00| 0.00| 0.23| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.38| 0.00| 0.00| 0.00| 0.00| 0.27| 0.00| 0.00| 0.00| 0.00| 0.00| 0.11| 0.00 |
| Buffalo-Niagara Falls, NY                | 27 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 1.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00 |
| Burlington-South VT                     | 28 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.54| 0.25| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.10| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.10| 0.00 |
| Canton-Massillon, OH                    | 29 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.78| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.14| 0.00 |
| Cape Coral-Fort Myers, FL                | 30 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 1.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00 |
| Cedar Rapids, IA                        | 31 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00 |
| Charleston, WV                          | 32 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.46| 0.00 |
| Charleston-North Charleston-Sumerville, SC | 33 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.54| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| Charlotte-Gastonia-Rock Hill, NC-SC      | 34 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| Charlottesville, VA                     | 35 | 0.00| 0.00| 0.16| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.38| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.22| 0.00|
| Chattanooga, TN-GA                      | 36 | 0.00| 0.00| 0.04| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.13| 0.00| 0.00| 0.00| 0.00| 0.00| 0.27| 0.00|
| Chicago-Joliet-Naperville, IL-IN-WI      | 37 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.04| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.50| 0.00|

TABLE 4-26. PEER WEIGHTS (Continued)
|   | L5  | L14 | L15 | L22 | L27 | L30 | L31 | L34 | L39 | L52 | L57 | L61 | L77 | L78 | L86 | L87 | L95 | L102 | L132 | L137 | L152 |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 38 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.21| 0.00| 0.00| 0.00| 0.18| 0.00| 0.00| 0.31| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.31| 0.00|
| 39 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 1.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 40 | 0.00| 0.00| 0.26| 0.00| 0.00| 0.00| 0.19| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 41 | 0.00| 0.00| 0.25| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 42 | 0.68| 0.00| 0.16| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 43 | 0.00| 0.00| 0.36| 0.00| 0.00| 0.00| 0.10| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 44 | 0.00| 0.00| 0.73| 0.00| 0.00| 0.00| 0.02| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 45 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 46 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 47 | 0.00| 0.00| 0.36| 0.00| 0.00| 0.00| 0.10| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 48 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 49 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 50 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 51 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 52 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 53 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 54 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 55 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 56 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|
| 57 | 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00| 0.00|

**TABLE 4-26. PEER WEIGHTS (Continued)**
### TABLE 4-26. PEER WEIGHTS (Continued)

<p>| #  | L5  | L14 | L15 | L22 | L30 | L31 | L34 | L39 | L52 | L57 | L61 | L77 | L78 | L86 | L87 | L95 | L102 | L132 | L137 | L152 |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 58 | Fayetteville, NC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 |
| 59 | Fayetteville-Springdale-Rogers, AR-MO | 0.21 | 0.00 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | 0.21 |
| 60 | Flint, MI | 0.00 | 0.00 | 0.49 | 0.00 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.29 | 0.00 |
| 61 | Fort Collins-Loveland, CO | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 62 | Fort Collins, AR-KO | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 63 | Fort Wayne, IN | 0.00 | 0.00 | 0.19 | 0.00 | 0.00 | 0.00 | 0.21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 |
| 64 | Fresno, CA | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 65 | Gainesville, FL | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 66 | Grand Rapids-Wyoming, MI | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.00 | 0.18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.38 |
| 67 | Green Bay, WI | 0.00 | 0.00 | 0.00 | 0.31 | 0.00 | 0.52 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 68 | Greeley, CO | 0.00 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 |
| 69 | Greensboro-High Point, NC | 0.00 | 0.00 | 0.37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.40 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 |
| 70 | Greenville-Mauldin-Easley, SC | 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.00 | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 |
| 71 | Hagerstown-Martinsburg, MD-WV | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 72 | Harrisburg-Carlisle, PA | 0.00 | 0.00 | 0.00 | 0.37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 73 | Hartford-West Hartford-East | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 74 | Hickory-Lenoir-Morganton, NC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 75 | Holland-Holland, MI | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.29 |
| 76 | Honolulu, HI | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.27 |</p>
<table>
<thead>
<tr>
<th>#</th>
<th>L5</th>
<th>L14</th>
<th>L15</th>
<th>L22</th>
<th>L27</th>
<th>L30</th>
<th>L31</th>
<th>L34</th>
<th>L39</th>
<th>L52</th>
<th>L57</th>
<th>L61</th>
<th>L77</th>
<th>L78</th>
<th>L86</th>
<th>L87</th>
<th>L95</th>
<th>L102</th>
<th>L132</th>
<th>L137</th>
<th>L152</th>
</tr>
</thead>
<tbody>
<tr>
<td>77</td>
<td>Huntington-Ashland, WV-KY-OH</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>78</td>
<td>Huntsville, AL</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>79</td>
<td>Houston-Sugar Land-Baytown, TX</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
<td>0.64</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.11</td>
<td>0.00</td>
</tr>
<tr>
<td>80</td>
<td>Indianapolis-Carmel, IN</td>
<td>0.00</td>
<td>0.00</td>
<td>0.15</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.06</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.55</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
</tr>
<tr>
<td>81</td>
<td>Jackson, MS</td>
<td>0.00</td>
<td>0.00</td>
<td>0.66</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.04</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.13</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.17</td>
</tr>
<tr>
<td>82</td>
<td>Jacksonville, FL</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.52</td>
<td>0.04</td>
<td>0.00</td>
<td>0.08</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.36</td>
</tr>
<tr>
<td>83</td>
<td>Kalamazoo-Portage, MI</td>
<td>0.00</td>
<td>0.00</td>
<td>0.44</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.63</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.31</td>
</tr>
<tr>
<td>84</td>
<td>Kansas City, MO-KS</td>
<td>0.00</td>
<td>0.00</td>
<td>0.08</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.04</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.63</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
</tr>
<tr>
<td>85</td>
<td>Kennewick-Pasco-Richland, WA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.60</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.19</td>
<td>0.05</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.16</td>
</tr>
<tr>
<td>86</td>
<td>Killeen-Temple-Fort Hood, TX</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>87</td>
<td>Kingsport-Bristol-Bristol, TN-VA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>88</td>
<td>Knoxville, TN</td>
<td>0.00</td>
<td>0.00</td>
<td>0.03</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.55</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.10</td>
<td>0.00</td>
<td>0.00</td>
<td>0.09</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.23</td>
</tr>
<tr>
<td>89</td>
<td>Lake Havasu City-Kingman, AZ</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.19</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.47</td>
<td>0.00</td>
<td>0.00</td>
<td>0.08</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.26</td>
</tr>
<tr>
<td>90</td>
<td>Lakeland-Winter Haven, FL</td>
<td>0.00</td>
<td>0.00</td>
<td>0.12</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.48</td>
<td>0.06</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.34</td>
</tr>
<tr>
<td>91</td>
<td>Lancaster, PA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.48</td>
<td>0.00</td>
<td>0.42</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.06</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>92</td>
<td>Lansing-East Lansing, MI</td>
<td>0.00</td>
<td>0.00</td>
<td>0.42</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.09</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.13</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.36</td>
</tr>
<tr>
<td>93</td>
<td>Las Vegas-Paradise, NV</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.33</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.11</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.56</td>
</tr>
<tr>
<td>94</td>
<td>Lexington-Fayette, KY</td>
<td>0.00</td>
<td>0.00</td>
<td>0.32</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.19</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.29</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.21</td>
</tr>
<tr>
<td>95</td>
<td>Lincoln, NE</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>#</td>
<td>L5</td>
<td>L14</td>
<td>L15</td>
<td>L22</td>
<td>L27</td>
<td>L30</td>
<td>L31</td>
<td>L34</td>
<td>L39</td>
<td>L52</td>
<td>L57</td>
<td>L61</td>
<td>L77</td>
<td>L78</td>
<td>L86</td>
<td>L87</td>
<td>L95</td>
<td>L102</td>
<td>L132</td>
<td>L137</td>
<td>L152</td>
</tr>
<tr>
<td>----</td>
<td>----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>96</td>
<td>0.00</td>
<td>0.00</td>
<td>0.33</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.51</td>
<td>0.00</td>
<td>0.00</td>
<td>0.16</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>97</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.18</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.50</td>
<td>0.32</td>
</tr>
<tr>
<td>98</td>
<td>0.00</td>
<td>0.00</td>
<td>0.21</td>
<td>0.00</td>
<td>0.00</td>
<td>0.31</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.27</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.21</td>
</tr>
<tr>
<td>99</td>
<td>0.00</td>
<td>0.00</td>
<td>0.10</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.33</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.32</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.11</td>
<td>0.00</td>
<td>0.00</td>
<td>0.14</td>
</tr>
<tr>
<td>100</td>
<td>0.00</td>
<td>0.00</td>
<td>0.28</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.23</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.47</td>
<td>0.00</td>
<td>0.00</td>
<td>0.02</td>
</tr>
<tr>
<td>101</td>
<td>0.00</td>
<td>0.18</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>102</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>103</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.52</td>
</tr>
<tr>
<td>104</td>
<td>0.00</td>
<td>0.00</td>
<td>0.29</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.09</td>
</tr>
<tr>
<td>105</td>
<td>0.00</td>
<td>0.00</td>
<td>0.10</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.05</td>
<td>0.36</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.49</td>
<td>0.00</td>
</tr>
<tr>
<td>106</td>
<td>0.00</td>
<td>0.00</td>
<td>0.17</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.45</td>
<td>0.09</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.29</td>
</tr>
<tr>
<td>107</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.35</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.26</td>
<td>0.00</td>
<td>0.00</td>
<td>0.18</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.20</td>
</tr>
<tr>
<td>108</td>
<td>0.00</td>
<td>0.00</td>
<td>0.82</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.11</td>
</tr>
<tr>
<td>109</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.28</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.72</td>
</tr>
<tr>
<td>110</td>
<td>0.00</td>
<td>0.00</td>
<td>0.18</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.54</td>
<td>0.11</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.17</td>
</tr>
<tr>
<td>111</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.07</td>
<td>0.00</td>
<td>0.00</td>
<td>0.36</td>
<td>0.00</td>
<td>0.00</td>
<td>0.33</td>
</tr>
<tr>
<td>112</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>#</td>
<td>L5</td>
<td>L14</td>
<td>L15</td>
<td>L22</td>
<td>L27</td>
<td>L30</td>
<td>L31</td>
<td>L34</td>
<td>L39</td>
<td>L52</td>
<td>L57</td>
<td>L61</td>
<td>L77</td>
<td>L78</td>
<td>L86</td>
<td>L87</td>
<td>L95</td>
<td>L102</td>
<td>L132</td>
<td>L137</td>
<td>L152</td>
</tr>
<tr>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>113</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.35</td>
<td>0.00</td>
<td>0.00</td>
<td>0.07</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.28</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.30</td>
<td>0.00</td>
</tr>
<tr>
<td>114</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.10</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.45</td>
<td>0.08</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.37</td>
<td>0.00</td>
</tr>
<tr>
<td>115</td>
<td>0.57</td>
<td>0.00</td>
<td>0.27</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.08</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.07</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>116</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.62</td>
<td>0.00</td>
<td>0.20</td>
<td>0.00</td>
<td>0.00</td>
<td>0.18</td>
<td>0.00</td>
</tr>
<tr>
<td>117</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.46</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.05</td>
<td>0.00</td>
<td>0.00</td>
<td>0.21</td>
<td>0.00</td>
<td>0.00</td>
<td>0.27</td>
<td>0.00</td>
</tr>
<tr>
<td>118</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.29</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.37</td>
<td>0.00</td>
<td>0.00</td>
<td>0.26</td>
<td>0.00</td>
<td>0.00</td>
<td>0.08</td>
<td>0.00</td>
</tr>
<tr>
<td>119</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.14</td>
<td>0.00</td>
<td>0.00</td>
<td>0.15</td>
<td>0.00</td>
<td>0.00</td>
<td>0.13</td>
<td>0.00</td>
</tr>
<tr>
<td>120</td>
<td>0.62</td>
<td>0.00</td>
<td>0.31</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.14</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>121</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.03</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.15</td>
<td>0.00</td>
<td>0.00</td>
<td>0.34</td>
<td>0.00</td>
<td>0.00</td>
<td>0.17</td>
<td>0.00</td>
</tr>
<tr>
<td>122</td>
<td>0.24</td>
<td>0.00</td>
<td>0.04</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.12</td>
<td>0.00</td>
<td>0.00</td>
<td>0.61</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>123</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.17</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.26</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.57</td>
</tr>
<tr>
<td>124</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.36</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.16</td>
</tr>
<tr>
<td>125</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.70</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.21</td>
<td>0.00</td>
<td>0.00</td>
<td>0.10</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>126</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.20</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.08</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.35</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>127</td>
<td></td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.04</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.62</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>#</td>
<td>L5</td>
<td>L14</td>
<td>L15</td>
<td>L22</td>
<td>L27</td>
<td>L30</td>
<td>L31</td>
<td>L34</td>
<td>L39</td>
<td>L52</td>
<td>L57</td>
<td>L61</td>
<td>L77</td>
<td>L78</td>
<td>L86</td>
<td>L87</td>
<td>L95</td>
<td>L102</td>
<td>L132</td>
<td>L137</td>
<td>L152</td>
</tr>
<tr>
<td>---------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>128</td>
<td>0.00</td>
<td>0.00</td>
<td>0.07</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.49</td>
<td>0.18</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
<td>0.00</td>
</tr>
<tr>
<td>129</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.46</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.30</td>
<td>0.28</td>
</tr>
<tr>
<td>130</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.18</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>131</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.18</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>132</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>133</td>
<td>0.00</td>
<td>0.00</td>
<td>0.31</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.13</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.46</td>
</tr>
<tr>
<td>134</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.12</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.18</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.28</td>
</tr>
<tr>
<td>135</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.56</td>
<td>0.12</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>136</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.24</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.49</td>
</tr>
<tr>
<td>137</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>138</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.21</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.23</td>
</tr>
<tr>
<td>139</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.39</td>
</tr>
<tr>
<td>140</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.33</td>
</tr>
<tr>
<td>141</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.22</td>
</tr>
<tr>
<td>142</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.58</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.19</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>143</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.11</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.84</td>
<td>0.05</td>
</tr>
<tr>
<td>144</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>145</td>
<td>0.40</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.32</td>
<td>0.00</td>
</tr>
<tr>
<td>146</td>
<td>0.00</td>
<td>0.00</td>
<td>0.35</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
</tr>
<tr>
<td>#</td>
<td>L5</td>
<td>L14</td>
<td>L15</td>
<td>L22</td>
<td>L27</td>
<td>L30</td>
<td>L31</td>
<td>L34</td>
<td>L39</td>
<td>L52</td>
<td>L57</td>
<td>L61</td>
<td>L77</td>
<td>L78</td>
<td>L86</td>
<td>L87</td>
<td>L95</td>
<td>L102</td>
<td>L132</td>
<td>L137</td>
<td>L152</td>
</tr>
<tr>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>147</td>
<td>Sacramento--Arden-Arcade--Roseville, CA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.26</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.17</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>148</td>
<td>Salem, OR</td>
<td>0.00</td>
<td>0.00</td>
<td>0.42</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.10</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>149</td>
<td>Salinas, CA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>150</td>
<td>Salt Lake City, UT</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.14</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>151</td>
<td>San Antonio-New Braunfels, TX</td>
<td>0.00</td>
<td>0.00</td>
<td>0.44</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>152</td>
<td>San Antonio-New Braunfels, TX</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>153</td>
<td>San Diego-San Marcos, CA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>154</td>
<td>San Diego-San Marcos, CA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.80</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>155</td>
<td>San Jose-Sunnyvale-Santa Clara, CA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>156</td>
<td>Santa Barbara-Santa Maria-Goleta, CA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.26</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>157</td>
<td>Santa Cruz-Watsonville, CA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.45</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>158</td>
<td>Santa Rosa-Petaluma, CA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>159</td>
<td>Savannah, GA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.19</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>160</td>
<td>Scranton--Wilkes-Barre, PA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.81</td>
<td>0.16</td>
<td>0.00</td>
<td>0.00</td>
<td>0.03</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>161</td>
<td>Seattle-Tacoma-Bellevue, WA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>162</td>
<td>Shreveport-Bossier City, LA</td>
<td>0.23</td>
<td>0.00</td>
<td>0.49</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.18</td>
<td>0.00</td>
<td>0.00</td>
<td>0.10</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>163</td>
<td>South Bend-Mishawaka, IN-MI</td>
<td>0.00</td>
<td>0.00</td>
<td>0.31</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.20</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.30</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
202

TABLE 4-26. PEER WEIGHTS (Continued)
#

L5

L14

L15

L22

L27

L30

L31

L34

L39

L52

L57

L61

L77

L78

L86

L87

L95

L102

L132

L137

L152

164

Spartanburg, SC

0.00

0.00

0.14

0.00

0.00

0.00

0.07

0.00

0.00

0.00

0.00

0.00

0.00

0.61

0.00

0.00

0.00

0.00

0.00

0.18

0.00

165

Spokane, WA

0.00

0.00

0.06

0.00

0.00

0.00

0.46

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.48

0.00

166

Springfield, MA

0.00

0.00

0.51

0.00

0.00

0.00

0.18

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.09

0.00

0.00

0.22

0.00

167

Springfield, MO

0.00

0.00

0.00

0.00

0.00

0.37

0.00

0.00

0.00

0.00

0.00

0.00

0.33

0.00

0.00

0.09

0.00

0.01

0.00

0.21

0.00

168

St. Louis, MO-IL

0.00

0.00

0.18

0.00

0.00

0.00

0.23

0.00

0.00

0.00

0.00

0.00

0.00

0.37

0.00

0.00

0.00

0.00

0.00

0.22

0.00

169

Stockton, CA

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.21

0.00

0.00

0.00

0.00

0.79

0.00

170

Syracuse, NY

0.00

0.00

0.05

0.00

0.00

0.00

0.42

0.00

0.00

0.00

0.00

0.00

0.00

0.29

0.00

0.00

0.00

0.00

0.00

0.24

0.00

171

Tallahassee, FL

0.00

0.00

0.25

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.07

0.36

0.00

0.00

0.00

0.00

0.32

0.00

172

Tampa-St.
PetersburgClearwater, FL

0.00

0.00

0.00

0.15

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.50

0.00

0.00

0.00

0.00

0.00

0.35

0.00

173

Toledo, OH

0.00

0.00

0.48

0.00

0.00

0.00

0.25

0.00

0.00

0.00

0.00

0.00

0.00

0.04

0.00

0.00

0.00

0.00

0.00

0.23

0.00

174

Topeka, KS

0.00

0.00

0.00

0.00

0.00

0.00

0.22

0.00

0.00

0.00

0.00

0.00

0.00

0.46

0.00

0.00

0.31

0.00

0.00

0.01

0.00

175

Trenton-Ewing, NJ

0.00

0.00

0.00

0.68

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.19

0.00

0.00

0.00

0.00

0.00

0.13

0.00

176

Tucson, AZ

0.00

0.00

0.29

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.31

0.17

0.00

0.00

0.00

0.00

0.23

0.00

177

Tulsa, OK

0.08

0.00

0.43

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.38

0.11

0.00

0.00

0.00

0.00

0.00

0.00

178

Utica-Rome, NY

0.00

0.00

0.18

0.00

0.00

0.00

0.66

0.00

0.00

0.00

0.00

0.00

0.00

0.03

0.00

0.00

0.03

0.00

0.00

0.10

0.00

179

Vallejo-Fairfield,
CA

0.00

0.00

0.00

0.44

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.42

0.14

180

Virginia BeachNorfolk-Newport
News, VA-NC

0.00

0.00

0.00

0.16

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.18

0.00

0.00

0.33

0.00

0.00

0.33

0.00

181

Visalia-Porterville,
CA

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.27

0.00

0.00

0.00

0.00

0.73

0.00

182

WashingtonArlingtonAlexandria, DCVA-MD-WV

0.00

0.00

0.00

0.75

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.25

0.00

0.00

0.00

0.00

183

Wichita, KS

0.00

0.00

0.14

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.66

0.07

0.00

0.00

0.00

0.00

0.14

0.00

184

Wilmington, NC

0.00

0.00

0.00

0.00

0.00

0.00

0.07

0.00

0.00

0.00

0.32

0.00

0.00

0.32

0.00

0.00

0.00

0.00

0.00

0.29

0.00

185

Winston-Salem,
NC

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.81

0.00

0.00

0.05

0.00

0.00

0.14

0.00

186

Worcester, MA

0.00

0.00

0.00

0.00

0.00

0.00

0.08

0.00

0.00

0.00

0.25

0.00

0.00

0.28

0.00

0.00

0.06

0.00

0.00

0.33

0.00


<table>
<thead>
<tr>
<th>#</th>
<th>Location</th>
<th>L5</th>
<th>L14</th>
<th>L15</th>
<th>L22</th>
<th>L27</th>
<th>L30</th>
<th>L31</th>
<th>L34</th>
<th>L39</th>
<th>L52</th>
<th>L57</th>
<th>L61</th>
<th>L77</th>
<th>L78</th>
<th>L86</th>
<th>L87</th>
<th>L95</th>
<th>L102</th>
<th>L132</th>
<th>L137</th>
<th>L152</th>
</tr>
</thead>
<tbody>
<tr>
<td>187</td>
<td>York-Hanover, PA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.48</td>
<td>0.00</td>
<td>0.23</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.29</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>188</td>
<td>Youngstown-Warren-Boardman, OH-PA</td>
<td>0.00</td>
<td>0.00</td>
<td>0.08</td>
<td>0.00</td>
<td>0.00</td>
<td>0.62</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.10</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.19</td>
<td>0.00</td>
</tr>
</tbody>
</table>
CHAPTER 5
DISCUSSION AND CONCLUSION

5.1. THE STUDY

Currently, there is no single agreed upon list of indicators with which to measure urban health quantifiably. This study examined the extent to which a generic set of indicators would permit intercity health comparisons. Central to this objective was the identification of consistent readily available indicators that would aid in the measurement of urban health. Specifically, this study sought to identify and classify health indicators related to the determinants of human health, to compare the influence of each indicator on and among urban areas, to determine the relationship between urban health and income inequality, and likewise, with urban health and racial and ethnic diversity. Moreover, this study sought to apply Data Envelopment Analysis (DEA) as a method to measure the technical efficiency of each Metropolitan Statistical Area (MSA) along with peer groups and peer weights relative to a given MSA.

5.1.1. DEA model of health indicators as a means of intercity and intracity comparison.

Trevor Hancock reasoned that indicators are context-bound and, for this reason, each city would need to develop its own set of indicators to meet its own requirements. Accordingly, he opined that the development of a generic set of indicators to allow intercity comparison would not be feasible (Hancock 1993). Hancock’s supposition was contrary to that of John Ashton and others who previously theorized that cities would collaborate in data collection and imagined a common database consisting of three categories — “mandatory, recommended, and optional” (Ashton et al. 1986:321).

This study supports John Ashton. With the exception of the Gallup-Healthways Well-Being Index®, the DEA model employs readily available data from government sources
— primarily from the U.S. Census Bureau. In this regard, the data employed was “mandatory” and available within a common database.

The fundamental implication is that consistency be maintained in data collection and indicator use. This still allows improvements and amendments to any subsequent data set with the collection of “recommended” and “optional” variables. Thus, while ensuring the retention of a small number of semi-permanent key indicators (i.e., “mandatory”) to permit comparisons between various geographic areas (Crown 2003:69), there is room for more “context-bound” indicators as envisioned by Hancock.

Consequently, while this study was centered upon the use of common indicators so as to provide intercity comparisons, it is acknowledged that "one size fits all" will not fit all perfectly. And to improve “fit” for any one city, “recommended” and “optional” data may be collected at each city’s own volition and would presumably have its greatest value when then used in intracity analysis. Although, the same “context bound” argument could be made with each successive subdivision.

Nevertheless, this study has demonstrated that intercity comparisons are achievable using readily available indicators. Intercity comparisons allow for benchmarking and identification of relevant peers and their respective peer weights. And, when used collectively, they provide the means to improve performance (i.e., effectiveness) through policy.

While this study made use of the proprietary data offered by Gallup-Healthways, should this data become unavailable or avoided, the Centers for Disease Control and Prevention (CDC) offer a number of alternatives worthy of consideration, including the Behavioral Risk Factor Surveillance System (BRFSS), Pregnancy Risk Assessment Monitoring System (PRAMS), National Nursing Home Survey (NNHS), National Health Interview Survey (NHIS), National Hospital Discharge Survey (NHDS), National Health
and Nutrition Examination Survey (NHANES), National Ambulatory Medical Care Survey (NAMCS), and National Hospital Ambulatory Medical Care Survey (NHAMCS).

5.1.2. Income inequality and non-cash income sources

The theoretical framework posits the negative effects of income inequality on population health. For decades, researchers assumed that health differences were the result of different living standards that could be directly attributed to economic inequality or the gap between the rich and the poor (Wilkinson 2005:60, 67-68). While the disparity in living standards may, indeed, affect health, this study found no evidence to support this conclusion as no correlation was realized between urban health and income inequality as measured by the Gallup-Healthways Well-Being Index® and the ACS Gini Index, respectively. At first, this may seem counterintuitive unless the distinction between poor — lacking sufficient money to live comfortably in a society — and, for example, destitute — without the basic necessities of life — is fully recognized.

According to the 2011 ACS, poverty rates for large metropolitan areas range from 8.3 percent in Washington-Arlington-Alexandria, DC-VA-MD-WV to 37.7 percent in McAllen-Edinburg-Mission, TX (Bishaw 2012:4).

Unfortunately, with the number of people in poverty established, what it actually means to be in poverty in the United States enters the political arena and becomes much obfuscated. For example, in conjunction with Figure 5.1, Senate Budget Committee Ranking Member Jeff Sessions (R-AL) claimed “…cumulative spending on means-tested federal welfare programs, if converted to cash, would equal $167.65 per day per household living below the poverty level. By comparison, the median household income in 2011 of $50,054 equaled $137.13 per day” (U.S. Senate Budget Committee 2012).
Moreover, Senator Sessions maintained that the federal welfare program’s $167.65 per day per household equaled $60,000 each year (U.S. Senate Budget Committee 2013).

Subsequently, Glenn Kessler of The Washington Post’s The Fact Checker awarded Sen. Sessions’ statement “Three Pinocchios” indicating “[s]ignificant factual error and/or obvious contradictions” which was then vehemently disputed in writing to the Post by Stephen Miller, a spokesperson for Sen. Sessions (Kessler 2013). While this may be the latest skirmish of what is often referred to as the work versus welfare trade-off (Tanner et al. 1995, Durden 2010), the larger confrontation is over welfare reform and the contemporary needs of those in poverty.
In 1957 and 1958, per capita caloric consumption was at its lowest level in the last 100 years (USDA 2003:14) and while undernourishment does exist, it is rare in the United States today. Consequently, much of the nature of the overall discussion involves how poverty is defined contemporarily in terms of amenities (e.g., FCC’s Lifeline telephone service) and in noncash income sources including Medicaid or Medicare, tax credits, Supplemental Security Income (SSI), Supplemental Nutrition Assistance Program (food stamps or SNAP), Federal Public Housing Assistance (Section 8), Head Start, National School Lunch Program’s Free Lunch Program, Low-Income Home Energy Assistance Program (LIHEAP), and if applicable, various state assistance programs.

Putting political contention aside, and providing context to any amenities and noncash income sources, the lack of correlation between urban health and income inequality becomes an increasingly reasonable and valid outcome as “what is unequal is not necessarily inequitable” (Carter-Pokras and Baquet 2002:427).

5.1.3. Racial and ethnic heterogeneity

Since the 1980s, almost all communities in the United States — whether traditional big city immigration gateways or small towns in middle America — have become progressively more racially and ethnically diverse. As Hispanic, Asian, and multi-racial populations surge, Americans are increasingly subject to living in diverse communities. Consequently, the number of predominantly white communities is yielding to the growth of both minority-majority and no-majority communities (US2010 Project 2012:8).

While racially and ethnically diverse populations follow government and military employment, affordable housing, and locationality — specifically to the coastal and southwestern regions — the overall social geography continues to change.
As the Entropy Index is a measure of the magnitude by which racial-ethnic groups are evenly distributed across a MSA, a statistically significant positive correlation follows the theoretical framework with specific implications regarding the relationship between land use and public health (Maantay 2001:1033, 1038).

Furthermore, this finding provides evidence to support a new emerging migration pattern that sees minorities leaving inner city areas for the opportunity to pursue the American Dream in the depressed suburban housing market. For example, over the past decade, Cleveland, OH has experienced an exodus of 33,000 black residents according to the 2010 census. The reason behind the “black flight” is due to a confluence of issues, including the foreclosure crisis that forced families from their homes in conjunction with depressed housing markets in the suburbs, and neighborhoods that offer better schools with prospects of increased safety and security (Smith 2011).

Ellen, Horn and O'Regan observed in their journal article, Pathways to Racial Integration: Examining Changes in the Prevalence of Racially Integrated Neighborhoods, that:

Despite this shift, predominantly White neighborhoods remained far more likely to become integrated than did largely minority neighborhoods. Between 2000 and 2010, 15.0 percent of predominantly White neighborhoods became integrated compared with only 5.5 percent of Black neighborhoods, 3.4 percent of Hispanic neighborhoods, 6.4 percent of Asian/other neighborhoods, and 4.9 percent of mixed-minority neighborhoods. Thus, contrary to media attention on the entry of young White residents into a few urban, minority neighborhoods, integration still results overwhelmingly from the in-movement of minority households to largely White neighborhoods. Indeed, of all newly racially integrated neighborhoods in 2010, 93 percent were White neighborhoods in 2000 (2012:41).
5.1.4. Benchmarking Metropolitan Statistical Areas (MSAs)

This study looked at the relative performance of well-being in 188 United States MSAs. The specification of inputs was a challenging task. In the development of the DEA model, a number of measures were examined including rental and homeowner housing expenditures, geographic constancy of residence, median age and median age by gender, public assistance, median income disparities associated with gender and with educational attainment, transportation to work by means and by commute time, native and foreign-born populations, native and U.S. naturalized citizens, owner- and renter-occupied housing, racial and ethnic diversity, per capita violent and property crimes, income inequality, and unemployment (U3).

Due to the limited number of observations available, a parsimonious model was sought to ensure some degree of statistical power. Hence, the model comprised five inputs and one output. The inputs were Entropy Index, median housing costs of owner-occupied households with a mortgage, median age, percentage of the total population receiving public assistance, and the unemployment rate. The output was a well-being score derived from six indices.

The efficiency scores based on the DEA model are listed in Table 4.24. Honolulu, HI (76) achieves a VRS technical efficiency (or following Pareto-Koopmans’ definition of efficiency discussed in Chapter 3, “effectiveness”) score of 0.8750 which ranks it 136th among 188 MSAs and below the average “effectiveness” score of 0.9134 (Table 4.23).

5.1.5. Peer groups and peer weights

The previously mentioned results indicate that Honolulu is not operating at optimal scale. From Table 4.25, Honolulu’s effective peer group was Lincoln, NE (95), Boulder, CO (22), and Provo-Orem, UT (137), in order of importance. As provided in Table 4.26, the
relative weights of these peers were 0.70, 0.24, and 0.06, respectively. With Lincoln, NE (95) and Boulder, CO (22) providing 94 percent of the peer weighting, both would be expected to have a mix of input-output levels similar to that of the corresponding inefficient or “ineffective” MSA, Honolulu, HI (76).

With the peer group identified, especially Lincoln, NE (95) with a weight of 70%, its operating practices can serve as a benchmark to improve the performance of Honolulu, HI (76). Given Honolulu’s peer group has higher output levels, it becomes a very useful model to emulate to improve performance (i.e., effectiveness).

5.2. LIMITATIONS OF THE RESEARCH

The main limitations of the research are threefold: (1) the DEA model of overall health and wellness is an obvious simplification of reality, (2) the variable specification may be criticized from a number of approaches, and (3) the size of the geographic area of analysis is large.

However, in an attempt to avert some of the potential criticisms, it is important to restate the objective of the study which was to establish benchmarks from readily available data that would provide a base for measuring the health of an urban area. While time and financial constraints necessitated the use of MSAs as the geographic area in this study, the MSA data is derived from much smaller geographic areas where a similar analysis can be applied.

Furthermore, an input-oriented VRS DEA model was used in the analysis based on the premise that governmental policies and programs exert greater influence over input quantities relative to output quantities.
Lastly, as discussed at the beginning of this chapter, some indicators may be reasoned to be uniquely context-bound and, accordingly, a city could find itself in the inevitable position of having to develop its own set of indicators to meet its own requirements.

5.3. DIRECTION FOR FUTURE RESEARCH

Future researchers are encouraged to take the U.S. Census data from the MSA level and “drill down” to the smallest geographic unit used by the United States Census Bureau for tabulation of 100-percent data (data collected from all houses, rather than a sample of houses) — the census block (block).

Census blocks nest within all other tabulated census geographic entities and are the basis for all tabulated data (see Figure 3.1). Introduced in the 1990 census, blocks are statistical areas often bounded by visible features, such as streets, roads, streams, and railroad tracks. In urban areas, it is not uncommon for blocks to correspond with city blocks. In densely populated areas, a census block may be occupied in its entirety by an apartment complex with several hundred inhabitants.

For example, Figure 5.2 provides a graphical representation of demographic data from an area in Honolulu, HI. On the left side is a map of the various blocks with the number of inhabitants within the center of each block. In turn, a block group (BG) consists of clusters of blocks within the same census tract. On the right side, numerical demographic information is tabulated into total population (P001001), total population of one race (P001002), white alone (P001003), Black or African American alone (P001004), American Indian and Alaska Native alone (P001005), Asian alone (P001006), Native Hawaiian and Other Pacific Islander alone (P001007), some other race alone (P001008), and population of two or more races (P001009).
It is believed that such detailed information would permit robust intracity block comparisons and, carefully targeted intercity comparisons between similar blocks.

Lastly, DEA affords the opportunity for a two-stage method. The first stage retains the use of traditional inputs and outputs. In the second stage, the efficiency scores from the first stage are regressed upon environmental variables such as political leadership and specific public policy. Interpretation of the influences of the variables is straightforward following the signs of the coefficients, and standard hypothesis tests may be used to assess the strength of the relationships.
APPENDIX A

NIGHTINGALE’S GRAPHS,
THE CONNECTION BETWEEN HEALTH AND HOUSING.

To convey the quantitative data she had collected, Florence Nightingale created polar area diagrams with which to present her findings. Prior to Nightingale’s graphs, military leaders supposed that the soldiers’ high mortality rate was due to battle-related medical problems, but the visual form in which Nightingale presented her findings led to a shift in their perception and brought about significant changes in patient health care (Berns 2010:43-44). Accordingly, the Royal Commission’s report resulted in the formation of four sub-commissions to carry out the recommended reforms:

The first presided over physical alterations to military barracks and hospitals: improvements in ventilation, heating, sewage disposal, water supply and kitchens. Other sub-commissions drafted a sanitary code for the army, established a military medical school and reorganized the army’s procedures gathering medical statistics (Cohen 1984:133).

As illustrated in Figure A.1, Nightingale’s graphs consist of circularly arranged wedges with all segments possessing the same angle (Aigner et al. 2011:22) and the statistic being represented is proportional to the area of a wedge in the circular diagram (Cohen 1984:133).

In addition to the chart on the right that indicates the extent to which British soldiers were dying of hospital-induced preventable diseases rather than their battle wounds, the chart on the left side ultimately conveys Nightingale’s views on how government reforms could improve nursing and healthcare in city and military hospitals throughout the world (Aigner et al. 2011 22).
Nightingale’s original diagram consisted of red, blue, and black wedges, each area measured from the circle center “as the common vertex.” The legend reads:

The Areas of the blue, red, & black wedges are each measured from the centre as the common vertex.

The blue wedges measured from the centre of the circle represent area for area the deaths from Preventable or Mitigable Zymotic diseases, the red wedges measured from the centre the deaths from wounds, & the black wedges measured from the centre the deaths from all other causes.

The black line across the red triangle in Nov. 1854 marks the boundary of the deaths from all other causes during the month.

In October 1854, & April 1855, the black area coincides with the red, in January & February 1856, the blue coincides with the black.

The entire areas may be compared by following the blue, the red, & the black lines enclosing them (Nightingale, 1858).
Nightingale then wrote and privately printed her 800-page book, *Notes on Matters Affecting the Health, Efficiency and Hospital Administration of the British Army* that included her vividly-colored statistical diagrams, and medical statistician William Farr extolled it as “the best [thing] that ever was written” on the subject (Cohen 1984:133). The same year, 1858, the Statistical Society of London recognized Nightingale as an accomplished statistician by making her the first female fellow of their organization (Economist 2007).

Because hospitals at that time did not keep uniform or consistently accurate data and statistics, Nightingale, aided by Farr, also developed a Model Hospital Statistics Form which was approved at the 1860 International Congress of Statistics in London (Cohen 1984:134). By structuring hospital record-keeping practices, she made certain that “hospital statistics were standardized across all hospitals in London and the rest of Britain” (Magnello 2011:278). After its adoption by many London hospitals, in 1862, the *Journal of the Statistical Society* printed the results. However, the form was lengthy and complex, asking for such information as the number of patients in each hospital at the open and close of the year, the numbers discharged and deceased, the mean duration of hospital stays, the causes of death along with categories for death by disease or following operations. Some years later, the hospitals in London and throughout Britain deemed the forms too costly to print and too time-consuming to administer and they were eventually discarded (Cohen 2005:69; Magnello 2011:276).
APPENDIX B

POLAR AREA DIAGRAM READING AND CONSTRUCTION.

Polar area diagrams are graphic visual representations of data with the intent to present complex information quickly and clearly.

Distinct from pie charts, polar area diagram segments share equal angles and may differ in the length of the resulting line segment (radius) that extends outward from the center of the circle. Thus, it is the area of the segment that represents the value of the corresponding category. For example:

TABLE B.1. NATIONAL AVERAGE OF URBAN HEALTH (2010)

<table>
<thead>
<tr>
<th>PERCENTAGE</th>
<th>Non-diabetic</th>
<th>Non-obese</th>
<th>Exercise frequently</th>
<th>Eat produce frequently</th>
<th>City Optimism</th>
<th>Health Insured</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Average</td>
<td>88.7</td>
<td>73.4</td>
<td>51.4</td>
<td>57.8</td>
<td>54.9</td>
<td>83.6</td>
</tr>
</tbody>
</table>

Source: Gallup-Healthways Well-Being Index

Figure B.1 presents the information from Table A-1 in the form of the usual pie chart. Observe each segment angle is dissimilar and the lengths of all radii are equal. These characteristics can make comparisons between different segments of a given pie chart, or comparisons of data across multiple pie charts, arduous.
Figure B.2 represents the same information with a polar area diagram. As with the previous figure, a segment of a circle represents each category. In contrast, each segment shares the same angle and the radii tend to be of different lengths when representing different values.
The mathematics behind a polar area diagram is straightforward. Divide 360 degrees by the number of desired categories. The result (equation A-1) is the angle for each segment.

\[
\text{Segment angle} = \left( \frac{360}{\text{Total segments}} \right)
\]  
(B-1)

Subsequently, for each category, solve the following equation (A-2) to determine the length of the line segment or radius.

\[
\text{Radius} = \left( \frac{\text{Area} \times \text{Total segments}}{\pi} \right)
\]  
(B-2)

Armed with the segment angle and the length of the radius, use a compass to connect the associated radii with an arc.
Regression analysis answers questions concerning the reliance of a dependent variable on one or more independent variables. With the advent of high-speed computing, advanced techniques such as nonparametric regression are becoming increasingly popular.

Nevertheless, a straightforward linear regression by ordinary least squares (OLS), or linear least squares, remains useful. As a method, linear regression is intuitively simple to understand and, therefore, transparent. Without a strong understanding of linear regression, advanced methodologies can become difficult to comprehend for the user, something akin to a mysterious device void of any meaningful working knowledge.

Using Gallup-Healthways Well-Being Index as the dependent variable, Table C.1 offers estimates for the model’s coefficients, associated standard errors, t-values, and the probabilities that a coefficient has a value of zero (p-value). With this model, there is evidence that the entropy index is different from zero and strong evidence that each of the remaining explanatory variables has a slope significantly different from zero.

<table>
<thead>
<tr>
<th>TABLE C.1. SUMMARY OF LINEAR REGRESSION ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated coefficient</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>Intercept</td>
</tr>
<tr>
<td>Entropy index</td>
</tr>
<tr>
<td>Median housing cost (%)</td>
</tr>
<tr>
<td>Median Age</td>
</tr>
<tr>
<td>Public assistance (%)</td>
</tr>
<tr>
<td>US unemployment (%)</td>
</tr>
</tbody>
</table>

Significance codes: *** ≤ 0.001  ** ≤ 0.01  * ≤ 0.05
Table C.2 offers a summary of measures for the model’s goodness of fit. The degrees of freedom is calculated by subtracting the number of parameters estimated in the model from the number of observations (182 = 188 – 6). The residual standard error, also known as the root mean square error (RMSE) or the standard error of the regression, is calculated from the square root of the quotient of the residual sum of squares divided by the degrees of freedom:

$$\text{Residual standard error} = \sqrt{\frac{RSS}{df}}$$

The coefficient of determination, denoted as $R^2$, indicates that the fitted regression equation explains 45.9-percent of the variation in the dependent variable, urban well-being. Given the minor difference between $R^2$ and adjusted $R^2$, there is no indication of a spuriously high $R^2$ due to the accumulation of extra explanatory variables.

The F-statistic compares the model with the null model; the null model sets all coefficients to zero except the intercept. The test statistic of 30.80 rejects the null hypothesis of no dependence on the explanatory variables.

|                | 1.686 on 182 degree of freedom | 0.459 | 0.444 | Pr(>|t|) | 0.000 |
|----------------|-------------------------------|-------|-------|---------|-------|
| Residual Standard Error | $R^2$              | Adjusted $R^2$ | F-statistic | $\leq 0.001$ |       |
| 1.686         | 0.459                        | 0.444 | 30.89*** | 0.000   |       |
| 182 degrees of freedom |                    |       |       |         |       |

Results from the studentized Breusch-Pagan test confirm homoscedasticity, or homogeneity of variance, as the null hypothesis fails to be rejected (Table C.3).
TABLE C.3. RESULTS FROM THE STUDENTIZED BREUSCH-PAGAN TEST

<table>
<thead>
<tr>
<th></th>
<th>BP</th>
<th>p-value</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studentized Breusch-Pagan</td>
<td>8.2953</td>
<td>0.1407</td>
<td>5</td>
</tr>
</tbody>
</table>

Econometricians use the term *specification* to describe the process of converting a theory into a regression model. The process includes the selection of variables and the determination of a suitable functional form for the model. Should the estimated model be misspecified, it will be biased and inconsistent.

The Ramsey Regression Equation Specification Error Test (RESET) is a diagnostic for correctness of functional form. Specifically, RESET tests nonlinear combinations of the fitted values to determine if they aid in the explanation of the dependent variable. As a consequence, should any of the nonlinear combinations improve the model, the original linear model would be misspecified.

As indicated in Table C.4, given the nonlinear combinations are not significantly different from zero, the null hypothesis failed to be rejected and the linear regression model is correctly specified.

TABLE C.4. RESULTS FROM THE RAMSEY RESET TEST FOR GENERAL SPECIFICATION

<table>
<thead>
<tr>
<th></th>
<th>RESET</th>
<th>p-value</th>
<th>df&lt;sub&gt;1&lt;/sub&gt;</th>
<th>df&lt;sub&gt;2&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramsey RESET</td>
<td>0.1514</td>
<td>0.8596</td>
<td>2</td>
<td>180</td>
</tr>
</tbody>
</table>
REFERENCES:


http://circ.ahajournals.org/content/121/21/2331.full.pdf
doi:10.1161/CIR/0b013e3181dbece1


http://www.springerlink.com/content/uw11304jgx036253/fulltext.pdf

www.healthpolicy.ucla.edu/pubs/.../Designed_for_Disease_050108.pdf


Canadian Public Health Association (CPHA), and the World Health Organization (WHO). 1986. 
http://www.who.int/hpr/NPH/docs/ottawa_charter_hp.pdf


www.activelivingresearch.org/files/envpolicyinterventions.pdf


http://books.google.com/books?id=oFGttNkqBF4C&printsec=frontcover#v=onepage&q=partly%20dependent%20on%20the%20noise&f=false


http://books.google.com/books?id=oFGttNkqBF4C&printsec=frontcover#v=onepage&q=mental%20health&f=false


http://www.euro.who.int/__data/assets/pdf_file/0005/98438/e81384.pdf


http://jech.bmj.com/content/54/12/923.full


http://whqlibdoc.who.int/hist/official_records/constitution.pdf


