4-1-2010

Toward an Applied Anthropology of GIS: Spatial Analysis of Adolescent Childbearing in Hillsborough and Pinellas Counties, Florida

Kathleen I. Maes
University of South Florida

Follow this and additional works at: https://scholarcommons.usf.edu/etd

Part of the American Studies Commons

Scholar Commons Citation

This Dissertation is brought to you for free and open access by the Graduate School at Scholar Commons. It has been accepted for inclusion in Graduate Theses and Dissertations by an authorized administrator of Scholar Commons. For more information, please contact scholarcommons@usf.edu.
Toward an Applied Anthropology of GIS: Spatial Analysis of Adolescent Childbearing in Hillsborough and Pinellas Counties, Florida

by

Kathleen I. Maes

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy
Department of Anthropology College of Arts and Sciences
University of South Florida

Major Professor: Linda M. Whiteford, Ph.D.
Susan D. Greenbaum, Ph.D.
Cecilia M. Jevitt, Ph.D.
Steven Reader, Ph.D.
Nancy Romero-Daza, Ph.D.

Date of Approval:
April 1, 2010

Keywords: teen births, spatial analysis, hot spot analysis, mapping, socioeonomic index, small area analysis

© Copyright 2010, Kathleen I. Maes
ACKNOWLEDGEMENTS

I wish to express my most sincere gratitude to everyone who has supported me over the years in this endeavor. In particular, I would like to thank Dr. Linda Whiteford for her continued support and faith in me. I also want to thank Dr. Steven Reader for the endless hours of patient assistance and guidance with this research. A sincere thank you also goes to my committee members, Dr. Susan Greenbaum, Dr. Cecilia Jevitt and Dr. Nancy Romero-Daza, whose work has inspired me.

My sincerest gratitude goes to the Children’s Board of Hillsborough County, Florida, for supporting me in my educational aspirations. And to all of my colleagues at the Children’s Board, thank you for your support and encouragement.

Last, and most certainly not least, I want to thank my family and friends who never stopped believing in me and who still remain close to me in spite of my absence while writing this dissertation.
# TABLE OF CONTENTS

## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table of Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>iv</td>
<td></td>
</tr>
</tbody>
</table>

## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure of Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td></td>
</tr>
</tbody>
</table>

## ABSTRACT

<table>
<thead>
<tr>
<th>Abstract of Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>vi</td>
<td></td>
</tr>
</tbody>
</table>

## CHAPTER ONE: INTRODUCTION TO THE STUDY

<table>
<thead>
<tr>
<th>Section of Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Introduction to the Study</td>
<td>1</td>
</tr>
<tr>
<td>2 Background</td>
<td>3</td>
</tr>
<tr>
<td>3 Conceptual Framework</td>
<td>5</td>
</tr>
<tr>
<td>4 Purpose of the Study</td>
<td>7</td>
</tr>
</tbody>
</table>

## CHAPTER TWO: REVIEW OF RELATED LITERATURE

<table>
<thead>
<tr>
<th>Section of Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropology and Analysis of Space</td>
<td>9</td>
</tr>
<tr>
<td>Anthropology and Geographic Information Systems (GIS)</td>
<td>12</td>
</tr>
<tr>
<td>Hot Spot Analysis</td>
<td>15</td>
</tr>
<tr>
<td>Multilevel Modeling and Ecosocial Theory</td>
<td>19</td>
</tr>
<tr>
<td>Risks and Outcomes of Adolescent Pregnancy and Childbearing</td>
<td>25</td>
</tr>
<tr>
<td>Maternal Risks and Outcomes</td>
<td>26</td>
</tr>
<tr>
<td>Neonatal and Child Health Risks and Outcomes</td>
<td>30</td>
</tr>
<tr>
<td>Behavioral Risks and Outcomes</td>
<td>35</td>
</tr>
<tr>
<td>Social Risks and Outcomes</td>
<td>40</td>
</tr>
<tr>
<td>Factors Associated with Adolescent Childbearing</td>
<td>45</td>
</tr>
<tr>
<td>Summary of the Literature</td>
<td>55</td>
</tr>
</tbody>
</table>

## CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

<table>
<thead>
<tr>
<th>Section of Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Overview of the Research Problem</td>
<td>56</td>
</tr>
<tr>
<td>2 Research Objective</td>
<td>57</td>
</tr>
<tr>
<td>3 Research Design</td>
<td>58</td>
</tr>
<tr>
<td>4 Existing Data Sets Used</td>
<td>58</td>
</tr>
<tr>
<td>5 1990 and 2000 Decennial U.S. Census of Population and Housing</td>
<td>59</td>
</tr>
<tr>
<td>6 U.S. Census Bureau's Annual Population Estimates</td>
<td>61</td>
</tr>
<tr>
<td>7 Florida Community Health Assessment Resource Tool Set</td>
<td>61</td>
</tr>
<tr>
<td>8 Neighborhood Change Database (NCDB)</td>
<td>62</td>
</tr>
<tr>
<td>9 State of Florida Vital Statistics Birth Data Files</td>
<td>63</td>
</tr>
<tr>
<td>10 Determining Teen Birth Rates</td>
<td>64</td>
</tr>
<tr>
<td>11 Preliminary Decisions</td>
<td>65</td>
</tr>
<tr>
<td>12 Calculating Denominators</td>
<td>68</td>
</tr>
<tr>
<td>13 Calculating Age by Race and Ethnicity</td>
<td>69</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Bridging Race</td>
<td>71</td>
</tr>
<tr>
<td>Population Estimates</td>
<td>73</td>
</tr>
<tr>
<td>Reconciling 1990 and 2000 Geographic Boundaries</td>
<td>74</td>
</tr>
<tr>
<td>Calculating Teen Birth Rates</td>
<td>75</td>
</tr>
<tr>
<td>Hot Spot Analysis</td>
<td>75</td>
</tr>
<tr>
<td>Determining Contextual Level Variables</td>
<td>76</td>
</tr>
<tr>
<td>Exploratory Interviews</td>
<td>76</td>
</tr>
<tr>
<td>Review of the Literature</td>
<td>79</td>
</tr>
<tr>
<td>Composite Indices</td>
<td>79</td>
</tr>
<tr>
<td>Developing an Index of Socioeconomic Inequality</td>
<td>80</td>
</tr>
<tr>
<td>Interviews with Teen Pregnancy Prevention Agencies</td>
<td>82</td>
</tr>
<tr>
<td>Summary of Methods</td>
<td>83</td>
</tr>
<tr>
<td>CHAPTER FOUR: RESULTS</td>
<td>84</td>
</tr>
<tr>
<td>Findings</td>
<td>84</td>
</tr>
<tr>
<td>Descriptive Statistics</td>
<td>85</td>
</tr>
<tr>
<td>Births to Adolescents in Hillsborough and Pinellas Counties</td>
<td>87</td>
</tr>
<tr>
<td>Hot Spot and Cold Spot Analysis</td>
<td>92</td>
</tr>
<tr>
<td>Interview Results – Round 1</td>
<td>103</td>
</tr>
<tr>
<td>Index of Socioeconomic Inequality</td>
<td>110</td>
</tr>
<tr>
<td>Interview Results – Round 2</td>
<td>114</td>
</tr>
<tr>
<td>Provider Interview Results</td>
<td>116</td>
</tr>
<tr>
<td>Provider Interest</td>
<td>116</td>
</tr>
<tr>
<td>Relevance/Usefulness to Providers</td>
<td>116</td>
</tr>
<tr>
<td>Perception of Expected and Unexpected Results</td>
<td>117</td>
</tr>
<tr>
<td>Funding Agency Interview Results</td>
<td>118</td>
</tr>
<tr>
<td>Funder Interest</td>
<td>118</td>
</tr>
<tr>
<td>Relevance/Usefulness to Funding Agencies</td>
<td>119</td>
</tr>
<tr>
<td>Perception of Expected and Unexpected Results</td>
<td>119</td>
</tr>
<tr>
<td>Common Themes Among Providers and Funders</td>
<td>120</td>
</tr>
<tr>
<td>Summary of Results</td>
<td>121</td>
</tr>
<tr>
<td>CHAPTER FIVE: DISCUSSION</td>
<td>122</td>
</tr>
<tr>
<td>Discussion of the Study</td>
<td>122</td>
</tr>
<tr>
<td>Caveats and Limitations</td>
<td>132</td>
</tr>
<tr>
<td>Summary</td>
<td>134</td>
</tr>
<tr>
<td>CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS</td>
<td>136</td>
</tr>
<tr>
<td>Conclusions</td>
<td>137</td>
</tr>
<tr>
<td>Recommendations</td>
<td>140</td>
</tr>
<tr>
<td>REFERENCES CITED</td>
<td>143</td>
</tr>
<tr>
<td>APPENDICES</td>
<td>157</td>
</tr>
<tr>
<td>Appendix A: Maps</td>
<td>158</td>
</tr>
</tbody>
</table>
### LIST OF TABLES

| Table 2.1 | Birth Rates for 15-19 Year Olds in 2000 by Race/Ethnicity | 26 |
| Table 3.1 | 1990 and 2000 U.S. Census Summary File 1 Age by Race Tables | 69 |
| Table 3.2 | 1990 and 2000 U.S. Census Age Categories | 70 |
| Table 3.3 | Selected Indicators for Index of Socioeconomic Inequality | 81 |
| Table 4.1 | Births by Age-Group, Race/Ethnicity and by Year for the State of Florida | 86 |
| Table 4.2 | Datasets with Record Counts Used for Analyses | 89 |
| Table 4.3 | Average Annual Births 1992-1997 by Age Group and by Race and Ethnicity | 92 |
| Table 4.4 | Birth Rates (per 1,000 live births) 1992-1997 by Age Group and by Race and Ethnicity | 93 |
| Table 4.5 | Hot Spot Census Tracts in Hillsborough and Pinellas Counties | 95 |
| Table 4.6 | Cold Spot Census Tracts in Hillsborough and Pinellas Counties | 96 |
| Table 4.7 | Factors Influencing Adolescent Childbearing with Data Availability and Possible Sources | 109 |
| Table 4.8 | Spearman’s Rho Correlation | 113 |
| Table 5.1 | Average z-Scores for Census Tract Hot Spots | 126 |
| Table 5.2 | Average z-Scores for Census Tract Cold Spots | 128 |
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 3.1</td>
<td>Hierarchical Relationships of U.S. Census Geography</td>
<td>67</td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>Average Annual Numbers of Births 1992-1997 by Age and Race/Ethnicity in the State of Florida</td>
<td>87</td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>Average Annual Number of Births 1992 - 1997 by Age and Race/Ethnicity in Hillsborough County, Florida</td>
<td>88</td>
</tr>
<tr>
<td>Figure 4.3</td>
<td>Average Annual Number of Births 1992 - 1997 by Age and Race/Ethnicity in Pinellas County, Florida</td>
<td>89</td>
</tr>
</tbody>
</table>
TOWARD AN APPLIED ANTHROPOLOGY OF GIS:
SPATIAL ANALYSIS OF ADOLESCENT CHILDBEARING
IN HILLSBOROUGH AND PINELLAS COUNTIES, FLORIDA

Kathleen I. Maes

ABSTRACT

This work investigates births to white, African American and Hispanic adolescents in Hillsborough and Pinellas Counties, Florida, from 1992 to 1997 in two age groups – 13 to 17 year-olds and 18 to 19 year-olds – using spatial statistical techniques along with key informant interviews to provide insights into the utility of the research findings. The research developed a method for estimating the adolescent population in inter-census years, which was used to determine denominators for calculating teen birth rates. It also developed a composite deprivation index using socioeconomic indicators at the census block group level. The index provided context for hot and cold spot analysis, areas where expected teen birth rates were statistically higher or lower than expected. The association between socioeconomic deprivation in a neighborhood and rates of teen births was inconclusive, indicating a need for further research. Next steps include investigating individual-level risk and protective factors using multi-level modeling and cluster analysis as alternate analytic methods, and conducting ethnographic investigation to help provide context to the neighborhoods.
CHAPTER ONE: INTRODUCTION TO THE STUDY

Anthropologists are increasingly working in diverse settings outside academia, in sectors such as government, commercial, industrial and financial as well as in not-for-profit organizations (Hahn 2009). As anthropologists have expanded their work settings, application of anthropological methods also must be expanded. One useful technique, not often employed by cultural anthropologists, is spatial analysis. Spatial analysis, using Geographic Information Systems (GIS), provides a unique analytic perspective by allowing “people to look at data in a whole new way by seeing all the pieces at once” (Lang 2000:2) as geographically referenced data in the form of a map.

Introduction to the Study

This study developed a method for exploring neighborhood variables within a spatial landscape that may be used to examine a given outcome. Births to adolescents in two Florida counties, Hillsborough and Pinellas, are used to test the proposed methods and contribute to an emerging “applied anthropology of GIS/spatial analysis” by showing ways in which anthropological methods and perspectives can be integrated into a more purely quantitative and spatial research design.

A growing movement toward an “applied anthropology of GIS/spatial analysis” is underway. At the 101st Annual Meeting of the American Anthropological Association in 2002, Dr. Susan C. Stonich called for the anthropology of rather than anthropology in
spatial analysis/GIS. This new anthropology will require an interdisciplinary approach, integrating a strong theoretical framework with tested methods and practical application. The theoretical framework must integrate statistical, geographic, cartographic, and anthropological foundations along with the topic being studied (e.g., public health, environmental conservation, etc.) Methods must accommodate both spatial and statistical analyses as well as ethnographic techniques. Finally, an “applied anthropology of GIS/spatial analysis” must have practical application and the work must be useful (Stonich 2002). GIS allows the researcher to make visible the abstract concepts of space as applied, for instance, to patterns of adolescent reproduction.

This study uses a mixed method design to provide information from quantitative, spatial, and qualitative perspectives. Descriptive statistics provide direct insight into the data, helping to clarify distributions of adolescent birth rates. Hot spot analysis identifies where rates of adolescent births are significantly higher or lower than expected and presents these hot spots and cold spots spatially on a map. Using area-based socioeconomic measures (ABSMs), an Index of Socioeconomic Inequality was created as part of this research to investigate the relationship between contextual factors (i.e., neighborhood characteristics) and births to teen. Interviews conducted with county and state-level adolescent pregnancy prevention service providers and funding agencies provide information regarding individual-level and neighborhood-level variables associated with adolescent childbearing, in addition to respondents’ perceptions of the utility and relevance of the information generated in this research for the work they do.

Aggregated birth data from 1992 through 1997 were used in this study. Births to adolescents are presented for two age groups (13 to 17 year-olds and 18 and 19 year-olds)
and by race and ethnicity, including white, African American and Hispanic. Presenting patterns of adolescent childbearing geographically by age-group and by race/ethnicity provides the opportunity to view these births from a cultural perspective and to consider different cultural norms, mores and customs that may affect attitudes toward adolescent childbearing. Maps showing the approximate location of teen’s mothers’ home addresses were produced for each of the age and race/ethnic group of adolescents, providing the opportunity to see spatial distributions and patterns of where these teens live. Maps were also produced to show different levels of socioeconomic inequality/stress in neighborhoods throughout Hillsborough and Pinellas counties, Florida, based on variables associated with adolescent childbearing and incorporated into an index developed for this study. These areas, with differing levels of social stress, provide context for hot spot and cold spot neighborhoods where adolescent birth rates, by age group and race/ethnicity, are statistically higher or lower than expected.

Originally, this study planned to use cluster analysis, a different method to identify hot and cold spots which is not limited by geographic boundaries, and a multilevel modeling approach as an explanatory technique. However, after months of work, it became apparent that this was beyond the scope of a dissertation project and would require a multi-person team approach to complete, which would be best left for a post-dissertation project.

**Background**

I have worked for several years as an applied anthropologist in the Research Department of the Children's Board of Hillsborough County, a local Children’s Services
Council in Tampa, Florida. As an independent taxing district, the Children’s Board of Hillsborough County uses property tax dollars to strategically invest in primary prevention and early intervention programs and services for children and families in Hillsborough County, Florida.

In the past few years, with rising unemployment rates, increasing numbers of home foreclosures, wildly fluctuating gas prices, a shortage of affordable housing, and economic recession, both politicians and practitioners want to ensure wise use of dwindling tax resources resulting from recent property tax cuts approved by Florida voters. The Children’s Board of Hillsborough County’s Research Department has been charged with helping to determine how these tax revenues can be most effectively invested to help ensure the well-being of children and families in the county.

Information for strategic decision making comes from many sources and in many forms. Spatial analysis, in the form of maps using geographic information systems (GIS) techniques, is one way to examine data. Spatial analysis is geographic in nature and can be a very useful addition to anthropologists’ research methods. According to Lang (2002), spatial analysis offers a different perspective on data. Spatial analysis, simply put, is the act of comparing the positions of different items or events on a map to identify similarities or relationships. Conditions and relationships not obvious in a list, table or chart often become readily apparent when displayed on a map.

Aldenderfer (1996) notes that GIS/spatial analysis is an important and relatively new method in anthropology. Although mapping and geographical analyses are used by archaeologists (and practitioners in other disciplines), cultural anthropologists have not fully explored the value and utility of this technique. Finally, Aldenderfer (1996)
believes that mapping is appropriate for many anthropological studies. He states that space is an inseparable part of life and society and if we want to develop more reliable and robust quantitative ideas to help us understand our ‘place’ in space, GIS [Geographic Information Systems/spatial analysis] has extraordinary advantages to offer (Aldenderfer 1996).

**Conceptual Framework**

The socioeconomic and spatial components of the research presented here are well-suited to ecosocial theory. Introduced by Nancy Krieger in 1994 in conjunction with the Harvard School of Public Health’s Geocoding Project, ecosocial theory uses a multi-level framework to integrate social and individual biological characteristics to develop new insights into patterns of health, disease and well-being from dynamic and historic perspectives.

According to Krieger (2001), four core concepts define ecosocial theory, including 1. embodiment, 2. pathways to embodiment, 3. cumulative interplay between exposure, susceptibility, and resistance, and 4. accountability and agency. The core concept of *embodiment* refers to how individuals biologically incorporate aspects of their material and social environments. Krieger (2001) contends that all aspects of an individual’s biology must be understood in the context of their history, personal, and cultural ways of living. The second core concept of ecosocial theory, *pathways of embodiment*, is structured simultaneously by society’s arrangements of power and property (patterns of production, consumption and reproduction) and by human biological constraints and possibilities (ecological context and biological and social
development). The third core concept addresses the cumulative interaction between exposure, susceptibility and resistance. These interactions are played out at multiple levels (individual, neighborhood, regional, national and international) and in multiple domains (home, work, school, and other public settings, for example) and at multiple scales of time and space. The fourth core concept of ecosocial theory, accountability and agency, refers to the way the core concept of embodiment is understood in relation to institutions, communities, households and individuals. Accountability and agency also refers to researchers’ accountability for the theories they use (and choose not to use) as well as explicit consideration of the benefits and limitations of the scale and level of analysis chosen (Krieger 2001).

An ecosocial framework is a systematic integrated approach that is more than adding individual or biological aspects to a social analysis or adding social factors to a biological study. Strengths of this approach are its capacity to generate new hypotheses (Krieger 2001) and explicitly investigating social determinants of population distributions of health, disease, and wellbeing, rather than treating these determinants as simply background to biomedical phenomena (Krieger 2001).

Following an ecosocial framework, the research conducted for this dissertation investigates adolescent childbearing (the biological or individual-level outcome) by examining social determinants (neighborhood-level variables) using area-based socioeconomic measures (ABSMs). This study uses two main spatial-statistical analyses – hot spot analysis and neighborhood analysis. Hot spot analysis identifies where rates of adolescent births are statistically significantly high or low and presents these hot spots and cold spots spatially on a map. Neighborhood-level analysis is used to explore small-
area socioeconomic factors and how these factors geographically align to adolescent childbearing. This study also includes a qualitative component. Interviews with teen pregnancy prevention service providers and funding agencies were conducted to discover factors that may lead to adolescent childbearing and to discover providers’ opinions on the usefulness and relevance of the results of this type of information for their work.

The following research questions are addressed this study:

- What are the patterns of adolescent childbearing in Hillsborough and Pinellas counties, Florida?
- Is there a relationship between community-level socioeconomic indicators and adolescent childbearing?
- Will adolescent pregnancy prevention service providers and funding agencies find this information useful and relevant to the work they do?

Purpose of the Study

This research contributes to the work some anthropologists have begun in developing an “applied anthropology of GIS/ spatial analysis.” In her presentation to the 101st Annual Meeting of the American Anthropological Association in 2002, Dr. Susan C. Stonich called for the anthropology of rather than anthropology in spatial analysis/GIS. In other words, Stonich envisioned an anthropology of spatial approaches.

Stonich (2002) called for a problem-driven or hypothesis-driven approach, using theories, concepts, and methods that help to clarify links between anthropology and GIS/spatial analysis. She called for the expansion of “qualitative” approaches and integration of qualitative data with spatial analysis to investigate, for example, the distribution of health risks or disease rather than having to rely on the perception of the distribution of health risks.
This research begins to fill gaps that Stonich (2002) indicates currently exist between anthropology and spatial analysis. First, this research is problem-driven, rather than data-driven. It uses GIS and spatial-statistical analyses to investigate patterns of adolescent childbearing in Hillsborough and Pinellas counties, Florida, as well as the neighborhood-level patterns of socioeconomic inequality in the communities where adolescents live. In addition, this research contributes to an “applied anthropology of GIS/spatial analysis” by demonstrating how anthropologists who work on more regional scales can now use readily-available and familiar technology as part of their toolkits. Finally, interviews with adolescent pregnancy prevention service providers and funding agencies conducted as part of this dissertation’s research serve to link the more regional spatial analyses with a qualitative approach, as Stonich (2002) suggests. Maps produced as part of this study allow service providers and funders to view information on adolescent childbearing in a different way which can contribute to data-driven decisions rather than decisions made on perceptions. Interviews also served to provide insights on the usefulness and relevance of this research to service providers and funders and served as a bridge between larger-scale analytic methods and the ethnographic technique more familiar to anthropologists.
CHAPTER TWO: REVIEW OF RELATED LITERATURE

There are several aspects of my study that can be informed by work already done in the field of anthropology as well as in other disciplines. One of the newer techniques to anthropology is the use of Geographic Information Systems (GIS) which has been used by archaeologists to a much greater degree than cultural anthropologists. Advances in GIS technology have facilitated new methods in data collection and analysis. This study can also be informed by work done primarily in the disciplines of geography and public health where hot spot analysis and small area analysis (using area-based socioeconomic measures or ABSMs) have been used in a wide variety of ways that can inform anthropological investigations. Finally, an enormous amount of literature has been devoted to the topic of adolescent pregnancy and childbearing. Because this research uses births to adolescents to demonstrate the utility of the analytic method being developed which can contribute to an “applied anthropology of GIS/spatial analysis,” a review of this literature can illuminate and inform the work done for this dissertation in addition to providing ideas for future research.

Anthropology and Analysis of Space

The study and analysis of space, although most often associated with geography, also plays an important role in anthropology. In the past, as well as today, the anthropological literature demonstrates consideration of geography, space, and place.
Intermittently throughout its history, anthropological inquiry has explored the relevance of space. Space has held importance in anthropological theory, cultural perspectives, and ethnographic methods of data collection and recording. As Aldenderfer (1996) notes, the concept of diffusion and perspectives of ecological anthropology are two anthropological theories relying on spatial thought.

Beginning with a historical examination of the role of space in anthropology, Aldenderfer (1996) notes that around the turn of the century much anthropological thought was focused on the notion of diffusion. Scholars attempted to identify geographic centers of diffused material culture, kinship systems, social organization, or political systems, among others, using the concept of spatial proximity to explain similarities and difference between cultures. In the United States, for example, Alfred Kroeber (1939) defined large culture areas such as California, the Eastern Woodlands, and the Great Plains in his book *Cultural and Natural Areas of Native North America* in an attempt to map out ethnic groups defined by language or similarities in material culture. Interestingly, Aldenderfer (1996) points out that with this approach, the size of the region could be scaled up or down depending on the problem being investigated, resulting in relatively coarse sets of data for large areas, down to very fine-grained, detailed lists of overlapping traits within small areas.

By the 1930s and 1940s, the discipline of anthropology had rejected the notion of diffusion in favor of re-emergent ideas of evolutionary explanations for observed patterns of cultural similarities and differences. Despite the potential for explanatory improvement during this period, Aldenderfer (1996:6) contends spatial thinking “turned
inward” using history, place and region as the primary means of understand cultural diversity, resulting in space becoming “passive and sterile as an analytical concept.”

Nevertheless, spatial thinking one again gained importance in anthropology with the growth of ecological theory within the discipline (Aldenderfer 1996). Julian Steward, the first and leading proponent of the cultural ecological perspective, demonstrated the relationship between culture and environment of a given area. Steward’s 1938 study of the Great Basin Shoshone drew from an ecosystems concept, where geographically referenced human activities varied, at least in part, as a consequence of spatial and temporal variations in energy availability and its flow through the system. Steward’s ecological approach was subsequently adapted and modified to include other regions and problems.

In addition to cultural anthropology’s considerations of space, Aldenderfer (1996) argues that archaeologists of the first half of the twentieth century engaged in similar perspectives. Archaeologists of the time were engaged in determining patterns of diffused cultural traits based on material remains found in excavated sites. Methodologically, artifacts such as spear points were examined, categorized stylistically and temporally, and their spatial distribution was determined. The regional distribution of artifact types established the spatial/temporal cultural boundaries and thus, the cultural history of a region. Aldenderfer (1996) further contends that although this method of defining spatiotemporal cultural boundaries has been criticized, it is still used in the same manner today.

During this early period of anthropology, the tools used to delineate space and manipulate data were fairly simple, consisting primarily of maps, map overlays and tables.
(Aldenderfer 1996). Data such as culture element distribution lists and cultural traits, for example, were tabulated by hand and plotted on maps. However, by the 1980s, significant technological innovations in Geographic Information Systems had emerged, setting the stage for inquiry on larger spatial scales and the ability to do so in a practical manner. Since then, many archaeologist and some cultural anthropologists have taken advantage of this new technology by incorporating spatial data in their research efforts.

**Anthropology and Geographic Information Systems (GIS)**

Anthropology’s historic and continuing use of mapping and quantitative methods set the stage for the use of GIS and spatial technologies. Cultural anthropologists frequently employ ethnographic techniques in their studies, which can entail mapping spatial relationships and community features as part of the research (Greenbaum 1998, Whiteford 2000). Cultural anthropologists also readily employ quantitative data collection and analyses, and test qualitative hypotheses using quantitative techniques (Greenbaum 1998).

As far back as thirty years ago, archaeologists began using the relatively new remote sensing (RS), geographic information systems (GIS) and global positioning systems (GPS) technologies as part of their systems of data collection and analyses. These emerging techniques were facilitated by developments in computer hardware and software that made the technologies more widely available (Conant 1994). In the early years, some anthropologists feared the value of fieldwork would be diminished by these emerging technologies. On the contrary, the opposite has been true and fieldwork has actually been encouraged (Conant 1994). However, Stonich (2002) notes that while
anthropologists, in general, have embraced these new technologies’ data collection and analytic methods, most spatial analyses have been done by archaeologists.

Geographic Information Systems (GIS) and Remote Sensing (RS) applications have become widely used tools in archaeology. Archaeologists, such as Eric E. Jones (2006), have studied settlement patterning at a regional scale. Jones (2006) used viewshed analysis, a GIS-based method, to determine how the natural and political landscapes affected choices in settlement location among the Late Woodland and early historic Onondaga Iroquois, showing how both productive soils and settlement defensibility entered into choice of settlement locations. His work demonstrated how GIS can surpass statistical analyses in helping to understand behavior by using spatial modeling.

Other archaeologists have used GIS techniques on a more micro-scale. For example, Abe et al. (2002) examined cutmark patterns from assemblages with differing levels of fragmentation within a small geographic area by analyzing the frequency of cutmarks over the observed geographic area using the image analysis capability of GIS.

To a lesser degree than archaeologists, cultural anthropologists have also used GIS techniques to investigate contemporary issues and phenomena. For example, Silltoe (2002) investigated the reasons for failure of development efforts in Bangladesh by integrating indigenous knowledge with a newly-developed computerized model using databases and geographic information systems (GIS) to integrate quantitative environmental information.

Other recent anthropological investigations of the effects of space and distance in modern cultural interactions have also used GIS spatial technologies. Futemma and
Brondizio (2003) used remote sensing data and GIS mapping technologies to understand changes in land use in the Lower Amazon over time and the implication for agricultural intensification and forest conservation. Coppolillo (2000) investigated the ecological impacts of and on pastoral grazing by determining associations of space and distance on cattle productivity and herding practices in East Africa, including the effects of traveling further from home, maintaining large herds, and the impact of high settlement densities on herding practices.

Although the use of GIS/spatial analysis had been increasingly used in cultural anthropology in the years since its emergence, several challenges and gaps still exist. Loker (2005) contends that although the complex challenge of description and analysis of human-environmental interactions has been aided by newer spatial technologies, concepts and methodological innovations, this task is still difficult, for two primary reasons. First, although computer-assisted GIS analysis is a powerful tool, it has not yet been able to accurately characterize social and natural systems, which are extremely complex and variable in both space and time. Also, Loker (2003) notes that environmental data tend to be continuous in nature while social data tend to be point data, such as individuals, households, villages, etc., making linkages a difficult task.

In addition to the challenges pointed out by Loker (2003), Stonich (2002) notes that most work done by cultural anthropologists has been narrowly focused on land use and the effects of climate change. Stonich (2002) also contends that work tends to be data driven rather than problem or hypothesis driven. The notable exception to this is the work done by Romero-Daza (2004) where she used cluster analysis and GIS technology to locate geographic areas with statistically significant high levels of low birth weight
births in Hillsborough County, Florida. Finally, Stonich (2002) asserts that although cultural anthropology currently uses spatial analysis/GIS techniques and technologies, the discipline has not yet fully developed an “applied anthropology of spatial analysis/GIS.”

Although relatively little work has been published by cultural anthropologists on their use of GIS/spatial technologies, other disciplines such as public health, epidemiology and medical geography have more readily embraced these newer techniques, including hot spot analysis and multilevel modeling using GIS technologies.

**Hot Spot Analysis**

Hot spot analysis gained increased attention in the 1980’s as a result of growing concern about adverse environmental effects on population health (Lawson 2001). Since then, spatial epidemiology began to use special statistical methods to identify clusters of chronic diseases and conditions. Clustering, according to Lawson (2001:104) is “any area within the study region of significant elevated risk.” He continues by noting that this definition makes no assumption about shape or extent, but would qualify as a cluster provided the area meets some statistical criteria. This definition, often referred to as hot spot clustering, is a way of classifying or grouping where clusters are groups of highly similar entities (Brimicombe 2005).

Closely aligned with the research conducted in this dissertation, the California Department of Health used GIS in a problem-driven approach aimed at more effective delivery of public health services and resource allocation. The project used hot spot analysis to locate census tracts where teen births were clustered. The authors used a Poisson distribution test (for areas with less than 100 births) and a Chi square test (for
more than 100 births) to calculate significance. The maps that were produced were used to justify allocation of funds to areas of greatest need for teen pregnancy services (Taylor and Chavez 2002).

The authors note that, “the use of GIS to improve the ability to more effectively deliver public health services is in its infancy” (Taylor and Chavez 2002:33) and offer several experiences with their project that may have particular relevance to the work being done in this dissertation. First, ZIP Codes were not a reliable geographic level because ZIP Code boundaries changed, therefore precluding aggregation of several years of birth data. Next, although census tracts worked well for hot spot analysis, public health staff often had trouble situating themselves in relation to the census tracts. To overcome this problem, landmarks such as schools and major roads were included on maps. Finally, when analyzing births for the entire State of California, it was often difficult to present enough detail in maps (roads, schools, program site locations, etc.) without the map appearing cluttered and hard to read.

Another study, which used similar analysis techniques to those employed in this dissertation, was conducted in California by Gould et al. (1998) to identify areas of the state in need of pregnancy prevention and prenatal care programs. Using birthrates for 15 to 17 year-old adolescents by ZIP Code for 1992 to 1994, the authors identified ZIP Code hot spots where birthrates to teens were significantly higher than the state mean. Working with individuals identified by the California State Office of Family Planning to be part of a state-wide advisory board, hot spots were aggregated into potential project areas based on the number of births and clinical experience of staff within each area. Finally, potential project areas were described by factors that would affect program
design and implementation, including racial and ethnic composition, socioeconomic characteristics (education, median income, poverty, female-headed households and unemployment) and characteristics related to teenage pregnancy (repeat adolescent births, late or no prenatal care, low birth weight births, Medicaid-paid births, and fathers younger than 24 years old).

Gould et al.’s (1998) study identified 210 hot spots, and based on input from local area providers and professionals, these hot spots were divided into 82 potential project areas. To assist in adolescent pregnancy-related program planning, the potential project areas were categorized as high or low priority based on birth rates, demographic and socioeconomic characteristics of the areas and staff case loads. The authors state that the results of this study will help to ensure the most judicious use of limited resources.

A number of studies have used cluster analysis, another method of detecting hot spots which does not rely on predetermined areas such as census tracts or ZIP Codes. For example, Publiatti et al. (2002) conducted a spatial analysis of the prevalence of multiple sclerosis (MS) to discover hot spots of the disease in the province of Sassari in northern Sardinia. Results showed a clustering pattern in the southwestern communes where an MS epidemic is suspected to have previously occurred, leading the authors conclude that because MS is not a single-source infectious disease. Their study may help test the hypothesis that a widely and evenly-spread environmental agent may produce disease in subgroups of genetically more susceptible individuals.

Similar to hot spot techniques used in the study above by Publiatti et al. (2002), English et al. (2003) investigated changes in low birth weight births to test whether rapid population growth, economic pressure and neighborhood instability in the communities
near the US/Mexico border affected reproductive health. This study (English et al. 2003) found geographic hot spots that showed statistically significant increases in full-term and pre-term low birth weight rates, providing an illustration of how hot spot cluster analysis can be used as a method to explore incidence patterns in a region.

Hot spot analysis has also been used to study births to adolescents in Washington D.C. (Johnson-Clarke 2000) to track changes in childbearing over time, as well as a wide variety of other issues, including environmental issues such as carbon monoxide levels (Meng and Niemeier 1998), biodiversity (Podolsky 2003), crime (Eck et al. 2005), and housing (Wang and Varady 2005). The wide variety of applications using hot spot analysis demonstrates the flexibility of this approach.

Hot spot analysis has several strengths and the information generated can be used in a number of ways. First, maps of hot spots convey spatial information to visually identify high risk groups in critical areas and to determine shifts in the distribution of teen births (Johnson-Clarke 2006). Hot spot analysis has also been used to target interventions and for resources allocation (Gould et al. 1998, Johnson-Clarke 2006, Taylor and Chavez 2002). Johnson-Clarke (2006) also notes that hot spot analysis and GIS techniques can be used for public health surveillance and monitoring, health-related policymaking, and for tracking racial/ethnic or economic disparities in health. Gould et al. (1998) state that hot spot analysis has potential for measuring specific outcomes of program interventions over time and for comparing communities that are testing the efficacy of different types of interventions (Gould et al. 1998). Finally, Johnson-Clarke (2006) notes that hot spot analysis is particularly useful in generating research hypotheses. As Rushton (2003:65) explains, “Exploratory analyses investigate alternative understandings of the pattern of
disease in any region with the aim of selecting more appropriate subsequent analyses that might resolve the ambiguities that typically arise in the early states of investigations.”

The idea of hot spot analysis as an exploratory device leads to a discussion multilevel modeling, an explanatory method that can be used in conjunction with hot spot analysis.

**Multilevel Modeling and Ecosocial Theory**

As discussed in the previous chapter, ecosocial theory was introduced by Nancy Krieger in 1994 in conjunction with the Harvard School of Public Health’s Geocoding Project. Ecosocial theory uses a multi-level framework to integrate social and individual biological characteristics to develop new insights into patterns of health, disease and well-being from dynamic and historic perspectives. Ecosocial theory emphasizes the social aspects and production of health (or disease) and well-being and, rather than focusing solely on individuals, it positions health and well-being as collective phenomena. By examining both individual and group-level processes, this theory encourages multi-level analysis by considering the combined effects the neighborhood and the individual (Krieger 1994).

Ecosocial theory grew from what Krieger (1994) saw as a major inadequacy in the “web of causation” metaphor that was (and still is) popular in epidemiology. The web of causation metaphor was developed by MacMahon et al. in 1960 and uses the image of a spider’s web with multiple intersections in the web representing specific risk factors or outcomes and the strands in the web symbolizing diverse causal pathways. And although this metaphor encourages investigation of the interaction between multiple
causes and multiple effects, the model omits discussion of the origins of multiple causes, what Krieger (1994:891) calls a “spiderless web.” It also fails to differentiate between the causes of cases (individual risk) and the causes of incidence (population risk). Krieger (1994) states that the ‘web’ sans ‘spider’ discourages consideration of why population patterns of disease and well-being exist and why these patterns persist or change over time. In other words, the web of causation views group patterns of disease/well-being as merely an aggregation of individuals’ traits and choices.

Ecosocial theory, according to Krieger (1994:896), strives to embrace “population-level thinking and rejects the underlying assumptions of biomedical individualism without discarding biology.” She envisions ecosocial theory as “an evolving bush of life intertwined at every scale, micro and macro, with the scaffolding of society that different core social groups daily reinforce or seek to alter” (Krieger 2001:671). For anthropologists, ecosocial theory is appealing because it facilitates consideration of culture, viewing culture as indivisible from political, economic, religious, biological and social aspects of daily life, as well as allowing for cross-cultural comparison of disease/well-being.

This multi-dimensional perspective of disease and well-being is especially well-suited to multi-level modeling techniques. Multilevel modeling disentangles the two levels of variation (individual-level and neighborhood-level) to distinguish variations due to characteristics of an area from characteristics of individuals who live in these areas (Krieger et al., N.d.). Multilevel modeling, according to Hox (1998:147), is a family of statistical procedures “specifically geared toward the statistical analysis of data that have a hierarchical or clustered structure.” Jones and Duncan (1998:95) also note that
multilevel models serve as a useful tool for “quantitative analysis when the problem under investigation has a multilevel structure, when a process is thought to operate at more than one level or scale, or when the researcher is particularly interested in variability and heterogeneity and not just overall average values.”

Data are conceptually considered to occupy different hierarchical levels for purposes of analysis. In other words, multilevel approaches use data sets of individual-level variables nested within geographic areas, such as neighborhoods, with associated neighborhood-level (contextual) variables (Diez-Roux 2001). For example, individual-level data is available in birth records, including demographic data (e.g., age of mother, race/ethnicity, marital status, address, prenatal care utilization, parity, etc.), whereas neighborhood-level variables usually includes aggregated information (e.g., demographic, housing, economic data, etc.). Diez-Roux (2001; 2003) continues, noting that multilevel regression equations with individuals as the units of analysis can simultaneously include both individual-level and neighborhood-level predictors, allowing examination of neighborhood or area effects after individual-level confounders have been controlled. Multilevel analysis also allows examination of individual-level characteristics as modifiers of the neighborhood effect, and vice versa. Finally, multilevel analysis permits simultaneous examination of within and between neighborhood variability in outcomes, as well as the extent to which between-neighborhood variability is explained by both individual-level and neighborhood-level factors.

O’Campo et al. (1997) assert that multilevel models have several advantages. First, multilevel analytic methods are more consistent with social theories’ more traditional methods of analysis because they explicitly accommodate multiple levels of
data. Next, multilevel models allow for inclusion of macro-level factors in current explanatory models, which can increase our understanding of how neighborhood factors affect differences in individual risk. Additionally, multilevel analysis helps to eliminate potential confounding of individual-level explanatory models due to omission of neighborhood factors. Finally, O’Campo et al. (1997) contend that multilevel approaches can inform design of effective intervention strategies by improving our understanding of how neighborhood factors influence individual health outcomes. Diez-Roux (2003) adds that multilevel approaches provide alternatives to the individual/population dichotomy.

The strength of multilevel models lies in their ability to integrate individual and ecological study designs while avoiding the limitations of each of these designs.

The first step in generating a multilevel model is to determine individual and neighborhood variables relevant to the problem or phenomenon being investigated. While vital statistics data contains individual level data (e.g., age, race/ethnicity, cause of death, gender, marital status, etc.), most vital records lack socioeconomic data, making it difficult, if not impossible, to investigate the role that social position or economic deprivation, for example, plays in individual-level outcomes (Krieger et al. 2003a).

The solution to this paucity of neighborhood-level socioeconomic data, according to Krieger et al. (N.d.), is to geocode the vital statistics or public health surveillance data and then use U.S. Census area-based socioeconomic measures (ABSMs) to ascertain both the cases and the population in a given area. In multilevel models, appropriate ABSMs, are usually determined through literature on the issue being investigated, and are applied both independently and together in the form of an index. An index is a set of indicators, combined in a standardized way, that summarizes complex or multi-dimensional
characteristics of a geographical area or highlight what is happening there. An index provides the big picture, making indicators easier to interpret than trying to find a trend in many separate indicators (Saisana and Tarantola 2002). Some commonly used public health indices measure material deprivation (e.g., Carstairs Index, Townsend Index), income inequality (e.g., Robin Hood Index) and access to material resources (e.g., U.S. CDC Index of Local Economic Resources) (Krieger et al. N.d.).

Area-based socioeconomic measures (ABSMs) are calculated within small geographic areas, and as mentioned, are used independently and together in the form of an index. The advantage of calculating measures on smaller scales is that populations within small areas tend to be more homogeneous and therefore a wider range of social and economic variation between areas can be distinguished. Using data on population and housing characteristics from the U.S. Census, such as census tracts, block groups or ZIP Codes, facilitates establishment of the relationships between these small-area variables and the health or vital statistics data (Carstairs 1981).

A lot of discussion has been generated around appropriate development and use of area-based socioeconomic measures (ABSMs), which are the neighborhood or socioeconomic-level aspect of ecosocial studies. According to Elliott and Wartenberg (2004), analysis of data at a local or small-area scale presents some unique challenges that must be considered. First, the quality of the data can present problems that must be addressed. The effects of missing variables, reliability and validity of the data become magnified at a small-area level of analysis. Another set of considerations directly relates to the scale of analysis. Small areas or groups of areas narrow the investigation, which reduces the size of the population at risk within given boundaries, leading to small
numbers of events or unstable risk estimation. Also, studies with small populations are more sensitive to errors and local variations in the quality of both the health (numerator) data and the population (denominator) data than studies conducted over larger areas. If undetected, local variations in data quality could lead to serious biases. Next, small area studies are susceptible to confounding, which can result in false exposure-disease associations. Finally, data can be misinterpreted as individual-level socioeconomic data, rather than being used as complimentary neighborhood-level data that can be analyzed together with individual level data in multilevel models (Elliott and Wartenberg 2004, Krieger et al. 2003a, Krieger et al. 2005, Taylor and Chavez 2002).

In spite of the limitations, Krieger et al. (2003a) state that area-based socioeconomic measures (ABSMs) have several strengths. First, ABSMS can be used with any database that includes addresses, as is the case for of the birth data used in my study. Next, ABSMs provide data for determining neighborhood (contextual) effects on health that goes beyond effects that are due to individual-level socioeconomic position. Finally, ABSMs are equally applicable to all people, regardless of factors such as age, gender, and employment status (Krieger et al. 2003a).

The ecosocial framework used in this dissertation’s research design views biological/individual factors and social/neighborhood factors as integrated. Area-based socioeconomic measures (ABSMs) provide the context and the Florida Vital Statistics Birth Records provide individual-level data on where births to adolescents, by race and ethnicity, occurred. Although not part of this dissertation’s research, information regarding birth outcomes, to both the adolescent mother and her baby, can provide
insights into the causal relationships between individual factors and possible neighborhood risk factors associated with adolescent childbearing.

**Risks and Outcomes of Adolescent Pregnancy and Childbearing**

To get an idea of the magnitude of teen childbearing, the Robin Hood Foundation’s (Maynard 1997) report on adolescent childbearing, *Kids Having Kids*, estimates that nearly one million teenagers in the United States become pregnant each year. This is approximately ten percent of all girls ages 15 to 19 years old. An estimated 48 percent of these pregnancies are not carried to term, but rather are terminated or end in miscarriage. Over half (52 percent – about half a million teens) will bear children each year, according the report (Maynard 1997). More than 175,000 of these new mothers in the United States are under 18 years old.

In 2000, the teen birth rate for adolescents ages 15 through 19 in the United States was at 47.7 per 1,000 females, down from 60.3 per 1,000 in 1990 (Guttmacher Institute 2004). This decline was observed in all racial and ethnic groups. Birth rates for African American adolescents declined from 112.9 (per 1,000 females ages 15 to 19) in 1990 to 77.4 in 2000. Similar decreases in teen birth rates are found among white teens where birth rates fell from 51.2 to 43.2 (per 1,000 females ages 15-19) and among Hispanic adolescents where birth rates declined from 99.5 to 87.1 during the period from 1990 to 2000 (Guttmacher Institute 2004). Nevertheless, the teen birth rate in the United States is the highest of any industrialized nation, nearly twice as high as the United Kingdom, which has the next highest teen birth rate (Maynard 1997).
In Florida, the birth rate was 51.0 per 1,000 for all births among 15-19 year olds, a ranking of number 16 out of the 50 states in 2000. The birth rates in Florida for white, African American and Hispanic teens in 2000 were 37.0, 82.0 and 58.0 respectively (Guttmacher Institute 2004). Table 2.1 below compares national and State of Florida birth rates among adolescents ages 15-19 in 2000 by race and ethnicity.

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>African American</th>
<th>Hispanic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida</td>
<td>37.0</td>
<td>82.0</td>
<td>58.0</td>
<td>51.0</td>
</tr>
<tr>
<td>United States</td>
<td>43.2</td>
<td>77.4</td>
<td>87.1</td>
<td>47.7</td>
</tr>
</tbody>
</table>

Sources: Guttmacher Institute 2004, Florida Department of Health 2005

As the table shows, Florida had a lower birth rate among white and Hispanic teens than the nation as a whole, while Florida’s African American and overall birth rates were higher than the United States in 2000 among 15-19 year-olds.

To put these statistics in context, we must look at the meaning of the numbers in terms of maternal and child outcomes. Adolescent mothers under age 20 are more likely to experience adverse medical outcomes, both during pregnancy and later in life. And the younger the mother, the greater the risk that she and her baby will experience health complications, primarily due to inadequate prenatal care, poor nutrition, and other lifestyle factors (March of Dimes 2004).

**Maternal Risks and Outcomes**

Like their more mature counterparts, pregnant adolescents are at risk of poor perinatal obstetric outcomes, including pregnancy-induced hypertension, anemia, and pre-term labor and delivery. However, there is disagreement in current literature about the extent to which the age of the adolescent mother versus pre-pregnancy and pregnancy
behaviors and risk contribute to poor childbearing outcomes (Ehrlich and Vega-Matos 2000). For example, Ananth et al. (2001) assert that age is at least partially linked to biological factors that increase risk of preterm delivery at younger ages, while Geronimus (2003) contends there is no difference in birth outcomes between adolescents and non-adolescent mothers when outcomes are compared within racial and ethnic groups.

One series of related disorders that can affect pregnant adolescents are gestational hypertensive disorders. One type of gestational hypertension is preeclampsia, a temporary condition in which high blood pressure develops in women with previously normal blood pressure after the 20th week of pregnancy and returns to normal after delivery. Typically, preeclampsia affects at least five to eight percent of all pregnancies, increasing the risk of preterm delivery (Ananth et al. 2001). Studies by Galvez-Myles and Myles (2005) and Eure et al. (2002) found younger teens were significantly more likely to develop preeclampsia than older teens and women over 20 years old.

Pregnant adolescents are also at risk of developing gestational diabetes, characterized by high glucose levels during pregnancy among women without a history of diabetes (American Diabetes Association 2006). A retrospective review of pregnancies at the Milwaukee Regional Medical Complex showed that gestational diabetes disproportionately affected African American women, occurring in about one percent of pregnant African American adolescents and almost five percent of pregnant African American women over age 30 years old (Lemen et al. 1998). There is a strong association between obesity and diabetes mellitus in pregnant women (Nuthalapaty and Rouse 2004) and women with gestational diabetes are at high risk of developing type-2 diabetes in the future (Turok et al. 2003). Unlike the small for gestational age infants
associated with preeclampsia, infants born to mothers with gestational diabetes are often large for gestational age (Turok et al. 2003).

According to the U.S. National Library of Medicine and the National Institutes of Health (2009), gestational age is a measurement of fetal development. Small for gestational age means a fetus or infant is smaller than normal for the baby's gender and gestational age, the period of time between conception and birth during which the fetus grows and develops inside the mother's womb. Large for gestational age means a fetus or infant is larger than normal based on gender and gestational age. Gestational age is the number of weeks measured from the first day of a woman’s last menstrual cycle to the current date. Normal pregnancies range from 38 to 42 weeks. Also called fetal age, gestational age can be determined with ultra sound before that baby is born by measuring the head size, abdomen and thigh bone. After the baby is born, developmental gestational age is determined by measuring the infant’s weight, length, head circumference, hair and skin condition, reflexes, muscle tone, posture, and vital signs. A baby born small for gestational age is small in size and is at higher risk of low body temperature, low blood sugar and increased red blood cells, while a baby born large for gestational age is at higher risk of birth injury and complications from low blood sugar. (U.S. National Library of Medicine and the National Institutes of Health 2009).

Pregnant women are especially vulnerable to anemia during pregnancy due to increased iron demands. A ten-year retrospective chart review of pregnant African American adolescents at an inner-city clinic by Chang et al. (2003) showed that African American women are at high risk, and African American adolescents have the highest risk of developing anemia during late pregnancy. Their research also showed that the
adolescents in the study were at risk for several adverse birth outcomes. Teens with low hemoglobin concentrations (diagnosed with anemia) in the third trimester of their pregnancy had increased risk of preterm delivery and delivering a low birth weight baby (Chang et al. 2003). A low birth weight infant weighs less than 2,500 grams (5 pounds, 8 ounces) at birth and is at increased risk of infant mortality, Sudden Infant Death Syndrome (SIDS), blindness, deafness, respiratory difficulties, mental illness, retardation, cerebral palsy, dyslexia, and hyperactivity (National Campaign to Prevent Teen Pregnancy 2007).

Another pregnancy-related risk to adolescents is delivery by cesarean section, that is, delivery of a baby through surgical incision in the mother’s lower abdomen wall and uterus, which poses risks for both mother and baby. Several conditions may necessitate birth by cesarean section, including prolonged or ineffective labor, placenta previa, placenta abruption, abnormal presentation, fetal distress, medical problems and multiple births, among others (American College of Surgeons 2006). In addition to a longer healing period, mothers who have had surgical deliveries are also at risk of increased bleeding, infection, endometriosis, reaction to anesthesia, injuries to the bladder and blood clots. Infants are at risk of prematurity, reactions to the effects of anesthesia, fetal injury and are more like to have breathing problems than babies delivered vaginally (Mayo Clinic 2004). While Amini et al. (1996) found cesarean deliveries for young teens ages 12 to 15 years old was significantly higher than for older teens (16-19 years old) and adults (age 20 and older), studies by Eure et al. (2002) and Galvez-Myles and Myles (2005) found that teens were significantly less likely than adult women to deliver by cesarean section.
Although most teen mothers only have one child during their teenage years, some adolescent mothers go on to bear another child. Nationally, about 17 percent of teen mothers have a second baby within three years after the birth of their first baby (National Center for Health Statistics 2001). From a biological perspective, Smith and Pell (2001), in their population-based retrospective cohort study, found that second teenage births are associated with an almost threefold increase in risk of preterm delivery and stillbirth.

There are several factors that place teenage mothers at risk of delivering a second child within two years of her first birth, including not using long-acting contraception (Depo Provera, Norplant or IUD) within the first three months of delivery, plans to have another baby within five years of the first child, not being in school within three months after delivery, experiencing intimate partner violence, not being in a relationship with the father of the first child, the father of the first child being more than three years older than the mother, and having many friends who were also adolescent parents (Raneri 2006). Jevitt (1983) found longer-term participation in a teen service program was a protective factor against repeat pregnancy. In her study of the Teen Service Program at Grady Memorial Hospital she found that 79 percent of teens did not become pregnant while enrolled in the program. In addition, program participants had lower neonatal death rates after participating the Teen Services Program.

**Neonatal and Child Health Risks and Outcomes**

In addition to adolescent mothers facing increased risk of poor pregnancy outcomes, their offspring are also at risk of poor outcomes, including preterm birth, low birth weight, and still births. One comprehensive study by Amini et al. (1996) clearly
illustrates the high rate of poor birth outcomes for teen mothers. Although this research was conducted more than a decade ago, it is one of the few that investigated several biological and psychosocial birth outcomes and also conducted a comparison of outcomes between age-groups. In a 19-year prospective study of pregnancy in adolescent women in Cleveland, Ohio, Amini et al. (1996) compared the obstetric outcomes of young teens (12-15 years old), older teens (16-19 years old) and adults (age 20 and older). Of the 69,069 births in the Metro Health Medical Center from January 1, 1975 to December 31, 1993, 1,875 (2.7%) were to young teens and 17,359 (25.3%) were to older teens. To test the hypothesis that teens have different characteristics and obstetric outcomes, the researchers examined variables including age, race and ethnicity, insurance status, mode of delivery, gravidity, prenatal visits, admission gestational age and use of alcohol, tobacco and narcotics (Amini et. al.1996). Outcomes included infant status, birth weight, and APGAR scores.

Using parametric analyses and analyses of covariance for continuous variables, $\chi^2$ tests for categorical variables to model multi-level associations, and regression and time series analyses for testing and modeling trends, the authors found that young teens fared worse in maternal and child outcomes than did older teens and adults, and that African Americans of any age had worse outcomes than either white or Hispanic mothers and babies (Amini et. al.1996). In sum, this study found:

- Cesarean deliveries for young teens ages 12 to 15 years old were significantly higher than for older teens and adults (11.6%, 9.4%, and 10.2% respectively).
- Overall, 17.3% of young teens delivered early, a significantly higher rate of preterm deliveries (<37 weeks gestation) than older teens and adults.
• For all deliveries, both younger and older teen mothers were 1.2 times more likely than adults to deliver a very low birth weight infant (1500 grams or less) after adjusting for delivery year, race, parity, patients’ health care insurance status, and marital status.

• The proportion of infants with one-minute APGAR scores of less than 5 was highest among young teens (14.1%) compared to the proportion of older teens (12.6%) and adults (13.3%).

• There was no statistically significant difference in the number of still births between the three groups (1.7 per 1,000 births). However, the antepartum fetal death rate and the in-hospital neonatal mortality rates were higher among young teens 12 to 15 years old (4.4 per 1,000 births) compared to older teens (3.5 per 1,000 births) and adults (6.2 per 1,000 births).

• Smoking, alcohol and narcotic use among young teens was significantly lower than the other two groups. Smoking was most prevalent among older teens while alcohol and narcotic use was significantly greater among adults.

• More than 95% of teenage mothers did not have private health insurance. This is significantly higher than in the adult population (81.6%), indicating a lower socioeconomic status among teen mothers than the overall patient population. After adjusting for insurance status and year of delivery, African American females were 1.2 times more likely to have a teenage birth than white females. In addition, infants born to African American mothers of any age had significantly longer hospital stays than either white or Hispanic infants.

Other research supporting Amini et al.’s (1996) study is discussed below.

One of the most frequent, and potentially harmful, outcomes among newborns of teen mothers is a low birth weight infant, less than 2,500 grams at birth (5 pounds, 8 ounces). Infants born with low birth weight, or born prematurely, have an increased risk of infant mortality, Sudden Infant Death Syndrome (SIDS), blindness, deafness, respiratory difficulties, mental illness, retardation, and cerebral palsy. Additionally, the risk of later diagnosis of dyslexia and hyperactivity is nearly twice as high among low birth weight infants (National Campaign to Prevent Teen Pregnancy 2007).
According to the Maternal and Child Health Bureau (2004), low birth weight is one of the leading causes of neonatal mortality (within 28 days of birth). Low birth weight infants are more likely to experience long-term disability or to die during the first year of life than are infants of normal weight. Vital statistics reports on birth outcomes in 2000 shows that as a mother’s age increases, the frequency of low birth weight infants decreases (Martin et al. 2002).

Other studies have shown that a baby’s birth weight can influence aspects of their future life, including obesity, diabetes and intelligence. Low birth weight babies and babies born large for gestational age are at increased risk of obesity in later life (Parsons et al. 2001, Singhal et al. 2003). Additionally, low birth weight babies are at increased risk of developing Type 2 diabetes (Rich-Edwards 1999), and studies have found an association between normal birth weight and higher intelligence (Matte 2001, Reichman 2005).

A retrospective cohort study by Phipps et al. (2002) showed that infants born to young teens, ages 15 years and younger, are at increased risk of death within the first year (post neonatal mortality) compared to infants born to older mother, ages 23 to 29 years old. These findings were consistent across all racial and ethnic groups.

The literature also shows that infants of adolescent mothers are at risk of preterm births. Preterm birth, according to Akinbami et al. (2000), accounts for most low birth weight births in the United States and there is a clear relationship to infant morbidity and mortality. Preterm births (births occurring before the end of the 37th week of pregnancy) account for over 60 percent of low birth weight babies. Teenage mothers, as an age-period-cohort study by Ananth et al. (2001) showed, are at high risk of preterm birth. In
addition, the study showed African American adolescents had higher rates of preterm births (about 17 percent of teen births) than their white cohort (about 10 percent of teen births).

In their population-based retrospective cohort study, Smith and Pell (2001) found that the risk of preterm birth and still birth almost tripled in second births to mothers between the ages of 15 and 19 years old. Similarly, Akinbami et al.’s cross-sectional analysis of U.S. Natality Files for the years 1990 to 1996 investigated risk of preterm birth to multiparous mothers from 10 to 20 years old. This study found a decreasing adjusted odds ratio as age of the adolescent increases. However, clear racial disparities exist. African American multiparous teens had nearly twice the percentage of preterm births as white and Hispanic multiparous teen mothers. In fact, 25 year-old African American mothers had about the same percentage of preterm births as 15 to 17 year old white and Hispanic mothers (Akinbami et al. 2000).

Teen mothers are also at risk of a still birth. In a nationwide inpatient sample for the years 1995 through 2002 with 5,874,203 deliveries identified for analysis, Bateman and Simpson (2006) found that women who were under 20 years old were more likely to have a pregnancy outcome of stillbirth (odds ratio, 1.11; 95% CI, 1.08–1.14), as were women who were 35 to 39 years old (odds ratio, 1.28; 95% CI, 1.24–1.32). Extremes of maternal reproductive age predicted a higher risk of stillbirth and this effect persisted even after adjustment for several maternal, placental, and fetal risk factors (Hughes and Riches 2003).

Being born to a teenaged mother puts children at risk of several adverse outcomes later in life. Children of teenage mothers are more likely to be poor, abused, or neglected.
than those of women who delay childbearing, and they are less likely to receive proper nutrition, health care, and cognitive and social stimulation (Annie E. Casey Foundation 1998). Maynard’s (1997) study showed that children born to teen mothers are also at greater risk of lower intellectual and academic achievement and social behavioral problems. Children of teenage mothers are almost three times more likely to be incarcerated during their adolescence or early 20s than the children of older mothers. These children also are less likely to graduate from high school, more likely to be unemployed and to become teenage parents themselves than children born to women who delay childbearing (Maynard 1997).

**Behavioral Risks and Outcomes**

There are several behaviors that researchers agree affect pregnancy outcomes. These include obtaining adequate prenatal care, proper nutrition, alcohol, drug and tobacco use during pregnancy and risky sexual behavior.

Early and adequate prenatal care is critical to improving maternal perinatal outcomes. Delaying prenatal care places pregnant women at risk of timely preventive care that can detect complications of pregnancy which result in maternal and/or fetal morbidity and mortality. Women who delay prenatal care (entry after the first 12 weeks of gestation) or receive no prenatal care are three times more likely to have a low birth weight infant than women receiving adequate prenatal care (Anachbe and Sutton 2003).

Of all the maternal age groups, pregnant adolescents are the least likely to get early and adequate prenatal care. In 2002, almost seven percent of pregnant teens between 15 and 19 years old received late or no prenatal care. This compares to less than
four percent of pregnant women for all other ages (Guttmacher Institute 2003, March of Dimes 2004). Akinbami et al.’s (2000) national cross-sectional analysis found that multiparous adolescents were more likely to obtain late, inadequate or no prenatal care when compared to 25-year-old multiparous women.

Another behavioral factor associated with birth outcomes is proper nutrition. Recent literature has devoted a considerable amount of discussion to the topic of nutrition. The American College of Obstetricians and Gynecologists (ACOG) (2008) recommends that pregnant women eat a well balanced diet and increase the number of servings of a variety of foods from each of the six basic food groups. For most women, this is about 300 extra calories a day (American College of Obstetricians and Gynecologists 2007). Although ACOG recommends taking folic acid supplements several years prior to conception, vitamin and mineral supplements during pregnancy are not recommended unless advised by the doctor.

Guidelines for pregnancy weight gain have been highly controversial in the United States over the past 50 years. In the 1960s, women were encouraged to gain only about 15 pounds during their pregnancy. However, by the 1970, obstetricians began challenging these guidelines after they came to realize that the practice of severely restricting weight gain during pregnancy was associated with increased risk of preterm birth and low birth weight (Abrams et al. 2000, Barwarsky et al. 2005, Howie et al. 2003). This recognition led to a report by the Institute of Medicine (IOM) in 1990, and later in 2009, recommending pregnancy weight gain based on pre-pregnancy body mass index rather than just weight gain. Subsequent studies have shown that pregnancy weight gain within the IOM ranges generally leads to better outcomes for both mothers and
infants, and maternal weight gain outside the IOM parameters are associated with twice as many poor pregnancy outcomes (Abrams et al. 2000), including gestational diabetes (Turok et al. 2003), cesarean deliveries (Galtier-Dereure 2000), shoulder dystocia (Jevitt et al. 2008), low Apgar scores, macrosomia, and neural tube defects (Galtier-Dereure 2000). In addition, mothers who are overweight are less likely to breastfeed, and more likely to have delayed milk production and to early cessation of breastfeeding (Jevitt et al. 2007).

In one national study comparing adolescent and adult maternal weight gain, Howie et al (2003) found teens were more likely to gain an excessive amount of weight during their pregnancy than older non-adolescent women. The authors found that excessive weight gain is most likely attributable to the adolescent’s need for nutrition to meet her own growth needs as well as the needs of her growing fetus. The study also found that younger mothers were most likely to gain excessive weight during pregnancy, and the risk of high maternal weight gain decreased as maternal age increased. There is evidence that these teens tend to retain the excess weight postpartum and are more likely to retain some of this weight and continue to gain weight with each subsequent pregnancy putting them at even greater risk and at an even younger age of hypertension, heart disease, diabetes and some types of cancers. Excessive weight gain was most often found among non-Hispanic teens. The investigators speculate that this is due to inadequate prenatal care and nutritional advice (Howie et al. 2003). As Jevitt (2005) notes, annual gynecologic visits are often the only time young women see a health care provider and she recommends that gynecologic and family-planning care providers monitor weight
gain and offer their patients counseling and guidance on weight maintenance or reduction at annual examinations.

Studies also recognize that there are other biological and social factors that affect birth outcomes, and inadequate or excessive weight gain can serve as useful markers of risk. Barwarsky et al. (2005) investigated the interrelationship of pre-pregnancy factors, pregnancy factors and social issues related to excessive or inadequate gestational weight gain. The investigators found that women with high pre-pregnancy BMI were most likely to have excessive weight gain during pregnancy while women with a low pre-pregnancy BMI were most likely to have inadequate weight gain. Of significance in this study, of all the food groups, low dairy consumption was found to be associated with inadequate weight gain. In addition, women who experienced high stress during pregnancy were more likely to have inadequate weight gain compared to women with low stress levels. This study suggests pre-pregnancy education and interventions are more appropriate for women at risk of excessive weight gain while interventions during pregnancy may be more successful with women at risk of inadequate weight gain (Barwarsky et al. 2005).

The use of alcohol, tobacco and drugs during pregnancy is associated with associated with pregnancy complications, intrauterine growth restriction, low birth weight, and infant mortality. According to the Centers for Disease Control and Prevention (2007), pregnant adolescents are more likely to smoke than pregnant women over age 25. In 2004, about 17 percent of pregnant teens under age 19 smoked during the last three months of their pregnancies, compared to an overall rate of 13 percent among all women.
Akinbami et al.’s (2000) national cross-sectional analysis found that white mothers have the highest prevalence of smoking and the prevalence of tobacco use in this group peaks between the ages of 15 and 19 years. African American teens also have an increasing prevalence of tobacco use as maternal age rises. Hispanic teens have a relatively low prevalence of maternal tobacco use for all age groups.

In addition, appropriate weight gain is affected by cigarette smoking. In a study among Medicaid eligible women ages 17 and older, Furuno et al. (2004) examined for the first time, the association between low maternal weight gain, as defined by the Institute of Medicine (IOM 1990) recommendations and cigarette smoking. This study showed that smokers were 1.34 times more likely than non-smokers to gain less than the IOM recommended weight (Furuno et al. 2004). In addition, the odds of inadequate maternal weight gain consistently grew with an increasing number of cigarettes smoked per day. In the United States, young people use alcohol and other drugs at high rates, and are more likely to engage in high risk behaviors, such as unprotected sex, when they are under the influence of alcohol or drugs. According to the Centers for Disease Control and Prevention (2004), 23 percent of high school students who had sexual intercourse during the past three months used alcohol or drugs beforehand.

Galvez-Myles and Myles’ (2005) research, however, contradicts some of the adolescent tobacco and drug-use findings. In their retrospective cohort study in rural Texas, the authors found that teens did not have significantly higher frequencies of drug or tobacco use. However, teens in this study did have a higher incidence of sexually transmitted diseases than did the teens in Eure et al.’s (2002) retrospective cohort study in
an inner-city setting, suggesting possible geographic differences or differences between rural and urban adolescents.

Finally, risky sexual behavior can put teens at risk. According to the Centers for Disease Control and Prevention (2004), three million teens in the United States are affected by sexually transmitted diseases annually. Teens account for about one-fourth of all the cases reported. Sexually transmitted diseases include chlamydia and gonorrhea (which can cause sterility and infant blindness), syphilis (which can cause infant blindness and death as well as maternal death) and HIV (the virus which causes AIDS, which may be fatal to the mother and infant).

**Social Risks and Outcomes**

Studies show that teen parenthood tends to result in lack of social and economic resources. When compared to peers who delay childbearing, teenage mothers are more likely to be poor, receive welfare, and are less educated. Estimates show that approximately two-thirds of families begun by teen mothers are poor and about one-quarter of adolescent mothers will go on welfare within three years of the child’s birth (The National Campaign to Prevent Teen Pregnancy 2010). In addition, only about 38 percent of adolescents having children before they are 18 earn a high school diploma (Perper et al. 2010) and less than two percent will complete college by the time they are 30 (Hoffman 2006).

Although adolescent pregnancy can be found in all socioeconomic groups and all racial groups, large variations are found between different socioeconomic and racial/ethnic groups. The Penn Study of Teenage Pregnancy examined several
psychosocial factors associated with adolescent pregnancy from the perspective of 326 African American teens between the ages of 13 and 17 years who were enrolled in family planning and obstetric services at the Hospital of the University of Pennsylvania in the early 1980s. The study followed teen participants for two years to investigate changes in initial pregnancy status as well as changes in perceptions and behavior over time (Freeman and Rickels 1993).

The Penn Study revealed changes in psychological and emotional factors. The delivery group reported deterioration in esteem in the family relations dimension, suggesting that childbearing did not enhance their status in the family, but instead resulted in additional responsibilities and difficulties. The delivery group also exhibited the least future orientation as rated by the interviewers at every assessment point, whereas the never-pregnant and abortion groups were more likely to recognize that postponing motherhood was important for achieving other educational and career goals (Freeman and Rickels 1993:37).

One of the more interesting findings in the Penn Study concerns teens’ desires to become pregnant. Although study participants reported that they never strongly “wanted” a pregnancy, the study showed that those who became pregnant did so because pregnancy was not sufficiently unwanted enough to prevent them from becoming pregnant. In other words, study participants did not believe the consequences of pregnancy would negatively affect their lives. The study also showed that personal and familial factors associated with making pregnancy unwanted enough to actively avoid it included strong educational and career goals that teens felt would be impeded by a baby, and family attitudes that oppose childbearing at a young age. The opposite was true for
study participants who gave birth. They reported less support from their families for education and career goals and nearly two-thirds thought their mothers would be happy if they had a baby (Freeman and Rickels 1993).

A great majority of the teens in the Penn Study perceived a generalized level of social and familial acceptance of early childbearing. Twenty-eight percent of the participants had a sister who gave birth as a teen and over three-fourths said their close girlfriends had babies. And most of the study participants believed that their family would provide financial, material and social support if they had a baby. Interestingly, most teens felt that their family and friends would not support them in a decision to terminate their pregnancy. Although interviews with family members and friends was not part of this study, perception appears to guide behavior of these teens (Freeman and Rickels 1993).

The Penn Study also briefly investigated repeat pregnancies during the study period. Results showed that adolescents who had a second pregnancy fell further behind in school and were less likely to have set occupational goals by the two-year follow-up. In addition, the study found that those who had a repeat birth were:

- less likely to be using contraception
- more likely to be younger (ages 13-15) at first birth
- four times more likely to be below their school grade level
- twice as likely to have fallen behind in school
- less likely to believe they could achieve their occupational goals
- more likely to have higher depression levels as measured by the SCL-90

Freeman and Rickels (1993:117) concluded that “Childbearing brings personal satisfaction but also has negative social and economic outcomes that young teens neither
know nor understand.” In a ten-year follow-up to the Penn Study, researchers found that 35 percent of the teens without children during the study still had no children after almost ten years. Those with children during the study had an average of 1.7 children with a range from 1 to 4. Overall, about 83 percent had completed high school. All but one of those not completing high school had a child during the study. Women with children had lower incomes than those without children ($12,000 compared to $18,000) in their mid-twenties, and this was not changed by when they had the child, whether it was before or after completing high school, nor by the number of children they had. The researchers concluded that long-term economic disadvantage was related to teen childbearing (Freeman and Rickels 1993:117).

In a particularly compelling nationally-conducted retrospective cohort study among 9,159 women, Hillis et al. (2004) found that the impact of cumulative exposure to childhood abuse and family dysfunction increased the likelihood of adolescent pregnancy and long-term psychosocial consequences. Assigning one point to each of eight adverse childhood experiences (ACEs), the researchers found that as the number of ACEs increased, so did the likelihood that an adolescent would become pregnant. In addition, as the number of ACEs increased, women who gave birth as an adolescent were incrementally more likely to experience long-term psychosocial consequences, including family problems, job problems, financial problems, difficulty controlling anger and high levels of stress as adults. Unlike the studies discussed above that attempt to show teenage childbearing places women at risk of undesirable psychosocial outcomes as adults, Hillis et al. (2004) concluded that exposure to adverse childhood experiences results in adolescent childbearing and undesirable psychosocial outcomes in adulthood.
From a more anthropological perspective, viewing the issue of teenage childbearing historically and cross-culturally provides insights into modern-day social concerns. Lawlor and Shaw (2002) note the acceptable age for childbearing has shifted over time. The authors observe that with the rise of western biomedicine in the 18th century, came the medicalization of pregnancy. This was the beginning of a “shift of power relations by which women’s bodies and the reproductive process came to be seen as legitimate subjects for social control” (Lawlor and Shaw 2002:552).

By the end of the 20th century, many developed countries of the world deemed teenage childbearing to be a “national public health problem requiring targeted intervention,” regardless of the country’s teen birthrate (Lawlor and Shaw 2002:552). Although most developed countries view teen pregnancy and child bearing as socially, culturally and economically unacceptable, in some cultures (such as in an ultra-orthodox Jewish community in Jerusalem and in the country of Nepal) childbearing at a young age is encouraged (Lawlor and Shaw 2002a, Smith 2001). Research has found no association between age of the mother and adverse birth outcomes in these cultures.

The literature also supports the notion that other factors beside age affect birth outcomes. Cunnington (2001:40) states, “The risks associated with young age (OR ranging from 1.2-2.7) are modest compared to those for the social, behavioural and economic risk factors.” The author asserts the literature clearly demonstrates that the increased risk of adverse birth outcomes, such as anemia, pregnancy-induced hypertension, low birth weight, prematurity, intrauterine growth retardation and neonatal mortality, were predominantly caused by the social, economic and behavioral factors that predispose some young women to pregnancy.
Although there is compelling evidence that teen pregnancy causes biopsychosocial harm, Hoffman (1998) cautions against confusing correlation with causation. He contends that many studies merely show correlations or associations which put adolescent mothers and their children at increased risk of certain undesirable outcomes. For example, Hoffman (1998) contends that adolescent childbearing does not cause low educational attainment or poverty, and there is no evidence that changing a woman’s age at first birth would dramatically change conditions in her life. This idea is support by Hillis et al.’s (2004) study of adverse childhood experiences. Still, whether adolescent pregnancy leads to adverse maternal and child outcomes or whether these outcomes are consequences of the same adversity that led to adolescent pregnancy continues to be debated.

Factors Associated with Adolescent Childbearing

Although teen birth indicators tell us about existing conditions and the outcomes of childbearing, they do little to inform us about why teens are getting pregnant. There are dozens of hypotheses on the causes and factors leading to adolescent childbearing and an extensive review of all these hypotheses is beyond the scope of this literature review. However, four studies in particular exemplify the various perspectives and hypotheses of why some teenagers get pregnant and bear children. These hypotheses are anthropological in nature and use perspectives that fit well with socioeconomic theory used in this dissertation’s research. This selected literature on teenage childbearing that attempts to explain why adolescent girls get pregnant and bear children include biological interpretations (Geronimus’ 2003 Weathering Hypothesis), political economic
considerations (Luker’s 1996 assertion that teen childbearing is a result, not a cause, of poverty), individual explanations (Kaplan’s 1997 notion of “relationship poor”), and social perspectives (Stack’s 1974 ideas of support systems). While these authors do not believe early childbearing is necessarily advantageous to adolescents, these authors do provide possible reasons for why it is occurring.

Geronimus’ (2003) *Weathering Hypothesis* explores the biological effects of social and economic inequality on African Americans. Geronimus (2003) contends that the difference in fertility timing between low-income African Americans and more advantaged whites is tied to health considerations, social support and future educational and career opportunities. She notes that among African Americans in high-poverty urban areas, early childbearing mitigates severe health risks by reducing rates of infant mortality and the chance of the child being orphaned. In addition, members of the extended family, which often form the new mother’s support network, are more likely to be in better health and can therefore assist with child rearing and will be less likely, themselves, to need care due to poor health. In contrast, the nuclear family ideal found in more advantaged, white populations, “calls for parents to be self-sufficient in the care of their children,” which is best achieved by delaying child bearing. In general, members of more advantaged groups “can expect access to high-quality and advanced education as well as opportunities for financial security, rewarding careers and long lifetimes” (Geronimus 2003:886).

Geronimus (2003) states that the message often promoted by organizations and programs addressing teen pregnancy contend that teen childbearing has negative consequences for teen mothers, their children, and society, and that this “well-publicized
conventional wisdom continues to hold teen childbearing to be, in all cases and in every aspect, an antisocial act and an important public health problem, especially when practiced by urban African Americans” (Geronimus 2003:882). Geronimus’ (2003) also challenges the perceived association between teenage childbearing and poor maternal, infant and social outcomes, asserting this notion is not supported by empirical evidence. In fact, a significant body of reputable scientific evidence exists contradicting this perception (Geronimus 2003). Contrary to the “dominant culture’s beliefs,” studies have shown that “Among African Americans, rates of low birth weight and infant mortality are lowest for babies whose mothers are in their mid to late teens.”

Discussions of unmarried young people having babies persisted for years. Using a social-construction model for her analysis, Luker (1996) argues that public perception of teenage mothers has come to represent challenges faced in modern society, including societal perceptions involving race, age, gender and poverty.

Luker (1996) presents the voices of the young mothers to tell their stories of motherhood, the challenges they face and their attempts to find meaning in motherhood. She also presents a multi-causal explanation for adolescent childbearing, stating that teen pregnancy and childbearing can be attributed to poverty, limited life choices, ineffectiveness with respect to contraception, and difficult negotiations around sex with their male partners.

According to Luker (1996), three major issues - childbearing by unmarried women, the proper age to begin childbearing, and who is fit for parenthood - have been at the forefront throughout US history. She investigates the evolution of public perceptions about teenage pregnancy during the twentieth century, and argues that teenage pregnancy
should be recognized not as a cause of poverty, but rather as a result of poverty. She concludes that teen mothers are not pathological, but rather they are young mothers whose problems must be understood in the context of the larger society.

Kaplan’s (1997) ethnographic work with black teenage mothers examines the strategies these girls adopt for survival. Her observations reveal that although these strategies make sense to these young girls within their social environment, they turn out to be inadequate. Kaplan emphasizes that the lives of these young mothers is not deviant, but rather that pregnancy at a young age is intentional. This, she concludes, raises the possibility that socioeconomic status is deeply intertwined with the psychological growth of adolescent girls. Her work found that the black community does not now, nor ever did, condone teenage pregnancy. “Pregnant teenage girls were considered deviants in the past and are still considered so today by many in the black community” (Kaplan 1997:12).

Kaplan discusses the social and economic changes that have eroded black families’ base of social support. First, community life of the 1950s and 1960s where two-parent families lived in stable neighborhoods and everyone knew each other, no longer exists. In addition, economic shifts during this time had a dramatic impact on poor black neighborhoods. Jobs and small businesses disappeared as the service sector overtook the industrial base, and small apartment buildings were replaced with densely populated housing projects. This resulted in a rise in poverty and single-parent households, setting the stage for gangs, drugs and family disruption.

Kaplan studied 32 teenage mothers from areas of Oakland and Richmond, California. She found that black middle-class flight to the suburbs left urban teens with
drug dealers, sports figures and show business entertainers as models for success. School courses focused on skills needed for low-paying jobs, such as cosmetology or secretarial positions. Often girls lacked relationships teachers or other responsible adults in school, which would have enabled them to see beyond gender ideology and stereotypes about black girls.

In addition, the girls often had a strained relationship with their mothers, a history of childhood sexual abuse, a lack of understanding of their sexuality, no positive role models for relationships with men, and little knowledge of birth control. From the girls’ perspectives, they believed they gave birth to receive the love (from their child) and support (from the baby’s father) that they did not get from their mothers.

Kaplan found that two assumptions from earlier literature regarding reactions to teen childbearing no longer apply. First, adult black mothers do not generally support and encourage their daughters to keep and raise the babies, and second, support of teen mothers and their babies is no longer linked to the existence of an extended family support system.

From the pregnant teens’ perspective, their mothers viewed them as deviant. All but one teen in this study reported that their mothers insisted that they have an abortion. After the baby was born, the teens reported that they felt their mothers were punishing them because they were not mothered as they had been before the baby was born. Additionally, their mothers made them feel incapable of caring for their babies by usurping responsibility for the children or harshly criticizing the new mothers’ child care practices. Teen mothers all also reported confusion about their mother’s wishes regarding marriage, place of residence and financial support. Finally, most of the teens
said they primarily relied on one or two friends for support, the babies’ fathers and other
kins, as well as acceptance and assistance from their churches, were absent from their
support system.

Regarding adult mothers, Kaplan found a strong belief in what she calls a
“mothering mandate,” a belief that all mothers are expected to mother their children.
This is consistent with the theory of the patriarchal family structure, contending that
fathers provide economic support and authority while mothers are responsible for raising
children with the proper values and behavior. All mothers, Kaplan found, were deeply
disappointed in their daughters when they became pregnant, despite the aspirations they
held for their daughters. However, lower class mothers felt their daughters had failed
them, while middle class mothers felt cheated of their image of middle-class
respectability.

Kaplan’s study also reveals complex and widely variable relationships between
the teen mother and the baby’s father. The father contributed very little, if at all, to the
financial support of the child, or to the emotional support of the child’s mother.
Nevertheless, most teen mothers felt that the fathers loved the children. A majority of the
new mothers knew very little about their babies' fathers' personal histories or their current
lives. And, most relationships ended abruptly when the father found out the girl was
pregnant, in spite of the length of the relationship. Contact with the child was limited and
sporadic. For the most part, these patterns reflected the teens’ relationships with their
own fathers and provided a model for the meaning of the mother/father relationship and
family life.
At one time or another, all the teen mothers in Kaplan’s study were on some form of public assistance. Their experiences with the welfare system and the public perception of welfare recipients also demonstrate a lack of support. In response, Kaplan found that teen mothers developed strategies to help them handle the stigma associated with welfare use. Yet, due to the structure of the system, these teen mothers regarded public assistance programs as hindering the possibility of becoming self-sufficient. Kaplan reports that a majority of teen mothers she interviewed regretted having a baby at such a young age.

Working from a feminist perspective, Kaplan contends that childbearing among African American teens should be analyzed by studying the interactive effects of gender, race and class. Kaplan (1997:68) concludes, “Black teenage girls’ experiences are rarely understood as part of the larger economic and social shifts in the lives of teenagers, women, and Americans in general.”

One classic work, Stack’s 1974 ethnographic study of poor, black families explores cooperation within social networks as an adaptive strategy for dealing with urban poverty and racism. She presents a picture of complex patterns of exchange interactions among kin and non-kin in The Flats, a poor black, urban community. The cooperative life style, built upon exchange and reciprocity, enables community members to respond to poverty, unemployment and scarce resources.

Using the ethnographic method, Stack investigates how people manage to survive despite great economic hardship. She found people in The Flats employed a number of survival strategies that involved family and extended kin. For example, Stack found that membership in a household is fluid in The Flats, yet fluctuations in household composition did not significantly affect the durable kin networks and cooperative familial
arrangements. It is the resulting collective power that kept people from going hungry and helped to keep a roof over their heads. A complex network of reciprocal exchange with a kin network also plays a large part, as does attracting others to participate in these social networks. Marriage is one example of this, and potential mates must be chosen carefully on their ability to fulfill kinship obligations.

Regarding the subject of motherhood, Stack (1974:46) states that, “Men and women in The Flats regard child-begetting and childbearing as a natural and highly desirable phenomenon.” She contends that restrictions on age, marital status, and number of children are all but non-existent, and in fact, “very few women in The Flats are married before they have given birth to one or more children (Stack 1974:50). When a young woman becomes pregnant with her first child, it is unlikely that she and the father will set up a separate household. They will more likely remain living in the homes of the kin who raised them. In the case of teen childbearing, the first child is often raised by a close female relative, although a majority of mothers in The Flats are the natural mothers of the children they are raising.

Stack demonstrates that the negative features often attributed to poor African American families (fatherless, matrifocal, disorganized, unstable) were not characteristic of the families she studied. Instead she found “the Black urban family, embedded in cooperative domestic exchange, proves to be an organized tenacious, active, lifelong network” (Stack 1974:124). She found that poor blacks share the same dreams and aspirations as mainstream society. However, the immediate need for survival is met in creative ways through strong loyalties to kin, internal sanctions, and a complex network
of exchanges and obligations. Stack’s (1974:129) study presents “a powerful challenge to the notions of a self-perpetuating culture of poverty.”

Smith (2002) questions whether this public health “problem” lies with the age of the mother, with other factors affecting the health of the mother and baby or with the attitudes towards women’s reproductive lives. The literature supports the notion that the young age of the mother presents a social or moral concern rather than an actual public health problem. Cunnington (2001:40), for example states, “It makes little biological sense for young women to be able to reproduce at an age that puts their children at risk.” In fact, Cunnington’s (2001) extensive review of the literature shows most teenage pregnancies are low risk. Additionally, women having babies their 30s and 40s and women who receive infertility treatment are not considered a public health problem in spite of the increased risk to both mother and infant(s) (Lawlor and Shaw 2002).

The literature also supports the notion that other factors beside age affect birth outcomes. Cunnington (2002:40) states, “The risks associated with young age (OR ranging from 1.2-2.7) are modest compared to those for the social, behavioural and economic risk factors.” The author asserts the literature clearly demonstrates that the increased risk of adverse birth outcomes, such as anemia, pregnancy-induced hypertension, low birth weight, prematurity, intrauterine growth retardation and neonatal mortality, were predominantly caused by the social, economic and behavioral factors that predispose some young women to pregnancy.

Finally, the literature supports the notion of teen childbearing being socially unacceptable in the dominant culture of the United States. Lawlor and Shaw (2002a:558) argue that “the underlying problem lies in society’s attitudes towards young people and
specifically in attitudes towards women’s reproductive lives.” Although it has been alleged that teenage childbearing is associated with increased risk of poor social, economic and health outcomes for both the mother and child, the authors argue that if women in the United States could begin their families in their teens and return to education or a career in their twenties without prejudice and with proper support, there would be no problem. Supporting this idea, among cultures where early childbearing is encouraged, social and community support appear to serve as protective factors against the new mother’s inexperience and economic hardship (Lawlor and Shaw 2002, Smith 2001).

Solinger (1992) also explores the historic relationship between race and unwed motherhood, including the time in which Stack conducted her ethnography. The findings of the two authors are similar. Solinger’s exploration of attitudes toward unwed pregnancy prior to the US Supreme Courts 1973 decision legalizing abortion in the case of Roe v. Wade reports similar cultural, racial and economic reasons why black, single, pregnant women were not generally rejected by their families or turned away from their communities. Solinger, like Stack, notes that black families, for the most part, accepted unwed pregnancies and made a place for the new mother and child in the family and the community. The response of the black community to out-of-wedlock pregnancy and childbearing was to organize itself to accommodate the mother and child. In contrast, the white community was unwilling and unable to do so, and simply reorganized itself by expelling the mother and child, usually by labeling the mother as ‘psychologically impaired,’ ‘deeply neurotic,’ or at the very least, an unfit mother and by placing the child with a nice middle-class couple who could provide the baby with a proper family.
Solinger (1992) concludes that, “Race, in the end, was the most accurate predictor of an unwed mother’s parents’ response to her pregnancy; of society’s reaction to her plight; of where and how she would spend the months of her pregnancy; and most important, the most accurate predictor of what she would do with the “fatherless’ child she bore, and of how being mother to such a child would affect the rest of her life” (Solinger 1992:18). In other words, Solinger contends that in post World War II American society, race was emerging as a vital pressing social issue and it was the distinction between races that eclipsed issues such as social class, regional differences in mores, and the age of the new mother.

**Summary of the Literature**

The literature reviewed in this chapter provided direction and guidance, as well as insights and ideas for relevant techniques to inform a newly emerging “applied anthropology of GIS/spatial analysis.” Spatial studies using GIS techniques conducted by anthropologists and archaeologists, as well as authors in other disciplines, have provided a basis on which to begin to build this dissertation’s research. The GIS methods of hot spot analysis, cluster analysis and multilevel models have guided the methods used and provided future directions for research. While ecosocial theory was used to frame my research, this represents only one way to frame spatial studies. Finally, literature on maternal and child health outcomes, resulting from adolescent childbearing, and hypotheses regarding the causes of teen motherhood present information that was directly used in my analyses.
CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

This research presents an analysis that takes the first steps toward the development of an “applied anthropology of spatial analysis/GIS” by using software and techniques that are more readily available and familiar to many anthropologists for new and challenging applications. This research identifies the distribution of teen births in Hillsborough and Pinellas Counties and considers the neighborhood factors that contribute to adolescent childbearing in these areas using spatial analysis/GIS techniques. A mixed method design provides information from quantitative, spatial, and qualitative perspectives.

Overview of the Research Problem

Florida is a large, heterogeneous state with considerable diversity in population density, demographic characteristics and cultural variation in different areas of the state. And like Florida, the counties of Hillsborough and Pinellas are also diverse. During the years between the 1990 and 2000 U.S. Decennial Censuses, these two counties, also known as part of the greater Tampa Bay area, have seen an increase in minority residents as well as a growing population of youth under 20 years of age (Florida Legislature 2009).

This increase in population and ethnic diversity has not occurred at the same rate in all parts of the Tampa Bay area, nor has it occurred at a steady rate over time. Looking at county-level data obscures the sometimes dramatic differences at the sub-county
geographic level. In other words, demographic and socioeconomic variations in communities and neighborhoods are not detectable when analysis is conducted on a wider geographic scale, such as counties (Aiken et al. 1991, Krieger et al. 2004, Reader 2000).

With rising demand and dwindling resources, local health agencies, community-based organizations and policymakers need local data for program planning, program evaluation and resource allocation (Jia et al. 2004). Using small area analysis (also called area-based socioeconomic measures or ABSMs), this research focuses on contributing to the development of an “applied anthropology of spatial analysis/GIS” by identifying neighborhood variables, that is, information on neighborhood-level conditions, that can help to provide a different perspective on the ways in which patterns of teenage childbearing align with conditions in the neighborhoods where these teen mothers live.

**Research Objective**

The work described here builds on spatial analytic methods described by Steven Reader (2000), Nancy Krieger (2004) and Taylor and Chavez (2002). Reader’s (2000) method analyzes spatial variation of low birth weight black infants in Florida by first identifying statistically significant high rate clusters and statistically significant low rate clusters of low birth weight black births and then comparing these clusters with the socio-demographic characteristics of their respective census tracts. Similarly, Taylor and Chavez (2002) investigated teen birth hot spots in California at the census tract level. Krieger (2003b) measures socioeconomic inequality and its relation to public health issues. Again, the unit of analysis for Krieger’s work is the census tract. All of these
works were conducted at a sub-county level because, as the authors state, spatially aggregated outcome data can hide important geographic variability.

**Research Design**

This study incorporates three aspects of applied anthropology – framework, fieldwork, and practical application (Hopper 2000). It is comprised of two main spatial-statistical analyses that provide a framework for this research – hot spot analysis and neighborhood analysis. Hot spot analysis identifies where rates of adolescent births are statistically significantly high or low and presents these hot spots and cold spots spatially on a map. Neighborhood-level analysis is used to geographically explore socioeconomic factors and how these factors geographically align to teenage childbearing. In addition, a series of two interviews with teen pregnancy prevention service providers and individuals from funding agencies were conducted to discover factors that they articulated as perhaps leading to adolescent childbearing and to discover providers’ opinions on the usefulness and relevance of the results of this type of research for the work they do.

**Existing Data Sets Used**

Several existing data sets were used in the development of this model. These data sets include:

- U.S. Census Bureau, American FactFinder Datasets
  - 1990 U.S. Census of Population and Housing Summary File 1 (1990 SF1)
  - 1990 U.S. Census of Population and Housing Summary File 3 (1990 SF3)
- U.S. Census Bureau's Annual Population Estimates
- Florida Community Health Assessment Resource Tool Set (CHARTS)
- Neighborhood Change Database (NCDB)

All of these data sets contain only de-identified data. In other words, these files do not contain any information that could identify an individual (e.g., name, address, Social Security Number, insurance number, etc.)

A description of each of these datasets and a discussion how it is used in this dissertation’s research follows.

1990 and 2000 Decennial U.S. Census of Population and Housing

Every ten years, in years ending in zero, the United States conducts a decennial census to count the population and housing units for the entire United States. Although the primary purpose of the decennial census is to provide population counts for determining how seats in the U.S. House of Representatives are apportioned, census data are used in many other ways that are well suited to this research. According to the U.S. Census Bureau (1994), census data are used to determine the distribution of government program funding (e.g., Medicaid), in planning the right locations for schools, roads, and other public facilities, for helping real estate agents and potential residents learn about a neighborhood, and in identifying trends over time that can help predict future needs. Investigating trends in adolescent childbearing, as demonstrated in this research, can assist in focusing efforts in high need areas as well as program planning and funding allocations.
Two versions of questionnaires are used to collect data in each decennial U.S. census. The first, referred to as the Short Form Questionnaire, asks a limited number of basic questions of each member of each household. The other version of the questionnaire, referred to as the Long Form Questionnaire, asks all of the questions included on the Short Form Questionnaire plus additional questions regarding population and housing characteristics. The Long Form Questionnaire polls a sample of households, resulting in data sets that are statistically weighted to represent the entire population. The Short Form contains data from the 100 percent count on age, race, sex, marital status, and Hispanic origin, as well as a limited amount of housing-related information (U.S. Census Bureau 2002).

Data collected from the census Short Form Questionnaire are presented in Summary Files 1 and 2 (SF1 and SF2), while Summary Files 3 and 4 (SF3 and SF4) contain data from the Long Form Questionnaire. According to the U.S. Census Bureau (2002), Summary File 1 provides numbers for the exact data collected, even for very small groups and areas, whereas, Summary File 3 gives estimates for small groups and areas (U.S. Census Bureau 2002).

Data from the 1990 and 2000 U.S. Census of Population and Housing Summary File 1 were used in determining denominators for the model being developed in this research. Although SF1 files contain fewer data elements than SF 3 files, there is more specificity in ages which better lends itself to calculating the datasets necessary to determine denominators for birth rates in the model. Data from the 1990 and 2000 U.S. Census of Population and Housing Summary File 3 were used in the neighborhood analysis. Detailed application of specific data is discussed below.
**U.S. Census Bureau's Annual Population Estimates**

In addition to conducting decennial census counts, the U.S. Census Bureau’s Population Estimates Program produces population numbers between censuses. Estimates are produced for each year between past censuses, while population projections are for future years. In general, population estimates are calculated using data for births, deaths and migration collected from various sources and are used to determine Federal funding allocations and in monitoring demographic changes, among other things.

Data from the U.S. Census Bureau’s Population Estimates Program were used (in conjunction with the 1990 and 2000 decennial census data) in determining denominators for the birth rates in the model being developed in this research. The details of this process are described below (U.S. Census Bureau N.d.(a)).

**Florida Community Health Assessment Resource Tool Set**

The Florida Department of Health’s *Community Health Assessment Resource Tool Set* (CHARTS) includes data related to health statistics, such as births, deaths, disease morbidity, population and behavioral risk factors. Data in the Florida CHARTS interactive statistical database also includes population estimates obtained in 5-year age-groups (e.g., 0-4, 5-9, 10-14 etc.) from the Florida Legislature’s Office of Economic and Demographic Research (EDR). Population estimates on the Florida CHARTS website for individual year of age populations are calculated by dividing the 5-year age-group totals by 5. Data for the population under one year of age are obtained from birth and infant death data, rather than by dividing the 0-4
year-old population by 5. Data for the 1-4 year-old population are determined by subtracting the under one year-old age population based on birth and infant death data from the 0-4 year-old population provided by EDR. The difference is then divided by 4 to produce estimates for the individual ages of 1 year-olds, 2 year-olds, 3 year-olds, and 4 year-olds.

In addition to age specific data, Florida CHARTS also provides population data and estimates by race and by Hispanic origin. Although the U.S. Census Bureau provides population estimates for inter-decennial census years, the data provided by the EDR was updated in 2009. The decision was made to use this more recent data for population estimates for white and African American adolescents. Population estimates for Hispanic and Non-Hispanic populations are not available from the EDR prior to 2004, so these estimates were obtained from the U.S. Census Bureau’s Population Estimates. Single age by race data were used to determine denominators for the birth rates in the model being developed and to calculate expected adolescent birth rates for the cluster analysis discussed in further detail below.

**Neighborhood Change Database (NCDB)**

The Neighborhood Change Database (NCCD) provides selected U.S. Census data elements from the 1970, 1980, 1990 and 2000 censuses. Funded by a grant from the Rockefeller Foundation, The Urban Institute partnered with GeoLytics, Inc., a private firm specializing in the development of demographic and geographic data products, to
develop a method of normalizing earlier census data to the 2000 census tract data elements and geographic boundaries, allowing for comparison over time.

The NCDB was used in this research to “bridge” the racial categories between the 1990 and 2000 U.S. Censuses. The method used by the NCDB to “bridge” race was developed by Jeffrey Passel of the Urban Institute’s Population Studies Center. This method, according to Tatian (2003:4-7), “assigns multiracial groups to single races according to the rules below, in descending order of priority:

1) Black + any other race, assign to Black, otherwise
2) Asian + any other race, assign to Asian, otherwise
3) Native Hawaiian/Other Pacific Islander (NH/OPI) + any other race, assign to NH/OPI, otherwise
4) White + any other race, assign to White, otherwise
5) American Indian/Alaskan Native (AI/AN) + any other race, assign to AI/AN, otherwise
6) Assign to “Some other race” (only people selecting this alone are assigned to that bridging category)”

Although the NCDB uses the census tract as the primary geographic unit of analysis, this database was also used to verify the method used to “normalize” 1990 to 2000 census block groups. This method is described in further detail below.

State of Florida Vital Statistics Birth Data Files

Vital statistics records, which include births, deaths and marriages, are collected and maintained by the Florida Department of Health. Vital statistics provide the foundation upon which many parts of a public health program are constructed and are regarded as an indispensable tool for the proper planning, management, and evaluation of many health programs (Florida Department of Health 2007).
Birth records provide information on the number of births and birth rates for geographical areas and various population groups. Data are used to estimate and predict family size and population growth. Health officials use birth data in planning and evaluating a wide range of health programs, including maternal and child health programs. Economists use birth statistics to estimate the size of the future labor force, and businesses use the data to estimate the future market demand for their product. In addition to informing public programs, a birth record is the fundamental document where proof is required of age, citizenship, or family relationship is required (Florida Department of Health 2007).

Florida Vital Statistics birth files contain records of all live births to residents of Florida, regardless of where the baby was born. Cooperative agreements exist between states for sharing vital statistics records. When a Florida resident gives birth in another state, that state will send a copy of the birth certificate to the Vital Statistics Office in Florida (Florida Department of Health 2007).

Birth data provide the numerators for the hot spot analysis described below. Birth data were also used for descriptive statistics which provide context and insights into the distribution of variables.

**Determining Teen Birth Rates**

To begin the hot spot analysis process, teen birth rates needed to be determined. Rates serve to standardize the number of births to adolescents by geographic area, thus allowing for comparison across areas with vastly different numbers of teens. For this study, birth rates are defined as the number of live births per 1,000 teens (for each age
from 13 through 19 years old) in each racial category and for Hispanic origin. The formula is as follows:

\[
\frac{\text{Number of births to [age] year-old [race/ethnic group] females in a given geographic area}}{\text{Total number of [age] year-old [race/ethnic group] females in a given geographic area}} \times 1,000
\]

The numerator in this formula was derived from State of Florida Vital Statistics Birth data files and the denominator was determined by using U.S. Census data. While obtaining numbers for the numerator was relatively straight-forward, several steps were needed to determine denominators.

**Preliminary Decisions**

The rate calculation formula above required four preliminary decisions to be made, including the lowest age limit to be included for analysis, whether all, or just some, of the racial categories would be used for analysis, whether the ethnic category of Hispanic or Latino would be used, and what geographic level would be most appropriate.

Based on review of data from the Florida Department of Health, there were roughly 2,800 births to females under age 20, with 1,900 of these births to adolescents in Hillsborough County and 900 births to teens in Pinellas County for each year during the 1990s. As may be expected with births to teenagers, the numbers of births increase as the ages of teenaged females increase. In consideration of the low number of births to females age 12 years and younger, a decision was made to use age 13 years as the youngest age for analytic purposes. Also entering into this decision is the fact that a very different set of circumstances are usually presents with births to females under age 12.
years. Therefore, this study will regard “teenager” in the strictest sense by investigating births to females, ages 13 to 19 years old.

Next, a decision had to be made regarding which racial categories would be analyzed and whether or not the ethnic category of Hispanic/Latino would be used. Florida Department of Health, vital statistics data show that there are fewer than 350 births per year to females under age 20 in the entire State of Florida who identified themselves as races other than white or black/African American. Due to small numbers, analysis proceeded with the white and black/African American racial categories only for Hillsborough and Pinellas Counties, Florida.

Although anthropology recognizes race as a social construct with no biological basis, information on individuals’ race is used in many datasets, including the U.S. Census and Florida Vital Statistics birth data. For the purpose of this dissertation, race is used as a proxy for cultural variation, denoting perspectives such as differing worldviews, concepts of kinship, and customs, for example, that may frame mores and attitudes of adolescent childbearing.

Third, it was determined that the ethnic category of Hispanic/Latino would also be included in analyses. Data from the Florida Department of Health show there were a growing number of births to Hispanic adolescents under 20 years of age each year in the 1990s. Increasing to over 4,500 births in 1997 in Florida, there were most likely sufficient numbers for analysis.

Finally, a decision had to be made regarding the geographic level of analysis. Knowing the analysis would take place at a geographic level within, and smaller than, the county, the U.S. Census data was again used in the decision process. Figure 3.1 below
shows the ways in which U.S. Census tabulates data geographically, beginning with census blocks and moving up to the entire United States.

**Figure 3.1 Hierarchical Relationships of U.S. Census Geography**

The lines represent “nesting” relationships where geographies connected by lines do not cross the boundaries of the next larger geographic unit. For example, the line joining counties and census tracts means that census tracts are completely contained within a given county and do not cross the county line. Therefore, census tracts are a subdivision of a county.

To ensure an adequate sample size for populations in small areas, the geographic units considered for analysis included census blocks, block groups and census tracts. The “nesting” relationship of these geographies allow for aggregation to a higher geographic level should small population number necessitate aggregation to ensure statistical reliability.
The census block usually contains less than 100 people and is the smallest geographic unit for which the Census Bureau tabulates data. Data at the census block level is only reported in Summary File 1. U.S. Census block geography may or may not correspond to city blocks bounded by streets. For example, in rural areas, blocks may cover many square miles and have boundaries that are not streets. The next largest geographic area, the block group, is an aggregation of census blocks which generally contain about 1,000 people. The final geographic area under consideration for analysis is the census tract, relatively permanent statistical subdivision of a county. Census tracts are composed of block groups and an optimum size of 4,000 people (U.S. Census 2000a).

The decision was made to initially conduct data analysis at the block group level. Although the smallest geographic area (the block-level in this case) provides the most specificity regarding population characteristics, U.S. Census geography includes what are termed “water blocks.” Water blocks have zero population associated with them and therefore are unsuitable for deriving denominators. Block groups, the next smallest suitable geographic area, provide the desired specificity of population characteristics. Should population or sub-population numbers be too small, the data from block groups will readily aggregate into census tracts, the next appropriate level of geography.

*Calculating Denominators*

After decisions were made regarding ages, race and ethnicity, and geographic level, the next step in determining birth rates involved deriving a denominator. Numerators were obtained directly from 1992 through 1997 Florida Vital Statistics Birth data for white, African American and Hispanic adolescent females ages 13 through 19.
years old. As mentioned previously, however, determining the denominator for this model is not quite so simple. To calculate a denominator at the block group level, four processes needed to occur, including “bridging races” for the 2000 U.S. Census, deriving single ages from age-group U.S. Census data, reconciling 1990 and 2000 geographic boundaries and estimating the single age adolescent population. These procedures were necessary because data for age and race are reported differently in the 1990 and the 2000 U.S. Censuses. In addition, census geographies changed as population increased or decreased in certain areas. Finally, because censuses with block group level data are only conducted every ten years, population estimates had to be used to calculate population denominators for inter-decennial census years between 1990 and 2000.

Calculating Age by Race and Ethnicity

Table 3.1 below presents the 1990 and 2000 U.S. Census of Population and Housing Summary File 1 tables that contain age, race and ethnicity data.

<table>
<thead>
<tr>
<th>1990 U.S. Census Tables</th>
<th>2000 U.S. Census Tables</th>
</tr>
</thead>
<tbody>
<tr>
<td>P12B AGE</td>
<td>P12A SEX BY AGE (WHITE ALONE)</td>
</tr>
<tr>
<td>-Universe: White females</td>
<td>-Universe: People who are White alone</td>
</tr>
<tr>
<td>P12D. AGE</td>
<td>P12B SEX BY AGE (BLACK OR AFRICAN AMERICAN ALONE)</td>
</tr>
<tr>
<td>-Universe: Black females</td>
<td>-Universe: People who are Black or African American alone</td>
</tr>
<tr>
<td>P12F. AGE</td>
<td>P12C SEX BY AGE (AMERICAN INDIAN and ALASKA NATIVE)</td>
</tr>
<tr>
<td>-Universe: American Indian, Eskimo, Aleut females</td>
<td>-Universe: People who are AIAN alone</td>
</tr>
<tr>
<td>P12H. AGE</td>
<td>P12D SEX BY AGE (ASIAN)</td>
</tr>
<tr>
<td>-Universe: Asian or Pacific Islander females</td>
<td>-Universe: People who are Asian alone</td>
</tr>
<tr>
<td>P12J. AGE</td>
<td>P12E SEX BY AGE (NATIVE HAWAIIAN and ACIFICISLANDER)</td>
</tr>
<tr>
<td>-Universe: Other Race females</td>
<td>-Universe: People who are NHPI alone</td>
</tr>
<tr>
<td>P13B. AGE</td>
<td>P12F SEX BY AGE (SOME OTHER RACE)</td>
</tr>
<tr>
<td>-Universe: Females of Hispanic origin</td>
<td>-Universe: People who Some Other Race alone</td>
</tr>
<tr>
<td></td>
<td>P12G SEX BY AGE (TWO OR MORE RACES)</td>
</tr>
<tr>
<td></td>
<td>-Universe: People who are Two or more races</td>
</tr>
<tr>
<td></td>
<td>P12H. SEX BY AGE (HISPANIC OR LATINO)</td>
</tr>
<tr>
<td></td>
<td>-Universe: People who are Hispanic or Latino</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, Standard Hierarchy of Census Geographic Entities.
Tables used for calculating single year of age by race and ethnicity from the 1990 U.S. Census include P12B (White Females), P12D (Black Females) and P13B (Hispanic Females). Tables from the 2000 U.S. Census used to calculate age by race and ethnicity include P12A (White Alone), P12B (Black or African American Alone), P12G (Two or more races) and P12H (Hispanic or Latino).

Table 3.2 below shows how the 1990 and 2000 U.S. Census reported ages in Summary File 1 data.

<table>
<thead>
<tr>
<th>1990 US Census Age Categories</th>
<th>2000 US Census Age Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 1 year</td>
<td>Under 5 years</td>
</tr>
<tr>
<td>1 and 2 years</td>
<td>5 to 9 years</td>
</tr>
<tr>
<td>3 and 4 years</td>
<td>10 to 14 years</td>
</tr>
<tr>
<td>5 years</td>
<td>15 to 17 years</td>
</tr>
<tr>
<td>6 years</td>
<td>18 and 19 years</td>
</tr>
<tr>
<td>7 to 9 years</td>
<td></td>
</tr>
<tr>
<td>10 and 11 years</td>
<td></td>
</tr>
<tr>
<td>12 and 13 years</td>
<td></td>
</tr>
<tr>
<td>14 years</td>
<td></td>
</tr>
<tr>
<td>15 years</td>
<td></td>
</tr>
<tr>
<td>16 years</td>
<td></td>
</tr>
<tr>
<td>17 years</td>
<td></td>
</tr>
<tr>
<td>18 years</td>
<td></td>
</tr>
<tr>
<td>19 years</td>
<td></td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, Standard Hierarchy of Census Geographic Entities.

Data from the 2000 U.S. Census were more aggregated, resulting in fewer reported single years of ages. Individual ages, by race and ethnicity, were determined using the same method used by the Florida CHARTS database discussed previously in this chapter. Single year of age populations are calculated by dividing the age-group totals by the number of ages in the group.

To determine single ages for white, African American and Hispanic females between 13 and 19 years old in 1990, the number of females in the 12 and 13 years
category was divided by 2 to come up with 13 year old females in each race category. The U.S. Census presents each of the other ages by single age and by race. For the 2000 data, all ages were grouped and therefore needed to be divided by the number of single years of age in the group for white, African American and Hispanic females 13 to 19 years of age.

**Bridging Race**

As Table 3.1 above shows, the two decennial censuses collected and reported information on race in different ways. Aside from some terminology changes in the 2000 U.S. Census (for example, Eskimo or Aleut from the 1990 U.S. Census was changed to Native Alaskan in 2000) and disaggregating the 1990 category of Asian or Pacific Islander (into two categories of Asian and Native Hawaiian/Other Pacific Islander in 2000), the most dramatic change to the question of race in the 2000 U.S. Census is that respondents were allowed to identify more than one race (U.S. Census 2000b). While previous Decennial Censuses allowed respondents to select only one race, the 2000 U.S. Census allowed respondents to select up to six races. Nationally, only about 2.4 percent of respondents selected more than one race in the 2000 Census, but this proportion was much higher in some census tracts (Tatian 2003).

In addition to the race question, a separate question regarding ethnicity asked respondents whether they consider themselves to be Hispanic or Latino. This question was asked in a similar way in earlier years, so no special method was needed to compare these data across the censuses (Tatian 2003).
The U.S. Census Bureau provided counts for all of the 63 possible combinations of the six racial groups collected in the Census 2000 Short Form Questionnaire. To allow comparison of 2000 Census race data with the 1990 census categories, the Neighborhood Change Database (NCDB) took the counts of all the multiracial categories in the 2000 U.S. Census and reapportioned them into single racial groups, both in terms of population numbers and proportions. Individuals self-identifying as “white” plus one or more other races were assigned to the “white only” category, those identifying themselves as “black or African American” plus one or more other races were assigned to the “black only” category, and so on.

The first step in “bridging” race for the 2000 U.S. Census, so that the races are comparable to the 1990 U.S. Census, was to divide the “Two or More Races” age groups in the 2000 U.S. Census Summary File 1 tables into single ages by census block group. Age groups were split evenly by the number of ages within each group as described above.

Then, using the Neighborhood Change Database (NCD) Census CD, the proportion of individuals in each census tract from the Two or More Races category who were assigned to the white racial category was calculated by multiplying the number of individuals in the “Two or More Races” category in each block group in a given census tract by the proportion provided by the NCD. These numbers were then added to the corresponding individual age in the "White Only" category by single age. This process was repeated to calculate the “black or African American” population by single age. As noted above, there is no need to “bridge” the Latino or Hispanic ethnic group because data were collected in the same way for both the 1990 and 2000 censuses.
Population Estimates

The final step in determining denominators for this study involved finding the incremental change in the female population, by age and race, in the intervening years between the 1990 and 2000 U.S. Censuses. Although annual population estimates are provided by the U.S. Census Bureau (U.S. Census Bureau N.d (a)) and from the Florida Office of Economic and Demographic Research (Florida Legislature 2009) on a county level, annual population estimates at the census tract or census block group level are not available.

The Florida Office of Economic and Demographic Research (Florida Legislature 2009) establishes population estimates by using the number of births, deaths, immigrants and emigrants by county each year. Because data are not available for the number of births, deaths, and individuals who move into or leave a census tract or census block group, an alternate method of determining the population was employed.

Using the number of females for each single age, 13 through 19 years old, by race and ethnicity for 1990 and for 2000 by census block group, which was determined in the previous steps, an annual growth rate formula was applied to each single age for white, African American and Hispanic females for each year between 1990 and 2000.

The formulas used to determine the incremental change in the female population, by age and race, in the intervening years between the 1990 and 2000 U.S. Censuses are:

\[ i = (FV/PV)^{1/n} - 1 \]

where the Annual Growth Rate \[ i = (2000 \text{ population}/1990 \text{ population})^{1/10} - 1 \]

and \[ FV = PV(1+i)^n \]

where the Final Value = 1990 population \((1+\text{Annual Growth Rate})^\text{number of years past 1990}\)
This analysis resulted in the denominators that were used to run the Hot Spot analysis.

Reconciling 1990 and 2000 Geographic Boundaries

Much of the work described so far focused on calculating and bridging 1990 and 2000 U.S. Census age and race data so they are comparable. In addition to differences in reporting age and race data, geographic boundaries also changed between the two decennial censuses. Census geographic boundaries are intended to remain stable over time to facilitate comparisons between censuses, but significant population increases or decreases over time can necessitate adding, splitting or merging geographies such as block groups or census tracts.

Because of these boundaries changes between the 1990 and 2000 censuses, a methodology was developed by Steven Reader during this study to remap 1990 block groups and their associated data into 2000 block group geographic boundaries. The steps involved are quite complicated, but the basic procedure used geographic information system (GIS) software to overlay the 2000 block group boundaries onto the 1990 block group boundaries. Then, 1990 block-level data was used to determine the proportion of persons in 1990 block groups that contributed to the new 2000 block group. For example, if a 1990 block group split into two block groups for 2000, the population may not have been distributed evenly. Reader’s method allows an exact weight to be allocated to each portion of the two new block groups. The population weights were then applied to block level population counts to convert the data to 2000 block group boundaries. Proportions (such as the proportion of Hispanic persons) were remapped by first
converting the numerator and denominator values (Hispanic persons / total persons) and then recalculating the proportion. This was done for the entire state of Florida, although only data for Hillsborough and Pinellas Counties were used for this study.

**Calculating Teen Birth Rates**

Using the population denominators calculated in the previous steps, teen birth rates were calculated for each census block group and each census tract in Hillsborough and Pinellas Counties using Florida Vital Statistics birth data for the years 1992 through 1997. Because there was concern about very small numbers of adolescent females in many of the census block groups, single ages of the adolescent mothers giving birth in each census block group (numerator) were aggregated by 13 to 17 year-olds and by 18 and 19 year-olds. Similarly, the population of females in each census block group (denominator) was also aggregated to these age groups for the years 1992 through 1997.

**Hot Spot Analysis**

Once birth rates by age and by race/ethnicity were estimated for each census block group in the State of Florida, a hot spot analysis was conducted. Hot spot analysis is a statistical method of exploratory data analysis, and is especially well-suited to large multivariate datasets, such as the datasets being used in this research. This technique can reveal the underlying structure of the dataset, natural sub-classes, interesting or unusual patterns and potential outliers (Gordon 1999). In this study, hot spot analysis was used to explore incidence patterns of births to adolescents in various regions of Hillsborough and Pinellas Counties by identifying locations where births to adolescents are statistically
higher than if they had occurred by chance alone. Additionally, a cold spot analysis was conducted to determine where births to adolescents are statistically lower than if they had occurred by chance alone.

Using the population denominators calculated in the previous steps, an overall birthrate for white, for African American and for Hispanic females 13 through 17 years old and for females 18 and 19 years old was determined for Hillsborough and Pinellas Counties. Due to small numbers of births, the single age groups were aggregated into the two age groups above. Then, a Chi square test was used to determine significance in teen birth rates at a level of .05.

**Determining Contextual Level Variables**

To begin a neighborhood contextual analysis, the relevance and availability of block group-level variables needed to be determined. First, characteristics that are relevant to adolescent childbearing were determined. Several sources of data for the neighborhood-level variables were explored, including interviews with service providers, a review of the literature and composite indices.

**Exploratory Interviews**

Short, open-ended survey interviews were conducted with a convenience sample of five service providers and individuals from funding agencies, all of whom work directly or indirectly with at-risk or pregnant adolescents by providing direct services or funding for programs. Agencies were located in the 211 database (211atyourfingertips.org) and contacted for possible participation. Several programs
were identified that offered services to pregnant and parenting teens, but only three were found that focused specifically on pregnancy prevention activities - the Girls Drop-In Program, the Child Abuse Council, Positive SPiN. Due to the small number of programs that specifically offer teen pregnancy prevention services, a decision was made to include a program that provides repeat pregnancy prevention services. I was familiar with the services at Alpha House, so this agency was contacted and agreed to participate.

Surveys interviews were conducted with staff from Alpha House, the Girls Drop-In Program, the Child Abuse Council, Positive SPiN and the Children’s Board of Hillsborough County, all with individuals whom I am acquainted. These programs all have different service delivery strategies which offered the possibility that respondents may have different ideas about factors associated with adolescent childbearing. All agency staff currently work directly with their program participants, or in the case of Alpha House and the Children’s Board, respondents have worked directly with program participants within the past five to six years. Alpha House works primarily with pregnant and parenting teens, but has a strong repeat pregnancy prevention component in their program. The Girls Drop-In Program and the Child Abuse Council offer pregnancy prevention education and youth development activities, and Positive SPiN provides counseling to at-risk adolescents and their families. The Children’s Board respondent is considered to be the agency’s content expert on healthy births and previously worked in direct service. Four respondents were female and one was male; one respondent was African American and four were white.

The purpose of the survey interviews was three-fold. First, these surveys were conducted to help verify neighborhood-level variables found in the literature to be
associated with adolescent childbearing that could feed into the Index of Socioeconomic Inequality developed as part of this dissertation research. Second, I sought to discover any neighborhood-level variables that providers thought may contribute to adolescent childbearing, but are not found in the literature. And finally, I wanted to clearly establish, before beginning the second set of interviews, the fact that my dissertation research was not connected in any way to my role with the Children’s Board. This was an ethical decision based on the consideration that the Children’s Board is a funding agency, one of the very few that focus on funding prevention activities, and currently funds these programs.

Providers were asked, based on their experience and expertise, which demographic factors they regard as most likely to place an adolescent female at risk of becoming pregnant. All survey interviews were conducted face-to-face at the site of the program. The responses were tape recorded and transcribed.

Respondents answered the following two open-ended questions:

1. Based on your expertise and experience with teenage child-bearing, what do you think are the most significant demographic factors that place adolescent girls at risk of getting pregnant?

2. Which of these factors do you think are most significant?

The data were analyzed using a componential analysis, that is, the analysis looked for specific responses to the questions asked. Interviews were transcribed and responses were sorted and coded manually. Regarding validity of the data, all of the interview respondents represent individuals whose work focuses specifically on teen pregnancy prevention activities. Although the number of interviews is small, each of these respondents is professionally engaged in teen pregnancy prevention programming.
and activities on a daily basis. They represent the best key informants in the Tampa Bay area.

The interview responses were categorized according to individual-level and neighborhood-level (demographic) indicators and then by the type of services the agency or program provides. On the first sort, the responses were divided into individual-level (personal) factors and neighborhood-level (demographic) factors that respondents believed had an influence on adolescent childbearing.

**Review of the Literature**

Drawing on the literature related to adolescent childbearing, variables associated with teenage births was explored. The large amount of literature on this topic provided insights into many neighborhood-level variables. For example, studies (which are discussed in more detail in the Review of the Literature) found that conditions such as poverty and living in single parent households were associated with adolescent childbearing.

**Composite Indices.**

One option to address neighborhood-level variables is a composite index. A composite index combines a number of indicators that include a range of economic, social and housing issues, for example, into a single score. Two widely-used existing composite indices, the Townsend Index and the Carstairs Index, were examined for availability of the variables, and relevance and alignment to the conceptual framework within this research model. In addition to examining existing composite indices,
literature on variables associated with adolescent childbearing afforded the opportunity to develop a new index using Summary File 3 U.S. Census data.

Because this model’s development was generative in nature, data from the first round of interviews had to be analyzed to determine whether or not the results yielded indicators where data were available and suitable for neighborhood analysis. After determining that data for many of the indicators identified during the interviews was not readily available, a decision was made to use the variables identified in the literature, relying primarily on selected indicators used in Harvard’s Public Health Disparities Geocoding Project (Krieger et al. 2004). Variables were derived from the 1990 U.S. Census Summary File 3 at the census block group level, the smallest geographic level for which data are available, and were used to explore neighborhood contextual effects.

**Developing an Index of Socioeconomic Inequality**

Before the neighborhood variables could be mapped, a composite socioeconomic index for all census block groups in the Hillsborough and Pinellas Counties was created using the variables in Table 3.3 below. An index is a set of indicators, combined in a standardized way, that summarize complex or multi-dimensional characteristics of a geographical area or highlight what is happening there. An index provides the big picture, making indicators easier to interpret than trying to find a trend in many separate indicators (Saisana and Tarantola 2002).

To develop the socioeconomic index for my research, the z-score was calculated for each variable in Table 3, by census block group, and the sum of a census block
group’s z-scores is a block group’s index of deprivation. The larger the score the more
deprived an area is assumed to be (Krieger et al. 2004).

Table 3.3 Selected Indicators for Index of Socioeconomic Inequality

<table>
<thead>
<tr>
<th>Construct</th>
<th>Operational definition</th>
<th>1990 Census variable</th>
<th>2000 Census variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Occupational class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Working class</td>
<td>% of persons employed in predominantly working class occupations, i.e., as non-supervisory employees, operationalized as % of persons employed in the following 8 of 13 census-based occupational groups: administrative support, sales, private household service, other service (except protective); precision production, craft, repair; machine operators, assemblers, inspectors; transportation and material moving; handlers, equipment cleaners, laborers.</td>
<td></td>
<td>78</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>2) Unemployment</td>
<td>% of persons age 16 and older in the labor force who are unemployed (and actively seeking work)</td>
<td>71</td>
<td>150A, 150B, 150H</td>
</tr>
<tr>
<td>B) Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Median household income</td>
<td>Median household income in year prior to the decennial census (for US in 1989 = $30,056)</td>
<td>80A</td>
<td>53</td>
</tr>
<tr>
<td>4) Low income</td>
<td>% of households with income &lt; 50% of US median household income (i.e., &lt; $15,000)</td>
<td>80</td>
<td>52</td>
</tr>
<tr>
<td>5) High income</td>
<td>% of households with incomes &gt; 400% of the US median household income (i.e., &gt; $150,000)</td>
<td>80</td>
<td>52</td>
</tr>
<tr>
<td>C) Poverty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) Below poverty</td>
<td>% of persons below the federally-defined poverty line, a threshold which varies by size and age composition of the household; in 1989, it equaled $12,647 for a family of 4.</td>
<td>117</td>
<td>87</td>
</tr>
<tr>
<td>D) Wealth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7) Expensive homes</td>
<td>% of owner-occupied homes worth &gt; $300,000 (400% of the median value of owned homes; 1989)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E) Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8) Low: &lt; high school</td>
<td>Percent of persons, age 25 and older, with less than a 12th grade education</td>
<td>57</td>
<td>37</td>
</tr>
<tr>
<td>9) High: &gt; 4 yrs college</td>
<td>Percent of persons, age 25 and older, with at least 4 years of college</td>
<td>57</td>
<td>37</td>
</tr>
<tr>
<td>F) Crowding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10) Crowded households</td>
<td>Percent of households with &gt; 1 person per room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G) Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) Single Parent Households</td>
<td>Percent of households with single male or single female with children &lt;18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Krieger et al. 2004, U.S. Census Bureau American FactFinder, SF3,

The scores were mapped, by census block group, and presented by quartiles on a
color-coded map, with black representing areas with the highest inequality index score
and white representing the lowest. A comparison was then made between the
socioeconomic inequality index score and the hot spot analysis.
Interviews with Teen Pregnancy Prevention Agencies

A second semi-structured interview was conducted after mapping the neighborhood-level index data with some of the same respondents who participated in the first interview. Two providers, representing the Child Abuse Council and the Girls Drop-In Program, work directly with adolescent females, offering pregnancy prevention services. One provider, Alpha House, works primarily with teens who are already pregnant or parenting, but has a strong educational component in its program aimed at repeat pregnancy prevention for the adolescents it serves. In addition, individuals from two public agencies that fund pregnancy prevention services, Florida Department of Health and the Children’s Board of Hillsborough County, were interviewed.

Results of the hot spot and the neighborhood-level analyses were presented to these service providers to obtain their reactions and feedback on any expected and unexpected results in these analyses. Respondents were also asked about their perceptions of the utility of this method to the work they do. As in the first set of interviews, respondents were audio-taped and their responses were aggregated to ensure anonymity. Data collected during these interviews were coded and analyzed by interest in the data shown on the maps, how useful or relevant respondents perceived the information would be for the work they do, and by respondents’ perceptions of what they perceived as expected or unexpected results. Responses were also analyzed by common themes that emerged among respondents.
Summary of Methods

The methods used in this research show where teen births occurred in Hillsborough and Pinellas Counties, where teen birth rates are statistically higher or lower than would be expected, how well-off people living in these areas are, and how useful providers think this type of analysis might be for their work in adolescent pregnancy prevention. The quantitative and spatial analysis answers the questions, “how much?” and “where?” while the qualitative interviews provides insights into the utility of the method to service providers. Together, these methods are intended to contribute to the work being done on developing an “applied anthropology of GIS/spatial analysis.”
CHAPTER FOUR: RESULTS

This research presents an analysis that takes the first steps toward an “anthropology of spatial analysis/GIS” by using software and techniques that are more readily available and familiar to many anthropologists, and by integrating small-scale and personal techniques of traditional anthropology with larger-scale, more regional methods as recommended by Aldenderfer (1996). The results identify the distribution of teen births in Hillsborough and Pinellas Counties in relation to the neighborhood factors that have been identified as associated with adolescent childbearing in these areas using spatial analysis/GIS techniques.

Findings

This study included all live births to white, African American or black and Hispanic adolescents between 13 and 19 years old in Hillsborough County and Pinellas County, Florida from 1992 to 1997. A Chi-Square test was used to determine where birth rates, by age-groups and by race/ethnicity, were statistically higher (hot spots) or lower (cold spots) than would be expected. This research also investigated contextual, or neighborhood-level, variables in relation to the teen mothers’ homes by developing an index using U.S. Census variables to indicate the level of socioeconomic inequality by census block groups. This helped to establish the relationship between areas with
statistically higher or lower than expected birth rates and the level of neighborhood socioeconomic inequality.

Finally, interviews with five teen pregnancy prevention program providers and individuals from funding agencies were conducted to help determine important factors that influence teenage childbearing. In addition, a second set of provider and funding agency interviews were conducted to elicit opinions on how useful the type of information presented in this research might be to public health pregnancy prevention programs, and how the technique in this research might be used.

**Descriptive Statistics**

An examination of birth statistics for the State of Florida can provide context for birth data in Hillsborough and Pinellas Counties. Table 4.1 below shows the number of births by age for white, black/African American and Hispanic females in Florida for the years 1992-1997. For these years, there was an annual statewide average of 191,773 births to women of all ages. By far, the largest number of births were to white women, accounting for about 75 percent of all births annually, recognizing white individuals make up almost 80 percent of the Florida’s population. Similarly, individuals of Hispanic descent comprise almost 17 percent of Florida’s population and account for about 15 percent of births. On the other hand, African Americans comprise about 17 percent of Florida’s population and account for almost 23 percent of the births (US Census 2000).

When viewed within racial and ethnic groups, dramatic differences can be seen in the percentage of adolescent births. As Table 4.2 below shows, the percent of births to white, African American and Hispanic adolescents account for approximately 10 percent,
23 percent and 15 percent of all births, respectively, within each racial and ethnic group.

Births to teens of all races made up about 13.3 percent of all births from 1992 to 1997 in the State of Florida.

Table 4.1 Births by Age-Group, Race/Ethnicity and by Year for the State of Florida

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>13-17</td>
<td>5,103</td>
<td>5,241</td>
<td>5,695</td>
<td>5,857</td>
<td>5,560</td>
<td>5,623</td>
<td>5,513</td>
<td>3.83%</td>
</tr>
<tr>
<td></td>
<td>18-19</td>
<td>9,460</td>
<td>9,506</td>
<td>9,591</td>
<td>9,639</td>
<td>9,783</td>
<td>9,990</td>
<td>9,661</td>
<td>6.72%</td>
</tr>
<tr>
<td>All ages</td>
<td></td>
<td>144,138</td>
<td>145,302</td>
<td>143,535</td>
<td>142,733</td>
<td>143,287</td>
<td>144,178</td>
<td>143,862</td>
<td>100%</td>
</tr>
<tr>
<td>Black</td>
<td>13-17</td>
<td>4,896</td>
<td>4,971</td>
<td>4,888</td>
<td>4,581</td>
<td>4,344</td>
<td>4,248</td>
<td>4,655</td>
<td>10.69%</td>
</tr>
<tr>
<td></td>
<td>18-19</td>
<td>5,854</td>
<td>5,499</td>
<td>5,117</td>
<td>5,118</td>
<td>5,207</td>
<td>5,460</td>
<td>5,409</td>
<td>12.43%</td>
</tr>
<tr>
<td>All ages</td>
<td></td>
<td>45,161</td>
<td>44,617</td>
<td>43,207</td>
<td>42,527</td>
<td>42,347</td>
<td>43,594</td>
<td>43,530</td>
<td>100%</td>
</tr>
<tr>
<td>All Races</td>
<td>13-17</td>
<td>10,075</td>
<td>10,297</td>
<td>10,674</td>
<td>10,565</td>
<td>10,006</td>
<td>9,983</td>
<td>10,267</td>
<td>5.35%</td>
</tr>
<tr>
<td></td>
<td>18-19</td>
<td>15,479</td>
<td>15,173</td>
<td>15,100</td>
<td>14,953</td>
<td>15,181</td>
<td>15,664</td>
<td>15,258</td>
<td>7.96%</td>
</tr>
<tr>
<td>All ages</td>
<td></td>
<td>192,876</td>
<td>193,887</td>
<td>191,021</td>
<td>189,636</td>
<td>190,385</td>
<td>192,832</td>
<td>191,773</td>
<td>100%</td>
</tr>
<tr>
<td>Hispanic* (Ethnicity)</td>
<td>13-17</td>
<td>1,343</td>
<td>1,489</td>
<td>1,798</td>
<td>1,893</td>
<td>1,821</td>
<td>1,865</td>
<td>1,701</td>
<td>6.04%</td>
</tr>
<tr>
<td></td>
<td>18-19</td>
<td>2,066</td>
<td>2,226</td>
<td>2,478</td>
<td>2,680</td>
<td>2,825</td>
<td>2,847</td>
<td>2,520</td>
<td>8.95%</td>
</tr>
<tr>
<td>All ages</td>
<td></td>
<td>29,420</td>
<td>31,610</td>
<td>32,899</td>
<td>1,893</td>
<td>35,738</td>
<td>37,337</td>
<td>28,149</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Hispanic is an ethnicity; Hispanic individuals may be of any race

Figure 4.1 below graphs the average annual number of births (1992-1997), by age and race/ethnicity, to mothers in Florida, providing a different perspective on the ages of childbearing. The numbers were derived by adding births to white women, black women and Hispanic women, by age, and dividing by six, the number of years of data.

The chart shows that the largest numbers of babies are born to white women who are approximately age 30 years, while black births are clearly skewed toward women around 20 years of age. Hispanic births follow a nearly a normal curve with the most babies being born to women who are between 25 and 30 years of age.
The table and chart above for births in the State of Florida can serve as a basis for comparison with Hillsborough and Pinellas counties, Florida.

**Births to Adolescents in Hillsborough and Pinellas Counties**

Florida Vital Statistics Birth data for the years 1992 through 1997 were used in this analysis. To begin, the data were cleaned and sorted as follows.

First, each year’s birth dataset was sorted by county code using column “COUNTYFP00” (Hillsborough = 057, Pinellas = 103). There were a total of 82,111 birth records for Hillsborough County and 56,124 birth records for Pinellas County for the combined years of 1992-1997. The aggregated birth records for 1992-1997 were then sorted by column “AGE_MOM” for each county. In this six-year period, 17 of the 82,111 birth records in Hillsborough County and 3 of the 56,124 birth records in Pinellas
County contained missing age data (AGE_MOM = 99). Missing data comprised a negligible percentage of each county’s dataset.

Next, the six years of aggregated birth records were sorted by “RACE_MOM” and “ETHNIC_M,” and selected by white, black and Hispanic. Using the “AGE_MOM” column for each county, data were sorted by race and by ethnicity, and the average annual number of births for Hillsborough County and Pinellas County were calculated. The average annual number of births was derived by adding births to white women, black women and Hispanic women, by age, and dividing by six, the number of years of data.

**Figure 4.2 Average Annual Number of Births 1992 - 1997 by Age and Race/Ethnicity in Hillsborough County, Florida**

Figures 4.2 and 4.3 show the average annual number of births (1992-1997), by age and race/ethnicity, to mothers in Hillsborough and Pinellas Counties, Florida. The patterns in these two county-level graphs are very similar to the State of Florida births as seen in Figure 4.1.
Next, using the “AGE_MOM” column for each county, data were selected and aggregated by age-groups (ages 13 to 17 and 18 to 19) by white, black and Hispanic.

<table>
<thead>
<tr>
<th>County</th>
<th>Age Group by Race/Ethnicity</th>
<th>Beginning Record Count</th>
<th>Not Geocoded</th>
<th>Error in Geocoding</th>
<th>Geocoded (Records Used in Analyses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillsborough</td>
<td>White 13-17</td>
<td>2,820</td>
<td>211</td>
<td>15</td>
<td>2,594</td>
</tr>
<tr>
<td></td>
<td>Black 13-17</td>
<td>2,191</td>
<td>131</td>
<td>3</td>
<td>2,057</td>
</tr>
<tr>
<td></td>
<td>Hispanic 13-17</td>
<td>1,142</td>
<td>94</td>
<td>6</td>
<td>1,042</td>
</tr>
<tr>
<td></td>
<td>White 18-19</td>
<td>4,600</td>
<td>324</td>
<td>39</td>
<td>4,237</td>
</tr>
<tr>
<td></td>
<td>Black 18-19</td>
<td>2,351</td>
<td>120</td>
<td>9</td>
<td>2,222</td>
</tr>
<tr>
<td></td>
<td>Hispanic 18-19</td>
<td>1,494</td>
<td>101</td>
<td>7</td>
<td>1,386</td>
</tr>
<tr>
<td>Pinellas</td>
<td>White 13-17</td>
<td>1,351</td>
<td>101</td>
<td>3</td>
<td>1,247</td>
</tr>
<tr>
<td></td>
<td>Black 13-17</td>
<td>1,259</td>
<td>61</td>
<td>0</td>
<td>1,198</td>
</tr>
<tr>
<td></td>
<td>Hispanic 13-17</td>
<td>112</td>
<td>18</td>
<td>0</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>White 18-19</td>
<td>2,584</td>
<td>193</td>
<td>0</td>
<td>2,391</td>
</tr>
<tr>
<td></td>
<td>Black 18-19</td>
<td>1,357</td>
<td>68</td>
<td>0</td>
<td>1,289</td>
</tr>
<tr>
<td></td>
<td>Hispanic 18-19</td>
<td>212</td>
<td>28</td>
<td>0</td>
<td>184</td>
</tr>
<tr>
<td></td>
<td>All Adolescents</td>
<td>21,247</td>
<td>1,239</td>
<td>67</td>
<td>19,941</td>
</tr>
</tbody>
</table>

This step created 12 separate datasets shown in Table 4.2 above. There were no missing data on race and ethnicity in Pinellas County, and only four births missing data on race and two missing data on ethnicity in Hillsborough County.
The final step in cleaning and sorting the birth data involved displaying each county’s birth data by race/ethnicity and age-group on a map (see Maps in Appendix A) using the latitude and longitude columns in the birth data sets. Rather than using a birth mother’s home address for geographic location, the Florida Department of Health geocodes (geographically references) these addresses, that is, they provide a set of coordinates (latitude and longitude) which related to the birth mother’s home address, thus allowing the data to be displayed on a map. To ensure accuracy, the birth data from Hillsborough and Pinellas Counties were cleaned geographically and birth records that were not geocoded (no data in columns “LATIT” or “LONGI”) or were geocoded to a location outside of Hillsborough or Pinellas Counties, were removed from the datasets.

The maps in Appendix A, displaying births to white teens between 13 and 17 years old from 1992 to 1997, shows higher incidents of births in the more populated areas, as would be expected. In Hillsborough County, higher numbers of births to white adolescents in this age range are found primarily along the Interstate Highways in the cities of Tampa and Plant City as well as in the more populous communities of Brandon, Palm River, Gibsonton and Ruskin in the south and central part of the county and in the community of Town 'n Country in the west-central part of the county. In Pinellas County, the incidence of births to white 13 to 17 year-olds are highest primarily in the largest cites of St. Petersburg and Clearwater. Because Pinellas County is more densely populated than Hillsborough County, births are more evenly distributed throughout Pinellas County whereas Hillsborough County, births clearly cluster in more densely populated communities.
The spatial distribution of births to white teens between 18 and 19 years old from 1992 to 1997 (see Appendix A) clearly aligns with the incidence of births to the younger white adolescents described above. There are, however, more births to 18 and 19 year-old white adolescents.

The spatial distribution of births to black teens between 13 and 17 years old from 1992 to 1997 looks very different than the distribution of births to their white counterparts, as the maps in the Appendix shows. In Hillsborough County, births to younger black adolescents are clearly clustered in the urbanized areas north of Tampa between Interstates 275 and 75. There is also a small cluster of births in Plant City. In Pinellas County, the incidence of births to white 13 to 17 year-olds are highest in south St. Petersburg. There is also a cluster of births in the City of Clearwater.

As with the incidents of births to 18 and 19 year-old white adolescents, maps in Appendix A show the spatial distribution of births to black teens between 18 and 19 years old from 1992 to 1997 clearly aligns with births to the younger black adolescents as described above. And again, there are more births to 18 and 19 year-old black adolescents.

Births to Hispanic teens in both age groups (maps in Appendix A) show a pattern similar to African American births. However, there are more births to Hispanic teens in rural areas of Hillsborough County than white or African American adolescent births. In Pinellas County, births to Hispanic teens appear fairly evenly distributed throughout the county, with no clear visual clusters appearing on the maps.

Table 4.2 below shows the age-groups by race and ethnicity for each county with the final record count used for determining birth rates and in hot spot analyses shown in the
last column labeled “Geocoded (Records Used in Analyses).” Between four and eight percent of the birth records in each category contained missing geocoding data or contained an error in geocoding with the exception of Hispanic 13-17 year-olds (16%) and Hispanic 18-19 year-olds (13%) in Pinellas County.

Tables 4.3 and 4.4 below provide an overview of births in Hillsborough and Pinellas Counties. Table 4.3 presents the average annual number births by race and ethnicity for 13 to 17 year-olds, for 18 and 19 year-olds and for women of all ages in these two Florida counties. The numbers were derived by adding the births for each race/ethnicity by age group and dividing by six, the number of years of data.

| Table 4.3 Average Annual Births 1992-1997 by Age Group and by Race and Ethnicity |
|---------------------------------|----------------|----------------|----------------|
|                                 | White | Black | Hispanic |
| Hillsborough Co.                |       |       |          |
| 13-17                           | 555   | 403   | 176      |
| 18-19                           | 2,273 | 1,162 | 570      |
| All ages (10-58)                | 61,410| 16,788| 11,218   |
| Pinellas Co.                    |       |       |          |
| 13-17                           | 270   | 252   | 22       |
| 18-19                           | 1,299 | 679   | 106      |
| All ages (11-56)                | 45,160| 9,251 | 2,518    |

As table 4.3 shows, Hillsborough County had a higher average annual number of births than Pinellas County. The table also shows the largest number of births were to white women, with more births to older teens than younger teens.

**Hot Spot and Cold Spot Analysis**

As mentioned in the previous chapter, a hot spot or cold spot analysis is an exploratory technique that identifies where adolescent birth rates are statistically higher or statistically lower than expected. The first step in conducting these analyses was to
determine birth rates. Birth rates were calculated using the geocoded birth records (the last column of Table 4.2) as the numerator and the age-group race/ethnicity female population of each census tract in Hillsborough and Pinellas Counties.

The geocoded births by age-group and race/ethnicity were calculated using MapInfo (8.0) to determine the number of births in each census tract. This became the numerator for the birth rates. The denominator (number of females in each census tract by age-group and by race/ethnicity) was calculated using the method described in the previous chapter. The births were then matched to the age-group by race/ethnicity female population in each census tract and the births were divided by the population to produce birth rates.

As an overview, Table 4.4 shows adolescent birth rates, presented by age group and by race/ethnicity in Hillsborough and Pinellas counties for the years 1992-1997.

| Table 4.4 Birth Rates (per 1,000 live births) 1992-1997 by Age Group and by Race and Ethnicity |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| County                         | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       | Hillsborough                   | Pinellas                       |
| Age-Group                      | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                | 13 -17 Year-Olds               | 18-19 Year-Olds                |
| White                           | Births                         | 2,594                          | 4,237                          | 1,247                          | 2,391                          | Population                     | 117,885                        | 53,196                         | 101,363                        | 40,964                         | Birth Rate                     | 22.0                           | 79.6                           | 12.3                           | 58.4                           | Birth Rate                     | 22.0                           | 79.6                           | 12.3                           | 58.4                           | Birth Rate                     | 22.0                           | 79.6                           | 12.3                           | 58.4                           |
| Black                           | Births                         | 2,057                          | 2,222                          | 1,198                          | 1,289                          | Population                     | 29,253                        | 11,830                         | 17,473                         | 6,409                          | Birth Rate                     | 70.3                           | 187.8                          | 68.6                           | 201.1                          | Birth Rate                     | 70.3                           | 187.8                          | 68.6                           | 201.1                          | Birth Rate                     | 70.3                           | 187.8                          | 68.6                           | 201.1                          |
| Hispanic                        | Births                         | 1,042                          | 1,386                          | 94                             | 184                            | Population                     | 24,684                        | 10,560                         | 3,231                          | 1,304                          | Birth Rate                     | 42.2                           | 131.3                          | 29.1                           | 141.1                          | Birth Rate                     | 42.2                           | 131.3                          | 29.1                           | 141.1                          | Birth Rate                     | 42.2                           | 131.3                          | 29.1                           | 141.1                          |

Table 4.4 also includes the number of births (numerator) and the population (denominator), used to calculate birth rates, by age-group and race/ethnicity, for adolescents in Hillsborough and Pinellas counties.
The next step in the hot/cold spot analyses used the birth rates matched to census tract data for Hillsborough and Pinellas Counties. The birth data are not normally distributed, meaning the data do not fall into a bell-shaped curve. In a normal distribution, half of the data fall above the mean and half below the mean, and 68 percent of the data fall within one standard deviation from the mean, 95 percent fall within two standard deviations, and almost all of the data, 99.7 percent, fall within three standard deviations from the mean. The birth data being used in this research are skewed by outliers, that is, birth rates that are much higher or much lower than the rest of the data, resulting in a non-normal distribution. For this analysis, it was these outliers that were of interest.

Because the data are not normally distributed, a Chi Square analysis, using the CHIDIST command in MS Excel (2003), was used to determine which, if any, of the outliers at the high end of the distribution were statistically significantly different from the rest of the data. This is the methodology followed by Taylor and Chavez (2002) in their study of adolescent childbearing in California. The results are shown in Table 4.5 below. The table shows the census tract of the hot spot, the birth rate, and the significance level of the Chi Square analysis by county, race/ethnicity and age group. Most hot spots are significant at the .0001 level. The Chi Square test only analyzed census tracts where the age-group population was over 20 females.

The most hot spots were found among old white adolescents in Hillsborough County, and among older African American teens in both Hillsborough and Pinellas counties. The most hot spots for Hispanic adolescents were found among 13 to 17 year-olds in Hillsborough County.
Table 4.5 Hot Spot Census Tracts in Hillsborough and Pinellas Counties

<table>
<thead>
<tr>
<th>Hot Spot Census Tract</th>
<th>Birth Rate (1,000 births)</th>
<th>Significance</th>
<th>Hot Spot Census Tract</th>
<th>Birth Rate (1,000 births)</th>
<th>Significance</th>
<th>Hot Spot Census Tract</th>
<th>Birth Rate (1,000 births)</th>
<th>Significance</th>
<th>Hot Spot Census Tract</th>
<th>Birth Rate (1,000 births)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillsborough 13-17 Year-Olds</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>8</td>
<td>409</td>
<td>&gt;.0001</td>
<td>10</td>
<td>441</td>
<td>&gt;.0001</td>
<td>208</td>
<td>433</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>686</td>
<td>&gt;.0001</td>
<td>26</td>
<td>496</td>
<td>&gt;.0001</td>
<td>218</td>
<td>310</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>455</td>
<td>&gt;.0001</td>
<td>31</td>
<td>427</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>341</td>
<td>&gt;.0001</td>
<td>124.02</td>
<td>456</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>129</td>
<td>290</td>
<td>&gt;.0001</td>
<td>138.04</td>
<td>305</td>
<td>&gt;.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>139.07</td>
<td>894</td>
<td>&gt;.0001</td>
<td>141.09</td>
<td>538</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hillsborough 18-19 Year-Olds</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>11</td>
<td>310</td>
<td>&gt;.01</td>
<td>214</td>
<td>403</td>
<td>&gt;.0001</td>
<td>202.04</td>
<td>248</td>
<td>&gt;.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>329</td>
<td>&gt;.0001</td>
<td>233</td>
<td>269</td>
<td>&gt;.01</td>
<td>209</td>
<td>601</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>298</td>
<td>&gt;.05</td>
<td>270</td>
<td>247</td>
<td>&gt;.05</td>
<td>210</td>
<td>279</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>364</td>
<td>&gt;.0001</td>
<td>213</td>
<td>350</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>479</td>
<td>&gt;.0001</td>
<td>218</td>
<td>341</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>407</td>
<td>&gt;.0001</td>
<td>234</td>
<td>313</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>433</td>
<td>&gt;.0001</td>
<td>263</td>
<td>356</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>112.06</td>
<td>499</td>
<td>&gt;.0001</td>
<td>268.04</td>
<td>329</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120.02</td>
<td>338</td>
<td>&gt;.0001</td>
<td>268.16</td>
<td>249</td>
<td>&gt;.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinellas 13-17 Year-Olds</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>19</td>
<td>312</td>
<td>&gt;.01</td>
<td>10</td>
<td>332</td>
<td>&gt;.0001</td>
<td>247</td>
<td>251</td>
<td>&gt;.05</td>
<td>229.02</td>
<td>375</td>
<td>&gt;.0001</td>
</tr>
<tr>
<td>37</td>
<td>488</td>
<td>&gt;.0001</td>
<td>49</td>
<td>446</td>
<td>&gt;.0001</td>
<td>259.02</td>
<td>340</td>
<td>&gt;.0001</td>
<td>248.02</td>
<td>322</td>
<td>&gt;.0001</td>
</tr>
<tr>
<td>39</td>
<td>463</td>
<td>&gt;.0001</td>
<td>108.07</td>
<td>307</td>
<td>&gt;.0001</td>
<td>259.02</td>
<td>260</td>
<td>&gt;.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>306</td>
<td>&gt;.01</td>
<td>127.02</td>
<td>404</td>
<td>&gt;.0001</td>
<td>264</td>
<td>242</td>
<td>&gt;.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130.01</td>
<td>611</td>
<td>&gt;.0001</td>
<td>267.02</td>
<td>245</td>
<td>&gt;.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>132.06</td>
<td>556</td>
<td>&gt;.0001</td>
<td>133.07</td>
<td>332</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>138.04</td>
<td>784</td>
<td>&gt;.0001</td>
<td>139.07</td>
<td>457</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>141.09</td>
<td>333</td>
<td>&gt;.0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Finally, a cold spot analysis was conducted by again using the birth rates matched to census tract data for Hillsborough and Pinellas counties. Cold spots are areas where birth rates are significantly lower than would be expected.

Again, because the data are not normally distributed, the mean and standard deviation are no longer relevant. Of interest are data at the “tails” of the distribution. However, areas with no births, and therefore a birth rate of zero, are problematic in that they can disguise important variations in the data. For example, an area with an
adolescent population of 2,000 and a birth rate of zero is very different from an area with a zero birth rate, but the population is only 20 teens.

To identify potential cold spots, a ‘what if…’ scenario was applied. In other words, the question asked was, “If there was one birth, rather zero births, in this census tract, what would the birth rate be? Would this birth rate still fall at the bottom of the tail?” To run this scenario, in areas where zero births occurred, one birth was substituted and then the birth rate was calculated. Data were then sorted by birth rates. For the purpose of this analysis, up to the lowest one percent of the census tracts (two or three census tracts, depending on how many census tracts had low population) were considered for possible cold spots. To help account for possible errors in population calculations, census tracts with a population of less than 20 adolescent females were not used. Table 4.6 shows the census tracts considered to be cold spots. Population and number of expected births were rounded to the nearest whole number.

Table 4.6 Cold Spot Census Tracts in Hillsborough and Pinellas Counties

<table>
<thead>
<tr>
<th></th>
<th>Hillsborough</th>
<th></th>
<th>Pinellas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13-17 Year-Olds</td>
<td>18-19 Year-Olds</td>
<td>13-17 Year-Olds</td>
</tr>
<tr>
<td>Cold Spot Census Tract</td>
<td>Population</td>
<td>Actual # of Births</td>
<td>Birth Rate (1,000 births) Using what if Scenario</td>
</tr>
<tr>
<td>white</td>
<td>139.05</td>
<td>993</td>
<td>0</td>
</tr>
<tr>
<td>black</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>Hispanic</td>
<td>114.14</td>
<td>261</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>153</td>
<td>0</td>
</tr>
</tbody>
</table>

* denotes the actual birth rate of the census tract and not a birth rate derived by using the ‘what if…’ scenario.
Births to white 13 to 17 year-old adolescents, in Table 4.6 above, will be used to better illustrate the *what if...* scenario. There were 14 census tracts in this age/race group with zero births. One birth was substituted in each of these census tracts and the birth rate was calculated using one birth. Data were then sorted by birth rate and the three census tracts with the lowest birth rates were considered for potential cold spots. Census tracts with the lowest data points were considered if the data were not close to the next lowest point.

In Hillsborough County, Florida, Table 4.6 shows cold spots for most age-groups. For white 13-17 year-olds, birth rates in three census tracts were still zero in spite of adding one birth using the ‘*what if...*’ scenario. This is well below the county average of 22 births per thousand adolescent females and well below the next birth rate in the tail of the distribution. Two census tracts showed births to white adolescents, ages 18 to 19 years old, to be below the county average of 79.6 births per thousand. The expected birth rate for black 13 to 17 year-old teens in Hillsborough County was 70.3 births per thousand, and for this population, the lowest birth rates all appeared about the same. However, for 18 to 19 year-old African American teens, the ‘*what if...*’ scenario yielded a birth rate of less than one birth per thousand population in one census tract. For Hispanic adolescents, 13-17 years old, one census tract had an actual birth rate of 3.8 births per thousand, and was well below the next lowest birth rate in the distribution. For 18 to 19 year-old Hispanic adolescents in Hillsborough County, two census tracts showed rates well below the expect birth rate of 131.3 births per thousand and well below the next lowest birth rate in the tail of the distribution.
In Pinellas County, Florida, Table 4.6 only shows cold spots for the two white age-groups. There was one census tract for white 13-17 year-old teens with an actual birth rate well below the average birth rate of 12.3 births per thousand. Similarly, two census tracts for white 18-19 year-olds had actual birth rates below the 58.4 births per thousand average for Pinellas County and well below the next lowest data point in the tail of the distribution. The distribution of birth rates for African American and Hispanic adolescents showed the lowest birth rates to be very close to each other.

No studies were found that investigate cold spots. To better understand cold spots and the neighborhood settings where they are found, three cold spot areas were selected for ethnographic observation, including Census Tracts 50 and 109 in Hillsborough County, Florida, and Census Tract 268.08 in Pinellas County, Florida. Observation of these neighborhoods provided some information about the accuracy of the Index of Socioeconomic Inequality, developed as part of this research, as well as current conditions in these neighborhoods. Although the Index of Socioeconomic Inequality used 1990 census data to coincide with the birth data used in this research, neighborhood observation can also provide insights about the amount of change that has taken place in an area over time.

The Hillsborough County census tracts were selected because Census Tract 50 has a positive z-score (+0.615) in the Index of Socioeconomic Inequality, indicating a higher level of socioeconomic stress, while Census Tract 109 has a negative z-score (-0.913), indicating a lower level of socioeconomic stress. All cold spot census tracts in Pinellas County have negative z-scores (lower socioeconomic stress). Because two of the cold spot census tracts are located near the city of Safety Harbor, I arbitrarily selected one
of these, Census Tract 268.08, which has an Index of Socioeconomic Inequality z-score of -1.252.

Census Tract 50 is located near downtown Tampa. The cold spot analysis shows this area has a low rate of births for 18 and 19 year-old white and Hispanic adolescents. Census tract boundaries include Interstate 275 on the north, the Hillsborough River on the east, the Crosstown Expressway on the south and North Rome Avenue on the west. Overall, the area is a mix of single and multi-family homes, businesses, light industry, schools, and churches.

Three streets in this area have high or relatively high traffic volume, including Kennedy Boulevard, which runs east/west in the southern part of this census tract, Cypress Boulevard, which also runs east/west in the northern part of this census tract, and North Boulevard, which runs north/south in the eastern part of this census tract. There are several bus stops locate along these streets.

One of the most striking features of this area is the University of Tampa, located on the east side of this census tract along the Hillsborough River. In addition, Tampa Preparatory School, an independent secondary school with a college-preparatory curriculum, is also located on the Hillsborough River, just north of the University of Tampa. In sharp contrast, across the street from Tampa Preparatory School on North Boulevard, is Oakhurst Section 8 Housing.

Most of the single-family homes are one-story block construction and appear to be about 30 to 40 years old. The homes are relatively small and located fairly close to each other, yet are set back from the streets so they have a front yard.
Several homes had small bicycles and toys in the yard, indicating younger children may live in this neighborhood. In addition, I saw two homes with signs indicating they are licensed home-childcare facilities. There were also indications that adolescents may live in this area. A Boys and Girls Club is located adjacent to Tampa Preparatory School and two churches, Beulah Baptist Church and New Salem Baptist Church, had signs advertising their after school programs.

The Index of Socioeconomic Inequality shows that Census Tract 50 has an average z-score of +0.615, indicating a higher level of socioeconomic stress in this area. If factors such as poverty, low median household income and low educational attainment are risk factors for adolescent childbearing, we would expect to see higher adolescent birth rates in this area. Instead, analysis shows that Census Tract 50 is a cold spot where teen birth rates are lower than expected. There are two possible reasons that birth rates are lower than expected in this high stress area. First, there may be a large college-student population living in this area. Although these students have not completed their education (low education level) and most likely do not have high-paying jobs (low median income, poverty), they plan to attain a college degree some day and therefore may be delaying childbearing. Another reason may be the availability of after school programs in this area for neighborhood children. During the first round of interviews that I conducted, several respondents indicated that they felt out-of-school time programs help to reduce the risk of adolescent childbearing.

The observations of Census Tract 50 describe current-day conditions in the neighborhood. To discover what conditions were like 15 to 20 years ago, and which would coincide with the birth data I used, an ethnographic investigation using key
informant interviews along with archival research could help to clarify neighborhood conditions.

Census Tract 109, also located in Hillsborough County, Florida, is a cold spot area where adolescent birth rates for white, black and Hispanic adolescents are lower than expected. Beginning at the corner of East Fowler Avenue and Bruce B. Downs Boulevard, the eastern boundary of this census tract runs north along Bruce B. Downs Boulevard to East Fletcher Avenue, then west to North 46th Street, then north to the Hillsborough River. Following the Hillsborough River southeast to East Fletcher Avenue, the boundary then proceeds west to North 50th Street, then south to East Fowler Avenue and west to Bruce B. Downs Boulevard. Census Tract 109 encompasses the entire campus of the University of South Florida. The portion of Census Tract 109 which is north of East Fletcher Avenue is The Claw at USF Golf Course and undeveloped conservation area.

There are currently two areas of on-campus housing located just south of East Fletcher Avenue near the northwest part of campus and one in the southeastern area of campus on Alumni Drive. The 1990 U.S. Census shows there were 3,062 individuals living in this census tract, of which 1,465 were ages 18 and 19 years old, while the 2000 U.S. Census shows a total of 2,598 individuals living in this census tract, of which 1,487 were 18 to 19 year-olds.

We would expect to see lower levels of adolescent childbearing in census tracts with a high z-score in the Index of Socioeconomic Inequality. In Census Tract 109, the Index shows a relatively low z-score of -0.913. As with Census Tract 50, the university setting of Census Tract 109 may suggest that educational aspirations may contribute to
delayed adolescent childbearing. Archival research and key informant interviews with
long-time faculty and staff, as well as alumni, would most likely be the best method of
discovering what the University of South Florida was like 15 to 20 years ago.

Finally, I conducted a drive-by observation of Census Tract 268.08 in Pinellas
County, Florida, located just south of the city of Safety Harbor. The boundaries of this
census tract include the Courtney Campbell Causeway/Gulf to Bay Boulevard on the
south, South McMullen Booth Road on the west, the Ream Wilson Train on the north
(just south of State Highway 590) and Tampa Bay on the east. Bayshore Boulevard runs
along Tampa Bay in this census tract and there are no homes between this road and the
bay until the far northern part of this census tract.

Two streets, the Courtney Campbell Causeway/Gulf to Bay Boulevard and South
McMullen Booth Road, are major thoroughfares yet they remain almost exclusively
residential with the exception of a gas station, restaurant and small strip mall. Homes are
set far back from McMullen Booth Road and visually separated by large trees and fences.
The southern part of Census Tract 268.08 has a mix of smaller homes, condominiums,
apartments, and a small area of manufactured homes.

Heading north on Bayshore Drive, approaching Drew Street, the land becomes
higher inland and the homes become larger. With the exception of Ruth Eckerd Hall near
the northwestern part of this census tract, the northern part of this census tract is
exclusively residential. Homes are large, perhaps three or four bedrooms, and appear to
be build in the 1970s and 1980s. Homes are set back several feet from the street, yards
are well-kept, and I could see many pool cages. There were no bus stops in this census
tract.
All homes in the residential neighborhoods in Census Tract 50 near downtown Tampa and Census Tract 268.08 near Safety Harbor, Florida, were built about the same time in the respective neighborhoods and no new residential construction was observed. U.S. Census data also shows the population decreased slightly in Census Tract 109 at the University of South Florida. However, what can not be determined from these observations and from the maps in Appendix A, are what the changes in the demographic composition of these neighborhoods mean to the residents who live there. The effects of neighborhood demographic change, and the meaning of this change to neighborhood residents, are illustrated in the ethnographic work done by Ashley Spaulding (2008) in Census Tract 105. Also known to residents as the Greenwood area, Census Tract 105 is located to the northeast of Hillsborough Avenue and North 56th Street,

Spaulding’s (2008) work describes the demographic changes that occurred in the Greenwood area of Hillsborough County, Florida, as a result of public housing residents’ relocation to a this neighborhood and the resulting social dynamics between long-time neighborhood residents and those who were relocated to this area. Spaulding’s work clearly illustrates that the hot/cold spot analysis and the Index of Socioeconomic Inequality developed as part of my research are only preliminary investigations and clearly need to be grounded in ethnography.

**Interview Results – Round 1**

Short, open-ended interview surveys were conducted with staff from five agencies that provide services focused explicitly on preventing adolescent childbearing, including Alpha House, the Girls Drop-In Program, the Child Abuse Council, Positive SPiN and
the Children’s Board of Hillsborough County. Providers were asked, based on their experience and expertise, which demographic factors they regard as most likely to place an adolescent female at risk of becoming pregnant. These survey interviews were relatively short, lasting from 6 minutes to 12 minutes, and were conducted face-to-face at the site of the program. Responses were taped and later transcribed.

The first round of survey responses were categorized according to individual-level and neighborhood-level (community) indicators and then by the type of services the agency or program provides. To preserve respondent anonymity, the position held by respondents in their respective agency is not discussed because the agencies are all relatively small and it is very possible to identify an individual by her or his job position.

On the first sort, the responses were divided into individual-level (personal) factors and neighborhood-level (demographic) factors that respondents believed had an influence on adolescent childbearing. These are paraphrased below and accompanied by examples and quotes where appropriate to illustrate responses. Additionally, factors that respondents felt were most influential have been noted.

Individual-Level Factors that respondents believed may lead to adolescent childbearing included:

- Lack of a good male role model in their life (Most influential – one respondent)
  One of the service provider respondents began the survey interview by stating that she felt that a girl would be at risk of becoming pregnant if she does not have a good male role model in her life. She said, “The most significant [factor] is not having a good male role model in their life.” She continued by adding, “Teens, because of what they are going through, they need a male role model to get their self-confidence. They have to have someone who’s interested, sensitive, caring, trusting, respectful.” She later confirmed that she believed that lack of a good male role model in a teen’s life was the most important factor that put a teen girl at risk of becoming pregnant.
• Cultural values regarding pregnancy and childbearing (Most influential – one respondent)
  Another provider said that she believed there were cultural differences in the meaning of adolescents having babies. She stated, “I think some ethnic groups sometimes tend to have children and raise them because of their cultural group beliefs, like not having abortions and accepting the baby as a member of their family.” She believed that the cultural values of the teens and their parents represented one of the most influential factors affecting adolescent childbearing.

• Supportive family and kinship support system (Most influential – one respondent)
  Yet another respondent thought that the cultural norms or beliefs of a girl’s family influence whether or not she was at risk of becoming a teen mother. She speculated, “I tend to think that African American sometimes have closer family ties – and Hispanics – and they tend to have children, because they have more family ties and the family helps bring up the child instead of a the young girl bringing up the child alone.”

• Getting pregnant versus having a baby
  The same respondent as immediately above stated later in the conversation that, “Some girls get pregnant, but do not always have the baby, they terminate the pregnancy. You know, more rich girls get pregnant than you think.” Getting pregnant is an illustration of risk taking behavior.

• Rape or molestation
  Another individual-level risk factor for teen pregnancy noted by a respondent included rape or molestation. The respondent stated that, “...a girl being raped or molested while growing up and thinking that is all men are looking for and that’s a way to get their attention by acting out sexually. Then they get pregnant.”

• Lack of self-worth and self-confidence
  One of the service providers felt that issues of self-esteem can influence whether or not a girl is at risk of getting pregnant. “Some teens have feelings of acceptance, I mean, seeing acceptance as given through having sex at a young age. They need this because they are going through a rough adolescence. And they think the boy loves them and this builds their self-worth and self-confidence.” The respondent was from one of the youth development programs and her response reflects the focus of that program.

• Desire to get pregnant
  Two respondents believed that sometimes a girl wants to have a baby. The first respondent thought this is because, “they want someone to love and someone to love them back.” The other respondent suggested that a girl may get
pregnant because, “Sometimes having a baby makes them feel older, more mature.”

- Not married but can live with relatives
  
  One respondent believed the consequences of having a baby have different impacts on different girls, noting, “Some girls have it easy because of their family who wants the baby. And they can live at home with their family and don’t have to worry about anything, you know, like food or rent or a babysitter, things like that.”

The male respondent offered the following three factors that may influence adolescent childbearing.

- Involvement of male partner during pregnancy (could be desirable or not)
  
  The responded stated that he believed, “Another issue, it’s more the lack of involvement of the male partner in the life the pregnant teen and her soon-to-be offspring. He, well, sometimes there’s not a desire to have that male involved because that girl is living with her parents or because, for whatever reason. And sometimes it’s better if he’s not involved, for example, if he is bad-news or a bad influence.”

- Weathering effect [the physical consequences of social inequality, such as poor health status and poor birth outcomes, among others] (African Americans) caused by racism, stress, issues of poverty, lack of educational opportunities
  
  - Effects self-worth, obesity, overeating, hypertension, high blood pressure
  - Impact birth outcomes of teens (and women later in life)

  This respondent noted that there was considerable discussion about the weathering effect in a recent meeting he attended. Here he describes Geronimus’ weathering hypothesis, which contends that African American adolescents tend to have children at a younger age while they are still healthy enough to have children and will be healthy enough to raise them.

- Getting pregnant by men older than them (rather than boys their own age)
  
  Finally, he offered the following idea, stating, “There’s also one factor that was talked about some time ago – I haven’t heard this come up in a couple of year – is around the rumor that most of these girls were not getting pregnant by other teens, they were getting pregnant by men who were older than them. And connotating some issues of statutory rape and some of those things. I don’t know that that’s really the case. I think there were blips on the radar screen.”

  Although the respondent cited this as a possible factor contributing to adolescent childbearing, there appears to be some question as to whether or not he believes this is true.
Neighborhood-Level Factors that respondents believed may lead to adolescent childbearing included:

- Diminishing programs and supports in the community:  **(Most influential – one respondent)**
  - Youth development activities
  - Teen pregnancy prevention
  - Gender-specific programs for boys and girls
  - Last 5 – 6 years teen pregnancy increased since funding for programs decreased

  The respondent from the Children’s Board, stated, “I think diminishing programs and supports in the community. There was a major de-funding of youth development activities, teen pregnancy prevention activities, gender specific programs for boys and girls. Those have diminished through several entities in the county, both at the county, the Children’s Board. And Work Force Wages began changing their strategies, their strategic plan, which impacted some of those programs and supports and we have seen the rates of teen pregnancy increasing in the last 4 to 6 years since those funds have been withdrawn.” This may reflect the nature of the type of work the respondent does. It is worth noting that this respondent considers boys, as well as girls, in the context of teen pregnancy.

- Programs as a diversion from sex  **(Most influential - 2 respondents)**

  Two direct service provided believed that keeping kids busy with supervised activities was a way to prevent adolescent childbearing. One respondent said, “Kids have a lot of time, like after school, when they are unsupervised. If the parent is working, kids need somewhere to go so they won’t get in trouble. There is a lot of peer pressure and kids, teens, still need guidance so they don’t get pregnant or in trouble with the law, things like that.”

  Similarly, the other respondent believed that, “It’s easy for teens to get bored. They need something to do, something like sports or hobbies to fill their time.”

- Cultural changes – ages of acceptable childbearing has gotten older over the decades  **(Most influential – one respondent)**

  The respondent noted that with longer life expectancy, modern society’s idea of the acceptable age of childbearing has increased. She stated, “There’s the cultural aspect of what today’s culture considers to be a problem in teen pregnancy, whereas 50 to 100 years it was not atypical for a girl of 16 or 17 or 18 to get married and have children.”

- Availability of different options
  - influenced by affordable health care, birth control, abortion options, religious beliefs, ideas of family
This respondent believed there is a combination of factors that influence teen childbearing. She noted, “Lots of things influence if a girl gets pregnant, like if her parents are working and have a good job, they might have good health insurance. So she can get good health care and birth control, or she can afford to have an abortion, unless there are religious beliefs about that. Also, what the family thinks about keeping the baby.”

- Teen motherhood less stigmatized now than 20 years ago
  From one provider’s perspective, motherhood at a young age is more accepted by society than it used to be.

- Parent(s) working (lack of supervise when girl is out of school)
  This respondent believed that lack of supervision puts a girl at risk of getting pregnant. She stated, That’s another issue, too. With both parents working, there is no one to serve in a supervisory capacity in the home when that girl is out of school. And most parents will tell you that the hours between 2:00 and 4:00 are deadly in terms of maybe where some of these issues of pregnancy are coming from.” Nevertheless, this respondent was quick to point out that girls whose parent or parents are not working also get pregnant.

- Lack of sex education in schools – both boys and girls
  This respondent reflected what may be considered a personal belief about the responsibilities of the educational system. “The other big issue is that Hillsborough County is a very conservative county in terms of the school system. And until we open up a more comprehensive sexual education component for both boys and girls, we are going to be dealing with an uphill battle. We need comprehensive sexuality education in the school system and the best place for that to start is at the middle school level. Our teens, unfortunately in this county, are not seeing a lot of this stuff beyond basic health education until high school.” This respondent considered educating boys, as well as girls, as a way to prevent teen childbearing.

Next, because an Index of Socioeconomic Inequality was developed as part of this research, interview responses were placed into one of three categories – Social, Economic, and Other. In addition, indicator data availability is noted in Table 4.7 below, along with the possible data source based on whether or not geographic data are available for the indicator.
### Table 4.7 Factors Influencing Adolescent Childbearing with Data Availability and Possible Sources

<table>
<thead>
<tr>
<th></th>
<th>Social Influences</th>
<th>Geographic Data</th>
<th>Economic Influences</th>
<th>Geographic Data</th>
<th>Other Influences</th>
<th>Geographic Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friends and Family</td>
<td></td>
<td></td>
<td>• Family financial resources</td>
<td>-Poverty -Income level</td>
<td>• Role model or mentor</td>
<td>N/A</td>
</tr>
<tr>
<td>Available health care choices</td>
<td>• Accessible health care</td>
<td>N/A</td>
<td>• Insurance from parent’s employer</td>
<td>-Working class</td>
<td>-Poverty -Un-employed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Religious beliefs</td>
<td>N/A</td>
<td>• Medicaid eligibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• State reporting laws for minors</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pregnancy prevention programs</td>
<td>• Available</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accessible</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Appropriate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involvement in activities during free time</td>
<td></td>
<td></td>
<td>• Ability to pay for activity</td>
<td>N/A</td>
<td>• Encouragement from parent(s)</td>
<td>N/A</td>
</tr>
<tr>
<td>Working parent(s)</td>
<td>• Supervision</td>
<td>N/A</td>
<td>• Type of work</td>
<td>-Working class</td>
<td>-Encouragement</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Job benefits</td>
<td>-Income level</td>
<td>from parent(s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-Low education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex education</td>
<td>• State and local policies</td>
<td>N/A</td>
<td></td>
<td></td>
<td>• Acceptability of early childbearing</td>
<td>N/A</td>
</tr>
<tr>
<td>Cultural Norms and Values</td>
<td></td>
<td></td>
<td>• Live with relatives</td>
<td>-Crowded conditions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N/A = data not available geographically or on a sub-county geographic level

Variables identified by the service providers during interviews, and that have data available geographically, included neighborhood levels of poverty, income levels (median income, high income and low income), working class, and unemployment.

Individual-level (personal) factors have been included in the interview analysis, even though they are not part of the larger analysis undertaken at this time. The Index of Socioeconomic Inequality, which is informed partly by these interview results, uses only
neighborhood-level variables. However, a multilevel model, which is the next logical step to the research conducted here, uses both neighborhood-level and individual-level variables that may place an adolescent girl at risk of having a baby. The individual-level variables discovered during these interviews can be used as a preliminary investigation for a multi-level model analysis. In addition, all variables whether they are found in the literature or not, can be used as part of a multilevel model. The multilevel modeling technique will separate variables that help explain adolescent childbearing from those that do not.

**Index of Socioeconomic Inequality**

A significant contribution of this research to an “applied anthropology of GIS/spatial analysis” involved the development of an Index of Socioeconomic Inequality. An index essentially combines several variables into one, thus eliminating the need to analyze each variable separately. It provides a single area-based measure by statistically combining variables with different units of analysis (e.g., individuals, households, dollars, education level, and job status), allowing block groups in Hillsborough and Pinellas Counties to be compared in relation to each other. While several indices are often used to measure socioeconomic deprivation and disadvantage for spatial epidemiological research (e.g., the Townsend Index, the Carstairs Index, and the Area-Based Socioeconomic Measures (ABSMs) used in the Harvard School of Public Health’s Geocoding Project), this research developed an index that aligned with Harvard’s ABSMs which include contextual (neighborhood-level) variables that relate specifically to adolescent childbearing.
In their Area-Based Socioeconomic Measures Index, Krieger et al. (2003c) provide variables demonstrating socioeconomic position. However, the authors state that variables used in any index must be meaningful, and at times it will be necessary to add relevant variables to any index that is developed. In other words, although socioeconomic position must be considered when investigating social and public health issues, any index being developed must also include variables specific to the investigation. For example, in their study of the relationship between low birth weight and lead poisoning, the authors added the percentage of housing units built before 1950 (a time when lead-base paint was still being used in homes) to their Area-Based Socioeconomic Measures Index.

Based on the social and economic indicators cited during interviews, and indicators found in the literature to be associated with adolescent childbearing (Freeman and Rickels 1993, Guttmacher Institute 2004, National Campaign to Prevent Teen Pregnancy 2004), and using variables from Harvard’s ABSMs, a composite Index of Socioeconomic Inequality was developed based on relevant neighborhood-level, or community, variables. Variables used include low educational level (less than 12th grade education), unemployment, working class jobs, low income/poverty (median household income, income less than 50 percent of poverty level, poverty level), and crowded conditions (greater than or equal to one person per room in residence). Measures that are negatively associated with adolescent childbearing (Freeman and Rickels 1993, Guttmacher Institute 2004, National Campaign to Prevent Teen Pregnancy 2004) include greater than fours years of college, high income (over 400 percent of median income) and expensive homes (as a measure of wealth). The variable “single parent households,”
found in the literature and during interviews as a contributing factor to adolescent
childbearing, was added to the socioeconomic variables used in the Harvard Geocoding
Project. Because birth data used in this research range from 1992 to 1997, neighborhood-
level data from the 1990 U.S. Census were used to create this index.

A correlation analysis was conducted using SPSS (v13.0) to test the
appropriateness of the indicators selected for inclusion in the Index of Socioeconomic
Inequality. As discussed above, the data are not normally distributed, and therefore a
Spearman rho correlation was used. Eleven neighborhood-level variables were used in
addition to birth rates for the six race/ethnicity and age-groups.

The results of the Spearman rho correlations are shown in Table 4.8 below. The
significance level for all variables tested was p = .000 in a 2-tailed test. Although the
strength of the correlations varies across the race/ethnicity and age-groups, there are
fairly strong correlations with all variables except two: Income over 400% of Median
Income and Expensive Homes. Both of these variables show minimal negative
relationship between and adolescent child bearing across all race/ethnicity and age-
groups.

The analysis shows that as the levels of single parent households, low educational
attainment, poverty, unemployment, blue collar employment, low income households,
poverty status, and crowding increase, levels of adolescent childbearing also increase.
And as levels of education, income and wealth (as measured by expensive homes)
increases, adolescent childbearing decreases.
Table 4.8 Spearman’s Rho Correlation

<table>
<thead>
<tr>
<th></th>
<th>W13_17 rates</th>
<th>B13_17 rates</th>
<th>H13_17 rates</th>
<th>W18_19 rates</th>
<th>B18_19 rates</th>
<th>H18_19 rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single HHolds</td>
<td>.341</td>
<td>.418</td>
<td>.249</td>
<td>.364</td>
<td>.440</td>
<td>.227</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
<tr>
<td>&lt;12 grade</td>
<td>.404</td>
<td>.388</td>
<td>.307</td>
<td>.441</td>
<td>.366</td>
<td>.265</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
<tr>
<td>&gt;4 yrs college</td>
<td>-.340</td>
<td>-.298</td>
<td>-.250</td>
<td>-.402</td>
<td>-.279</td>
<td>-.199</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
<tr>
<td>Unemployed</td>
<td>.274</td>
<td>.316</td>
<td>.187</td>
<td>.230</td>
<td>.318</td>
<td>.192</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
<tr>
<td>Working Class</td>
<td>.386</td>
<td>.343</td>
<td>.278</td>
<td>.437</td>
<td>.307</td>
<td>.259</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
<tr>
<td>Income&lt;50%</td>
<td>.311</td>
<td>.373</td>
<td>.194</td>
<td>.322</td>
<td>.351</td>
<td>.143</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
<tr>
<td>Income&gt;400%</td>
<td>-.246</td>
<td>-.230</td>
<td>-.144</td>
<td>-.299</td>
<td>-.212</td>
<td>-.155</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
<tr>
<td>Med HH Inc</td>
<td>-.335</td>
<td>-.384</td>
<td>-.238</td>
<td>-.343</td>
<td>-.371</td>
<td>-.206</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
<tr>
<td>&lt;Poverty</td>
<td>.335</td>
<td>.431</td>
<td>.260</td>
<td>.383</td>
<td>.430</td>
<td>.239</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
<tr>
<td>Crowded</td>
<td>.404</td>
<td>.431</td>
<td>.346</td>
<td>.404</td>
<td>.415</td>
<td>.368</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
<tr>
<td>Expensive Homes</td>
<td>-.261</td>
<td>-.264</td>
<td>-.168</td>
<td>-.278</td>
<td>-.250</td>
<td>-.193</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
<td>1338</td>
</tr>
</tbody>
</table>

Because the variables are indicators of very different neighborhood characteristics, all eleven variables were used to develop the Index of Social Inequality.

A thematic map of the Index was created for Hillsborough and Pinellas Counties to show
areas with very low, low, high and very high levels of socioeconomic inequality. Hot spots and cold spots, by race/ethnicity and age-group were overlaid on the Index thematic map (see Appendix A).

In general, hot spots align with areas of high or low levels of socioeconomic inequality, with a few exceptions. However, cold spots aligned with all four levels of socioeconomic inequality. As the maps in Appendix A show, some of the hot spots for births to African American 13-17 year-olds and 18-19 year-olds, as well as hot spots for births to 18-19 year-old Hispanic adolescent are in areas with a low level of socioeconomic inequality. In addition, the maps in Appendix A show hot spots and cold spots are found in urban, suburban and rural areas of Hillsborough and Pinellas counties.

**Interview Results – Round 2**

A second round of semi-structured interviews was conducted with five service providers and professionals, all of whom work directly with at-risk or pregnant adolescents or provide funding for these services. Although I had hoped to interview the providers from the first round of interviews, Positive SPiN was unable to participate. However, an individual from the Florida Department of Health in Tallahassee was going to be in Tampa and arrangements were made for an interview. Four respondents were female and one was male; one respondent was African American and four were white. Two providers, representing the Child Abuse Council and the Girls Drop-In Program, work directly with adolescent females, offering pregnancy prevention services. One provider, Alpha House, works primarily with teens who are already pregnant or parenting, but has a strong educational component in their program aimed at repeat
pregnancy prevention for the adolescents they serve. In addition, individuals from two
public agencies that fund pregnancy prevention services, Florida Department of Health
and the Children’s Board of Hillsborough County, were interviewed.

The purpose of these semi-structured interviews was to obtain providers’
reactions and feedback on expected/unexpected results of this research as well as the
utility of this method to the work they do. First, they were shown six maps with birth
locations for white, black and Hispanic adolescents in the 13 to 15 year-old and 18 to 19
year-old age categories (see Appendix A). Next, they were shown the hot spot/cold spot
maps (see Appendix A). Finally, they were introduced to the thematic Index of
Socioeconomic Inequality map (also found on the maps in Appendix A). These
interviews lasted from 45 minutes to 80 minutes, with only one interview lasting less than
one hour.

Respondents answered the following three questions:

1. Are the results of this analysis consistent with your knowledge and experience with
teenage child-bearing?
   Which factors did you expect to see? Which factors did you not expect to see?
2. How reliable do you think the information from this analysis is?
3. Do you think this type of information would be useful to you in your work?

Data gathered from the interviews were transcribed and analyzed using a
componential analysis, that is, responses that specifically address the questions asked. In
addition, other comments made during these interviews were also analyzed. Based on
these questions, the interview responses were categorized and then sorted and coded
manually by respondents’ interest in the information presented to them, by how relevant
or useful they think this type of information would be for the work they do, and by their
perception of the level of reliability of the information presented based on their
experiences and expertise. Additionally, common themes that emerged in all five
interviews were analyzed.

Provider Interview Results

Provider Interest. Without exception, all providers expressed interest in the maps
shown to them during the interviews. One provider noted, “Maps are always interesting.
You get a perspective of data that’s different.” Another said, “I like it because I get to
see the bird’s eye view.” And yet another provider stated, “It’s interesting because you
can see multiple factors.”

However, there was also some indication that maps were not appropriate for all of
the respondents. Although all of the provider respondents stated that the maps were of
interest to them, it became apparent early in one interview that the respondent was having
difficulty getting oriented to locations on the maps and understanding the relationship
between hot spots and cold spots, and the socioeconomics of different communities.

Relevance/Usefulness to Providers. All providers stated that information, such
as adolescent birth distributions, hot spots and the socioeconomic well-being of
communities would be useful information. They indicated several ways in which this
type of information would be useful to them.

Referring to the thematic map of the Socioeconomic Inequality Index, one
provider stated, “It would be helpful to see what area has more of a need than another.”
They also indicated the socioeconomic indicators would be useful for service planning, “…looking at where you can do the most in your community.”

In addition to identifying need and targeting prevention services in communities, providers also noted that the information and the maps would be helpful in securing funding for their existing programs or possible new initiatives. One respondent stated, “This would be great if we ever apply for a grant or additional funding or want to do additional activities. Things like that.” Another noted, “Something like this easily could be put into some kind of grant.”

However, not all comments were positive. One provider stated that maps are not always the best way to present information, noting, “Sometimes they show small populations, and with small populations, it’s hard to justify services.” Another provider, when discussing the map with the Socioeconomic Inequality Index which was overlaid with hot/cold spots, stated, “This is too distracting for me.” The same respondent, when reflecting on the data presented by race and by age-group, also offered, “I think dealing with race from a data perspective can get very confusing.”

**Perception of Expected and Unexpected Results.** Many of the maps (see Appendix A) displayed conditions or circumstances that providers expected to see. For example, one respondent noted, “[The births] seem to cluster around where the populations of the races are. I would expect that.” Also speaking of the birth maps, one provider noted, “…generally I would have expected it to look that way.”

There were, however, several things that providers did not expect to see. Speaking of the map showing births to 13 to 17 year-old African American adolescents,
one respondent stated, “I’m amazed at how low these are compared to some of the data I
was seeing from like 2006-2007. [The number of births] has truly increased in this
population. I believe it has increased significantly throughout the state.”

There was considerable discussion about the hot/cold spot maps. One provider
simply stated, “Wow, that is interesting. I never would have thought that was a hot spot.”
Another offered, “In the Sulphur Springs area, there is a lot of work already in that area.
But it’s the white adolescents in the Sulphur Springs area that are showing up [as a hot
spot]. Yet Plant City is not that bad of a hot spot.”

The Index of Socioeconomic Inequality also generated some discussion. One
provider stated, “I would have expected darker [higher levels of socioeconomic
inequality] in the Plant City area. Interesting.” Another offered this observation, “With
hot spots, a neighborhood is not always that bad, but it’s next door to the bad areas. Hot
spots don’t really correspond to the high inequality areas. But are they affected or
impacted by that? By living in what one might call a blighted area, is that causing these
hot spots that surrounded this area of high inequality?”

**Funding Agency Interview Results**

**Funder Interest.** Both individuals from the two funding agencies expressed great
interest in the information presented in the maps. One respondent simply noted, “…this
is data we would look at.” The other stated, “it’s definitely something interesting to see,”
and added, “It would be interesting to see if we are spending our money where we can
make an impact, and if not, what can we do in another part of the county where we
haven’t looked at before.”
**Relevance/Usefulness to Funding Agencies.** As with providers, respondents from the funding agencies indicated that information about the adolescent birth distributions, hot/cold spots and the socioeconomic well-being of communities would be useful information for the agency. They indicated several ways in which this type of information could be used, such as “Funding for special projects,” “…to pinpoint areas that we can make an impact, certainly that is where we will want to put the money,” or to, “…concentrate funds or implement a special project in an area.”

One respondent stated, “…it would be essential if you were to do a needs assessment to see where the need is in the community. I can imagine someone who is not a data guru taking a look at this and seeing where they can make a difference. Certainly this would be helpful for providers to use the data.”

On the other hand, according to one respondent, the utility of presenting data by race and ethnic group, although interesting, may not be useful to that particular funding agency. “To be politically correct, we probably would put it all together. In a grant, it probably wouldn’t be politically correct to single out a population.”

**Perception of Expected and Unexpected Results.** Almost all of the discussion focused on the hot/cold spot maps. One respondent observed that, “Hot spots don’t necessarily align with where the most births are.”

The focus was also primarily on unexpected results. For example, when looking at the hot/cold spot maps of the Hispanic populations, one respondent stated, “I’m not surprised at this considering what’s happening in that [the Hispanic] community. I would imagine that data from 08-09 is the same thing.” The other respondent commented,
“Interesting – why is a hot spot for 18 to 19 year-old Hispanic teens showing up in Safety Harbor?” One funder also remarked on the Hispanic 13-17 year-old hot spots in the area of Brandon and Valrico, stating, “I can totally understand Wimauma, Ruskin, Gibsonton. It floors me – Brandon and Valrico. It’s further enough away. It’s really odd.”

**Common Themes Among Providers and Funders**

Three common themes emerged among individuals from both provider and funding agencies, including dwindling economic resources, the need for more current birth data, and an interest in Hispanic adolescents.

Each respondent mentioned lack of funding due to the current economic crisis, often on several occasions during their interview. One provider stated, “Money is so very tight right now and continuing to shrink, so you’re going to want to put your dollars where they have the most effect.” Another noted, “Considering the shortage of funding now-a-days, it is hard to know whether to offer services where there are the most births or where there is a smaller, but higher risk population.” Yet another provider offered, “When you don’t have the dollars you had a few years ago, well, it’s tough now.” And a respondent from a funding agency commented, “I certainly think this would be useful for an agency and they could use this, especially now what’s happening with the shrinking budget.”

Respondents from both service providing agencies and funding agencies also expressed the desire for more current data, noting that the data they get is often outdated. One respondent stated, “The data we use is sometimes unfortunately several years old, so it wasn’t up to date.”
All respondents spent most of their time looking at the maps of Hispanic adolescent hot spots. One respondent brought up the topic of Hispanic teens more often than white or African American. Comments included, “[Florida] has had such a large influx of Hispanic population,” and “The Hispanic population has increased dramatically [in recent years].”

**Summary of Results**

This chapter presented this study’s results, showing where teen births occurred in Hillsborough and Pinellas Counties, where teen birth rates are statistically higher or lower than would be expected, the socio-economic well-being of people living in these areas, and how useful providers and funding agencies think this type of analysis might be for their work in adolescent pregnancy prevention.

Results are presented by race or ethnic group (white, black and Hispanic) and each of these groups is presented by age-group (13 to 17 year-olds and 18 to 19 year-olds). Descriptive birth statistics for the State of Florida as well as for Hillsborough and Pinellas Counties were presented.

Maps were created to show the spatial distribution of births in Hillsborough and Pinellas Counties. Maps were also produced to show hot spots and cold spots, areas where adolescent childbearing is statistically higher or lower than would be expected. Finally, an Index of Socioeconomic Inequality was generated using 1990 U.S. Census data.
CHAPTER FIVE: DISCUSSION

This research offers data analysis methods that contribute to an “applied anthropology of GIS/spatial analysis.” The study included quantitative, spatial and qualitative techniques and used an iterative design which integrated data on births and birth rates, small area indicators of socioeconomic well-being, and key informant interviews to investigate adolescent childbearing in Hillsborough and Pinellas counties, Florida. Further work is needed in developing and testing sound hypotheses and applying rigorous study methodologies to advance the field.

Discussion of the Study

The research conducted in this study was iterative in nature. It began with calculating adolescent birth rates and determining hot and cold spots (where birth rates were higher or lower than expected). Next interviews were conducted with teen pregnancy prevention service providers and funders to determine neighborhood or demographic factors that contribute to adolescent childbearing. The results of these interviews helped to inform the Index of Socioeconomic Inequality, developed to provide context to where these adolescents live. A second set of interviews asked these service providers if they thought this type of information would be helpful in the work they do.

During the analysis of the first round of survey interviews, when sorting responses by individual-level and neighborhood-level (community) indicators and then
by the type of program services, several patterns emerged. First, it was interesting to note that the funding agency and the two youth development programs noted out-of-school time activities as the most important factor influencing whether or not a girl is at risk of getting pregnant. This may reflect the focus of their work as well as personal beliefs. Second, all of the respondents, at some point in the interview, identified solutions to the risk factor they identified. For example, one respondent talked about teens needing something to when they are not in school and offered suggestions such as participation in sports or hobbies. This may indicate that providers have an interest in protective factors associated with delayed childbearing. Finally, although respondents were asked to identify what they felt was the most influential factor affecting adolescent childbearing, two respondents identified two factors as being equally influential. This suggests that, while there are several factors that place an adolescent girl at risk of getting pregnant, there is not consensus about the most important factor.

During the second round of interviews, all respondents indicated they were interested in the type of information provided in the maps of adolescent births, hot and cold spots, and the Index of Socioeconomic Inequality. Respondents also indicated they thought this type of information would be useful in the work they do, and each person listed at least two ways in which they could possibly use the information. What was quite interesting, however, was the fact that the cold spots on the maps generated almost no discussion from providers, even though discussion during the first round of interviews, which investigated risk factors for adolescent childbearing, suggested funders and providers were interested in factors and strategies that protect and prevent teen girls from having babies.
There are two observations regarding the second, longer interview process worth noting. First, a study by Taylor and Chavez (2002), which investigated adolescent childbearing in California, found that many service providers had difficulty orienting themselves to maps. This was not the case with the providers I interviewed. In fact, just the opposite was true and respondents clearly recognized the different areas of the county by correctly referencing different areas by name. The second observation was the body language of the respondents and their level of engagement with the maps. All of the respondents took their time and carefully looked over various parts of the counties. And all respondents touched the maps, using their hands to point out or explore different parts of the counties. In addition, all respondents spent at least half of the interview standing up and bending over the maps on the table or desk. While exploring the maps, they made very little eye contact with me when they spoke. Finally, I had to remind each respondent at least once during the interview that they were looking at data from the 1990s and not current data. This reflects providers’ desire for current data as noted above.

A major focus of this study investigated the relationship between socioeconomic well-being and adolescent childbearing. The Index of Socioeconomic Inequality, created as part of this research, is shown in the maps in Appendix A with hot spots and cold spots overlaid. Geographic areas containing hot spots and cold spots are outlined on the maps. A Spearman’s rho correlation tested the strength and significance each of the variables considered for use in the Index. These eleven variables, which are indicators of socioeconomic well-being, were then standardized using z-scores. Gradients on the maps show four levels of socioeconomic well-being, ranging from very high to very low levels of socioeconomic inequality.
A z-score standardizes a distribution in terms of the number of standard deviations that a score is from the mean of the distribution. A negative z-score means that the original score was below the mean and a positive z-score means that the original score was above the mean. The actual value of the z-score corresponds to the number of standard deviations the score is from the mean and in what direction (above or below). For example, if each of the eleven indicators shown in Table 4.8 had z-score of two (two standard deviations above the mean) for a given block group, by adding the eleven z-scores together, the final z-score for that block group would be 22.0. A score of 22.0 would indicate a very high level of socioeconomic inequality, meaning the population is experiencing greater levels of socioeconomic deprivation.

In all of Hillsborough County, Florida, the z-scores ranged from +23.1 to -10.3 and in all of Pinellas County, Florida, z-scores ranged from +20.0 to -8.0. Higher z-scores indicate greater levels of socioeconomic inequality. The z-scores for the hot spots in Hillsborough and Pinellas counties by race/ethnicity and age-group are shown in Table 5.1.

Z-scores for the Index of Socioeconomic Inequality were calculated at the block group level to show differences that exist within census tracts. Because the Index was formulated by block group, in order to compare the level of socioeconomic inequality in an area to hot spots and cold spots presented at the census tract level, average z-score were calculated for hot spot and cold spot areas by adding the block group z-scores within each census tract-level hot/cold spot and dividing by the number of block groups within each hot/cold spot census tract.
<table>
<thead>
<tr>
<th></th>
<th>Hillsborough 13 -17 Year-Olds</th>
<th>18-19 Year-Olds</th>
<th>Pinellas 13 -17 Year-Olds</th>
<th>18-19 Year-Olds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;Hot Spot&quot; Census Tract Index Average z-Score</td>
<td>&quot;Hot Spot&quot; Census Tract Index Average z-Score</td>
<td>&quot;Hot Spot&quot; Census Tract Index Average z-Score</td>
<td>&quot;Hot Spot&quot; Census Tract Index Average z-Score</td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 0.728</td>
<td>10 2.546</td>
<td>208 4.244</td>
<td>218 4.244</td>
</tr>
<tr>
<td></td>
<td>9 -0.537</td>
<td>26 4.650</td>
<td>218 4.244</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 7.841</td>
<td>218 4.244</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>31 7.041</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 6.641</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>124 2.852</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>129 4.822</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>138 1.707</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>139.02 2.996</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>141.03 3.804</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11 -1.205</td>
<td>214 4.418</td>
<td>202.04 -0.716</td>
<td>268.04 -1.418</td>
</tr>
<tr>
<td></td>
<td>12 3.588</td>
<td>233 0.225</td>
<td>210 7.269</td>
<td></td>
</tr>
<tr>
<td></td>
<td>29 2.782</td>
<td>270 -1.130</td>
<td>213 2.310</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30 7.841</td>
<td></td>
<td>218 4.244</td>
<td></td>
</tr>
<tr>
<td></td>
<td>31 7.041</td>
<td>218 4.244</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>33 10.60</td>
<td>234 4.483</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>33 10.60</td>
<td>234 4.483</td>
<td>234 4.483</td>
<td></td>
</tr>
<tr>
<td></td>
<td>49 2.310</td>
<td>263 -1.345</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>112.06 -0.256</td>
<td>268.04 -1.418</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>120.02 1.897</td>
<td>268.07 -1.423</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>19 6.359</td>
<td>247 2.176</td>
<td>229.02 -0.072</td>
<td></td>
</tr>
<tr>
<td></td>
<td>37 3.431</td>
<td>259.02 4.533</td>
<td>248.02 -0.068</td>
<td></td>
</tr>
<tr>
<td></td>
<td>39 7.247</td>
<td>108.07 2.769</td>
<td>259.02 4.533</td>
<td></td>
</tr>
<tr>
<td></td>
<td>43 16.24</td>
<td>127 0.706</td>
<td>264 -0.046</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130 1.200</td>
<td>267.02 -2.978</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>132.02 -4.080</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>133.01 1.707</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>138 1.707</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>139.02 2.996</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>141.03 3.804</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If there is indeed an association between the neighborhood-level variables used to calculate the Index of Socioeconomic Inequality and high rates of adolescent childbearing as shown by the associations in the Spearman’s Rho correlation, we would expect to see high rates of adolescent childbearing in areas with higher z-scores. In most
cases this is true. The exceptions in Hillsborough County, where z-scores were low (negative numbers) in hot spot areas, are found in the Carrollwood, Old Seminole Heights, and Valrico areas of the county.

In Pinellas County, over one-third (9 of the 21 hot spots) have negative z-scores, showing lower levels of socioeconomic inequality in these communities. These low z-scores are associated with hot spots for both younger (13 to 17 year-old) and older (18 to 19 year-old) African American adolescents and for older Hispanic adolescents.

Hot spot areas and the level of socioeconomic inequality associated with these areas raises two very different questions. First, in hot spot areas (areas of higher than expected rates of adolescent childbearing) where there are high levels of socioeconomic stress, the question then becomes, “If birth rates to adolescents are expected to be high where there are high levels of socioeconomic inequality, then why are the birth rates even higher than expected?” Second, hot spot areas where there are lower levels of socioeconomic stress raises the question, “Why are adolescent birth rates so high in areas where they should be lower?” All of the areas shown in Table 5.1 above offer opportunities for further investigation. Ecosocial theory states that neighborhood factors alone can never fully explain adolescent childbearing. And, as noted, hot spot analysis is an exploratory technique (English et al. 2003) which requires further investigation in order to understand why something is happening and why conditions look like they do. Examination of individual-level factors, perhaps using ethnographic techniques or a multilevel modeling approach, may help to explain the higher than expected birth rates to adolescents in these geographic areas.
While several hot spots were found in Hillsborough and Pinellas Counties, there
far few cold spots found, that is, areas where the birth rate was much lower than would be
expected. Again, if there is an association between the neighborhood variables used to
calculate the Index of Socioeconomic Inequality, as demonstrated by the Spearman’s Rho
correlation, and very low rates of adolescent childbearing, we would expect to see lower
z-scores in cold spot areas where there are lower levels of socioeconomic stress. Table
5.2 below shows the average z-scores for the cold spots in Hillsborough and Pinellas
Counties by race/ethnicity and age-group.

Table 5.2 Average z-Scores for Census Tract Cold Spots

<table>
<thead>
<tr>
<th></th>
<th>Hillborough</th>
<th></th>
<th>Pinellas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13-17 Year-Olds</td>
<td>18-19 Year-Olds</td>
<td>13-17 Year-Olds</td>
</tr>
<tr>
<td>Cold Spot Census Tract</td>
<td>Cold Spot Census Tract</td>
<td>Cold Spot Census Tract</td>
<td>Cold Spot Census Tract</td>
</tr>
<tr>
<td>Index Average z-Score</td>
<td>Index Average z-Score</td>
<td>Index Average z-Score</td>
<td>Index Average z-Score</td>
</tr>
<tr>
<td>white</td>
<td>139.04 -0.144 50 4.430</td>
<td>273.07 -0.171 201.05 -1.368</td>
<td></td>
</tr>
<tr>
<td></td>
<td>110.01 -4.528 109 3.678</td>
<td>268.09 -1.251</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>114.02 -3.495 109 3.678</td>
<td>-- -- -- --</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 4.430</td>
<td>-- --</td>
<td>-- --</td>
</tr>
</tbody>
</table>

Just two cold spot areas show higher levels of socioeconomic inequality, both in
Hillsborough County. One is located near the University of South Florida and the other
is near downtown Tampa in the vicinity of the University of Tampa, perhaps suggesting
that student status may play a role in the higher levels of socioeconomic disparity in these
areas. As with the hot spot areas, the questions that arise are, “If we expect low rates of adolescent childbearing in areas that are socioeconomically better-off, why are these areas so much lower than expected?” and “Why are adolescent birth rates not higher in more socioeconomically stressed areas?” As with hot spot areas, these cold spots call for further investigation.

While there is some evidence of an association between adolescent childbearing and neighborhood socioeconomic well-being based on the results of the Index of Socioeconomic Inequality, clearly other factors influence childbearing. We cannot ignore individual-level experience, social processes and state level factors, as well as the interaction between these aspects, that can also affect adolescent childbearing and birth outcomes (Colen et al. 2006, Diez-Roux 2001, Hox 1998, Jones and Duncan 1998, Krieger et al. 2005, O’Campo 1997). It is also important to note here that the Index of Socioeconomic Inequality is an area-based population measure and is not intended to be substituted for individual-level measures. These area-based measures provide context while individual level measures, such as risk taking behavior, values, mores, social relationships, religious beliefs, and other cultural factors can all provide explanation and meaning to adolescent childbearing.

Results of the Index of Socioeconomic Inequality are consistent with Leventhal and Brooks-Gunn’s (2008) research which shows that socioeconomic conditions of neighborhoods where adolescents live are associated with their well-being. Their study found that high socioeconomic status (SES) neighborhoods were associated with adolescent’s educational achievement while low-SES neighborhoods were associated
with low social well-being and high sexual and fertility outcomes. Yet anomalies exist in the results in Hillsborough and Pinellas Counties, Florida,

An unusual aspect of this study is the investigation of cold spots as well as hot spots. While research conducted by English et al. (2003) Gould et al. (1998), Johnson-Clarke (2000) Romero-Daza (2004), and Taylor and Chavez (2002) discussed in Chapter Two look for hot spots, the research in this dissertation also investigated cold spots where rates of adolescent childbearing were lower than expected. These cold spots offer opportunities for investigation of possible protective factors associated with youth in a given area. It also offers a bridge for anthologists between the larger-scale quantitative study done for this dissertation and opportunity to investigate the role of culture using more traditional anthropological ethnographic techniques as discussed by Greenbaum (1998). This may be one of the first steps toward an “applied anthropology of GIS/spatial analysis.”

Another potential contribution of this dissertation’s research, which has remained relatively unnoticed to this point, was the creation of age and race/ethnicity specific denominators for each block group’s female adolescent population for each year of the corresponding birth data. The number of steps involved – calculating individual ages by race and ethnicity, bridging the racial categories of the 1990 and 2000 U.S. Censuses, incorporating inter-census population estimates, reconciling Census boundaries, and calculating each census block group’s female population, for whites, blacks, and Hispanics for each single age for each year between the 1990 and 2000 Censuses – was time consuming, yet critical to determining denominators used in calculating birth rates. This lengthy procedure helped to ensure greater data validity by eliminating the need to
use either 1990 or 2000 U.S. Census data when the birth data used in this research fall between these two censuses.

This method of calculating age and race/ethnicity specific denominators by year has great potential for future analyses. The 23rd decennial U.S. Census takes place on April 1, 2010, and current population and housing statistics will most likely be very different than the previous U.S. Census in 2000, just as the 1990 U.S. Census differed from the 2000 U.S. Census. Each decennial census presents a “snapshot” in time of population and housing conditions, and demographic and socioeconomic conditions will vary over the ten-year period leading to the subsequent census enumeration. Until such time as the U.S. Census Bureau begins providing age, gender and race specific data by year at different geographic levels, this method of calculating these data will help to provide greater data validity.

Last, but not least, the interviews conducted with service providers were an important part of this study. The interviews found that service providers and professionals, who work directly with at-risk or pregnant adolescents or provide funding for these services, considered the results of this research and analysis would be useful in their provision and funding of services. Respondents considered the information in the maps to be potentially useful for service planning, identifying need, targeting communities where prevention services are needed, and in applying for grants. In addition to addressing the applied anthropological goal of making our work useful, the interviews also served as a bridge from the larger scale regional hot/cold spot and socioeconomic analyses to a smaller-scale inquiry more consistent with anthropological techniques.
Caveats and Limitations

This research relied primarily on two data sources – the U.S. Census and Florida Vital Statistics birth data. Each has its strengths and weak points. As Kirby (1996) notes, censuses do not provide a total enumeration of a population, although they strive to. The same is true for vital statistics data sets, which also tend to be undercounted.

Nationally, the 1990 U.S. Census missed almost two percent of the population (National Public Radio 2009). In Hillsborough County, Florida, for children under age 18, the U.S. Census Bureau estimates there was an undercount of:

- 4.1 percent white (6,561)
- 6.5 percent black (2,720)
- 6.3 percent Hispanic (1,922)

For children under 18 years old in Pinellas County, Florida, the U.S. Census Bureau (1999) estimates an undercount of:

- 4.3 percent white (6,825)
- 6.3 percent black (1,528)
- 5.5 percent Hispanic (295)

The 1990 U.S. Census population undercount affects denominators used to determine teen birth rates. However, the 2000 U.S. Census introduced a method for estimating populations which will be used in subsequent census enumeration and helping to provide a more accurate population count. Additionally, the method for determining single age by gender by race by year, developed as part of this dissertation, helped to partially account for this undercount by using an annual growth rate calculation to move the population forward toward the more accurate 2000 U.S. Census.
In addition to undercounts, the 1990 U.S. Census presented another challenge related to race and ethnicity. Although the 2000 U.S. Census reported number of non-Hispanic individuals by race, the 1990 U.S. Census did not. Therefore, in this research white and black adolescents may also be Hispanic. In other words, the Hispanic adolescents in the population denominators in this research are also included in the denominators for white and African American adolescents. Therefore, it is important to consider that the maps showing the distribution of births to Hispanic adolescents most likely duplicates births to white and African American adolescents. This has cultural, and perhaps linguistic, implications for service providers.

While ages by race and ethnicity were calculated for each inter-census year for the adolescent population, data were not available to calculate inter-census indicators used in the Index of Socioeconomic Inequality. As the U.S. Census Bureau’s American Community Survey data becomes available for more indicators and on a smaller geographic scale, inter-census estimation of neighborhood-level indicators may become possible.

As shown, there is a heavy reliance on secondary data sets in this research and, in fact, any research involving GIS or spatial analysis. Although the data are publicly available there are still ethical considerations in the way the data are used and disseminated. Anthropologists have ethical responsibilities to the people we study and communities affected by our work, as well as our colleagues, students, our employers and to society as a whole. When considering a newly emerging anthropology of GIS, ethical considerations must be examined. Depending on the research being conducted, ethical considerations must include ensuring confidentiality while sharing data and study results.
appropriately. Appropriate dissemination of data and research results would consider how the people being studied are represented as well as sharing how to (and how not to) interpret study results. It would also consider the consequences of research and take steps to ensure local political powers are not reinforced and politically sensitive areas are protected (American Anthropological Association 1998, Brondizio 2002, Cassell and Jacobs 1987, Society for Applied Anthropology 1983, Whiteford and Trotter 2008).

Reflecting on the interview process, perhaps only one interview should have been conducted, rather than two. Maps presented during the second, longer interview engaged the respondents and provided a visual representation of how factors contributing to adolescent childbearing were used in my study. I believe soliciting respondents ideas about factors affecting adolescent childbearing (from the first, short interview survey) could have been accomplished more effectively during the interview with the maps (my second interview), when there was some context for how these variables were used.

Finally, the methods described in this research are exploratory and can not be substituted for ethnographic investigations. While useful in helping to highlight what may be happening and where, quantitative and spatial methods alone can not answer the questions why or how. This is not meant to be a stand-alone method, but rather a place to begin further investigations.

**Summary**

This study has shown some association between hot spot and cold spot areas of Hillsborough and Pinellas Counties where adolescent childbearing is higher or lower than
would be expected by chance. While this is not always the case, there is enough evidence for further investigation.

The Index of Socioeconomic Inequality, which was developed as part of this study, showed inconsistency in relation to socioeconomic stress and teen births. The incompatible index scores with hot/cold spots were found primarily in Pinellas County, Florida, where the adolescent female population was relatively small.

Interviews with individuals who provide adolescent pregnancy prevention services or who work at agencies that fund pregnancy prevention programs and activities bridged the spatial analytic portion of this research with more traditional anthropological ethnographic techniques. Respondents expressed interest in the results of this study and identified several ways in which they thought the type of information provided would be useful for their program or for possible future projects.
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

To contribute to an “applied anthropology of GIS/spatial analysis,” this study must be more than the geography of health or an epidemiological study. As Aldenderfer (1996) points out, one of the challenges of working toward an “applied anthropology of GIS” is to integrate small-scale and personal techniques of traditional anthropology with larger-scale, more regional methods. This research has combined spatial analysis within two Florida counties with key informant interviews, a more widely used technique among cultural anthropologists.

In addition to contributing to an “applied anthropology of GIS/spatial analysis,” this study makes several contributions to the discipline of anthropology as a whole. First, this research presents the opportunity to view adolescent childbearing from a holistic perspective by presenting racial and ethnic analysis that can be used to consider race in the context of culture. Because there is no biological basis for race, there is an opportunity to explore race and ethnicity in the context of culture. Second, this research presents a multi-method approach, showing one example of how to bridge spatial and quantitative inquiry with more ethnographic investigation. Third, this research is informed by the contentious debates on cause and effect of race/ethnicity and influences on adolescent childbearing. By investigating neighborhood-level factors that influence adolescent childbearing, the focus shifts from the individual to the influences of outside factors. Fourth, the focus of this research was to develop a method that can inform
practitioners. As applied anthropologists, we want our work to be useful. Finally, there
is interest within the discipline of anthropology regarding spatial analysis. Dr. Susan
Stonich presented her ideas on how to move toward an anthropology of rather than
anthropology in spatial analysis/GIS to the 101st Annual Meeting of the American
Anthropological Association in 2002

**Conclusions**

While archaeology has embraced spatial analytic techniques on larger geographic
scales often using sophisticated technology, as discussed in Chapter 2, cultural
anthropologists employ similar techniques, but usually on a smaller scale. According to
Greenbaum (1998), ethnographic approaches are often used in anthropological inquiry
and employ several techniques for studying small populations, including key informant
interviewing, mapping spatial relationships and the use of quantitative data, all of which
were used in this research. Just as anthropologists have been using ethnography, as a
way “to understand cultural and social differences within and among communities”
(Greenbaum 1998:120), this research has used newer technologies on a larger scale
which provide a different and somewhat more holistic perspective on local phenomena.

The research undertaken in this dissertation set out to address three questions:

- What are the patterns of adolescent childbearing in Hillsborough and Pinellas
  counties, Florida?
- Is there a relationship between community-level socioeconomic indicators and
  adolescent childbearing?
- Will adolescent pregnancy prevention service providers and funding agencies find
  this information useful and relevant to the work they do?
First, this study has investigated patterns of adolescent childbearing in Hillsborough and Pinellas Counties, Florida, in several ways. Descriptive statistics show patterns in childbearing among 13 to 17 year-old and 18 and 19 year-old white, African American and Hispanic teens. Although white teens have the largest number of births, birth rates are highest for African American teens in both age groups. In addition, hot/cold spot analysis has shown neighborhoods where births to adolescents are statistically higher or lower than would be expected. While there were no hot spots for white 13 to 17 year-olds in Pinellas County and no hot spots for black 13 to 17 year-olds in Hillsborough County, there were a large number of hot spots for 13 to 17 year-old Hispanic teens in Hillsborough County. Although hot spot analysis is a descriptive technique which is exploratory in nature, the maps provide a way to view the hot spots spatially and offer the opportunity for more targeted research studies.

Regarding the second question and relationships between community-level socioeconomic indicators and adolescent childbearing, there were mixed results when these hot/cold spots were overlaid on a map showing the Index of Socioeconomic Inequality. Hot and cold spots were located in neighborhoods experiencing both high and low socioeconomic stress. Although the Spearman’s rho analysis showed correlation between the selected indicators used in the index and adolescent childbearing, there are clearly other factors at work which need to be explored.

Addressing the third research question regarding the usefulness and relevance of spatial investigation of adolescent childbearing, interviews with adolescent pregnancy prevention services providers and funders highlighted the utility of this study’s results. Respondents believed the information provided in the maps could be used for service
planning, to obtain additional funding, and to help target prevention efforts for maximum impact. In fact, there is also evidence that the methods used in this study are applicable to service providers other than those addressing teen pregnancy prevention. I was recently asked by the Hispanic Services Council for a map that displays the Index of Socioeconomic Inequality and areas of Hillsborough County where there is a high concentration of Hispanic families. The Hispanic Services Council plans to use this map in their strategic planning process.

This dissertation’s research demonstrates the feasibility of the mapping techniques, hot spot analysis and development of an index that were used to investigate adolescent childbearing in this research. The software (MS Excel and GIS mapping software) used in this study is readily available and increasingly being used by anthropologists. From a cultural perspective, stratifying female adolescents by race/ethnicity and age-groups helped provide a more detailed perspective of adolescent childbearing. In addition, calculating birth rates by age-group and race/ethnicity to correspond to each year’s birth data helped to ensure a higher level of validity for population denominators. The use of publicly-available data allows this methodology to be replicated anywhere in the United States and the flexibility of this publicly-available neighborhood data means it can be used with a wide variety of outcomes or events and can track these outcomes or events over time.

This research can contribute to the field of applied anthropology and other social sciences by demonstrating the feasibility and utility of this problem-driven approach and by providing a greater understanding of how contextual, or neighborhood-level, factors can be analyzed. Although this study has yielded important information about the
relationship between adolescent childbearing and the socioeconomics of the neighborhoods where these girls live, further work is needed in developing and testing hypotheses and applying rigorous research methodologies to advance the emerging field of an “applied anthropology of GIS/spatial analysis.”

**Recommendations**

Bearing in mind that this study is just one small step toward an “applied anthropology of GIS,” there are many things that can be done to build on this research. These include alternate ways to assess hot and cold spots, different ways to conceptualize neighborhood-level variables through multilevel modeling techniques, and working to build a conceptual framework for anthropological small area analyses.

While useful, the hot spot analysis used in this study is limited by geographic boundaries. As Kirby (1996) points out, these boundaries are artificial and social groups are not confined to ZIP Codes or Census Tracts, but rather are influenced by factors from a wide variety of sources. Hot spot assessment using cluster analysis is not dependent on these artificial political boundaries and may prove to be another way to view hot spots, especially on a larger scale.

The idea of hot spot cluster analysis as an exploratory device leads to a discussion of another meaningful method of analysis. Recently, hierarchical models (multilevel models) have emerged as a methodology to handle the interplay of individual-level variables and neighborhood variables. This method would be the next logical step in the research presented here, building on the Index of Socioeconomic Inequality which was
developed using neighborhood-level variables. In addition, multilevel methods provide a bridge between statistical modeling and descriptive mapping (Krieger et al. 2003).

Multilevel modeling is an important tool that allows simultaneous study of individual-level and neighborhood-level factors, and provides information on how these two levels of risk interact. Analyses of individual-level and neighborhood-level variables, in addition to their interaction, is useful for developing better explanatory models of adolescent pregnancy, childbearing and birth outcomes. Examining individual-level variables and neighborhood-level risk factors, as well as interaction between the two, will help to increase understanding of the many factors responsible for adolescent birth rates, birth outcomes and risks and protective factors. Multilevel analysis can also help to identify racial differences in birth rates and disparities in birth outcomes. In general, this will lead to a better understanding of the complex causes of adolescent pregnancy and adverse birth outcomes.

In addition further analysis, the information provided by this type of study has potential practical applications. As indicated in interviews, providers can use information on where to focus their prevention activities and for writing grants for expanding services or implementing special projects. Funding agencies can use the type of information in this research to make funding decisions and to track the impact of the services they fund.

There are also several possible ways in which anthropologists can use information from this type of research. First, anthropologists can use this research as a beginning point for further investigation of cold spots to better understand protective factors that allow adolescents to delay childbearing. In addition, anthropologists can work with service providers and funding agencies to assist them in interpreting the data regarding
areas where teen births rates are higher than expected or where there are a large number of births to adolescents. Finally, anthropologists can assist teen pregnancy prevention service providers in designing and implementing new and creative ways to deliver prevention services and to provide these services in a culturally sensitive manner.

Perhaps the greatest challenge facing an emerging “applied anthropology of GIS/spatial analysis” is integrating statistical, spatial and anthropological theory with analytic applications. As Kirby (1996:1860) asserts, without critical attention to the aspects of small area analysis conducted in this research, “the gulf between theory and practice will widen into an ocean.” Here is where anthropological theory, perspectives and methods can begin to contribute to this newly emerging “applied anthropology of GIS/spatial analysis” by providing a way in which phenomena can be viewed, interpreted and understood.
REFERENCES CITED

Abe, Yoshiko. Curtis W. Marean, Peter J. Nilssen, Zelalem Assefa, and Elizabeth C. Stone

Abrams, Barbara, Sarah L. Altman, and Kate E Pickett

Aickin, Mikel, Clara N. Dunn, and Timothy J. Flood

Akinbami, Lara J., Kenneth C. Schoendorf, and John L. Kiely

Aldenderfer, Mark

American College of Obstetrics and Gynecology (ACOG)


American Diabetes Association
American Anthropological Association  

American College of Surgeons  

Amini, Saeid B., Patrick M. Catalano, LeRoy J. Dierker, and Leon I. Mann  

Anachbe, N.F. and M.Y. Sutton  

Ananth, Cande V., Dawn P. Misra, Kitaw Demissie, and John C. Smulian  

Annie E. Casey Foundation  

Anselin, Luc  

Bateman, Brian T., and Lynn L. Simpson, Lynn L.  

Brimicombe, Alan J.  

Brondizio, Eduardo S.  

Carstairs, Vera  

Cassell, Joan and Sue-Ellen Jacobs  

Centers for Disease Control and Prevention  

Chang, Shih-Chen, Kimberly O. O’Brien, Maureen Schculman Nathanson, Jeri Mancini, and Frank R. Witter  


Conant, Francis Paine  

Coppolillo, Peter B.  
Cunnington, Aubrey J.  

Diez-Roux, Ana V.  

Eck, John E., Spencer Chainey, James G. Cameron, Michael Leitner, and Ronald E. Wilson  

Ehrlich, Ginny and Carlos A. Vega-Matos  

Elliott, Paul and Daniel Wartenberg  
2004 Spatial Epidemiology: Current Approaches and Future Challenges. Environmental Health Perspectives 112(9):998-1006.

English, Paul B., Martin Kharrazi, Stephanie Davies, Rusty Scalf, Lance Waller, and Raymond Neutra  

Eure, Chineta R., Michael K. Lindsay, and William L. Graves  

Florida Department of Health’s Community Health Assessment Resource Tool Set  
Florida Department of Health
2005 Florida Youth Risk Behavior Survey. Electronic document,

Florida Legislature
2009 Florida Demographic Summary. Office of Economic and Demographic
Research. Florida Legislature, Tallahassee, FL. Electronic document,

Freeman, Ellen W. and Karl Rickels
1993 Early Childbearing: Perspectives of Black Adolescents on Pregnancy, Abortion,

Furuno, Jon P., Lisa Gallicchio, and Mary Sexton
2004 Cigarette Smoking and Low Maternal Weight Gain in Medicaid-Eligible

Futemma, Célia and Eduardo S. Brondízio
2003 Land Reform and Land-Use Changes in the Lower Amazon: Implications for

Galtier-Dereure, Florence, Catherine Boegner and Jacques Bringer

Galvez-Myles, Rosa, and Thomas D. Myles

Geronimus, Arline T.
2003 Damned If You Do: Culture, Identity, Privilege and Teenage Childbearing in

Gordon, A.D.
1999 Classification. New York: Chapman and Hall

Gould, Jeffery B., Beate Herrehen, Tanya Pham, Stephan Bera and Claire Brindlis
1998 Small-Area Analysis: Targeting High-Risk Areas for Adolescent Pregnancy
Greenbaum, Susan D.

Guttmacher Institute

Hahn, Robert

Hillis, Susan D., Robert F. Anda, Shata R. Dube, Vincent J. Felitti, Polly A. Marchbanks, and James S. Marks

Hoffman, Saul D.

Hopper, Kim

Howie, LaJeana D., Jennifer D. Parker, and Kenneth C. Schoendorf

Hox, Joop
Hughes, Patricia, and Samantha Riches

Institute of Medicine, National Academy of Sciences.

Jevitt, Cecilia M.
1983 A Study of Repeated Pregnancy Among Adolescents Enrolling in a Teen Services Program.

Jevitt, Cecilia, Ivonne Hernandez, and Maureen Groër

Jevitt, Cecilia M., Shannon Morse, and Yong Sue O’Donnell

Jia, Haomiao, Peter Muennig, and Elaine Borawski

Johnson-Clarke, Fern

Jones, Eric E.

Jones, Kelvyn and Craig Duncan
Kaplan, Elaine Bell

Krieger, Nancy

Krieger, Nancy, Jarvis T. Chen, David H. Rehkopf, and S.V. Subramanian

Krieger, Nancy, Jarvis T. Chen, Pamela D. Waterman, M. J Soobader, S. V. Subramanian, and R. Carson

Krieger, Nancy, Sally Zierler, Joseph W. Hogan, Pamela Waterman, Jarvis Chen, Kerry Lemieux, and Annie Gjelsvik

Krieger, Nancy, Pamela D. Waterman, Jarvis Chen, David Rehkopf and SV Subramanian

Krieger, Nancy, Jarvis T. Chen, Pamela D. Waterman, David Rehkopf, and S.V. Subramanian
Krieger, Nancy, Pamela D. Waterman, Jarvis T. Chen, David H. Rehkopf, and S.V. Subramanian

Kroeber, Alfred L.

Lang, Laura

Lawlor, Debbie A., and Mary Shaw

Lawson, Andrew B.

Leadbeter, Bonnie J. and Niobe Way

Lemen, Paul M., Thomas R. Wigton, Amy J. Miller-CcCarthey, and Dwight P. Cruikshank

Leventhal, Tama and Jeanne Brooks-Gunn

Loker, William M.

Luker, Kristin
MacMahon, Brian, Thomas F. Pugh, and Johannes Ipsen

March of Dimes

Martin, Joyce A., Bradly E. Hamilton, Stephanie J. Ventura, Fay Menacker, and Melissa M. Park

Maternal and Child Health Bureau (MCHB)
2004 Child Health USA 2004. Electronic document,

Matte, Thomas D., Michaeline Bresnahan, Melissa D. Begg, and Ezra Susser.

Maynard, Rebecca A.

Mayo Clinic
2004 Cesarean Birth and the Road to Recovery. Electronic document,

Meng, Yu and Debbie A. Niemeier

National Campaign to Prevent Teen Pregnancy
2004 General Facts and Stats. Electronic document,
2007 Why It Matters: Teen Pregnancy and Other Health Issues. Electronic document,
2010 Why It Matters: The Costs of Teen Childbearing. Electronic document,
National Center for Health Statistics

National Public Radio
2009  Census Stirs Debate In Washington. Weekend All Things Considered, April 19, 2009

Nuthalapaty, Francis S., and Dwight J. Rouse

O’Campo, Patricia, Xiaonan Xue, Mei-Cheng Wang, and Margaret O’Brien Caughy

Parsons, Tessa J., Chris Power, and Orly Manor

Perper, Kate, Kristen Peterson, and Jennifer Manlove

Phipps, Maureen Glennon, Jeffrey D. Blume, and Sonya M. DeMonner

Podolsky, Richard

Publiatti, M., G. Solinas, S. Sotgiu, P. Astiglia, and G. Rosati

Raneri, Leslie G.
Reader, Steven  

Reichman, Nancy E.  


Romero-Daza, Nancy  
2004 "Low Birth Weight in Hillsborough County: Combining GIS and Anthropology.” Presentation to Anthropology Club, University of South Florida, April 12, 2004.

Rushton, Gerard  

Saisana, Michaela and Stefano Tarantola  

Sillitoe, Paul  

Singhal, Atul, Jonathan Wells, Tim J. Cole, Mary Fewtrell, and Alan Lucas  

Smith, Gordon C.S., and Jill P. Pell  
Smith, Sally

Society for Applied Anthropology

Solinger, Rickie

Stack, Carol B.

Steward, Julian H.

Stonich, Susan C.

Tatian, Peter A.

Taylor, Don and Gilberto Chavez

Turok, David K., Stephen D. Ratcliffe, and Elizabeth G. Baxley
U.S. Census Bureau
N.d. American FactFinder Datasets.
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=DEC&_tabId=DEC2&_submenuId=datasets_1&_lang=en&_ts=266574506897
N.d.(b) Standard Hierarchy of Census Geographic Entities.
http://www.census.gov/geo/www/geodiagram.pdf
1999 Net Undercount and Undercount Rate for U.S. and States (1990),
2000a Census 2000: Census 2000 Geographic Terms and Concepts, Appendix A
2002 Comparing SF 3 Estimates with Corresponding Values in SF 1 and SF 2.
Last Revised: August 08, 2002 at 12:00:02 PM. Electronic document,

U.S. National Library of Medicine and the National Institutes of Health

Wang, Xinhao and David P. Varady

West, Kirsten and J. Gregory Robinson
http://www.census.gov/population/www/documentation/twps0039/twps0039.html

Whiteford, Linda M.

Whiteford, Linda M. and Robert T. Trotter II
APPENDICES
Appendix A: Maps

2000 Census Tracts, Hillsborough County, Florida
2000 Census Tracts, Pinellas County, Florida
Births to 18-19 Year-Old White Adolescents (1992-1997)
Appendix A (Continued)

Births to 13-17 Year-Old Black Adolescents (1992-1997)

Births to 18-19 Year-Old Black Adolescents (1992-1997)
Appendix A (Continued)

Births to 13-17 Year-Old Hispanic Adolescents (1992-1997)

Births to 18-19 Year-Old Hispanic Adolescents (1992-1997)
Appendix A (Continued)

**Hot and Cold Spots: 13-17 Year-Old White Adolescents**

**Hot and Cold Spots: 18-19 Year-Old White Adolescents**
Appendix A (Continued)

Hot and Cold Spots: 13-17 Year-Old Black Adolescents

[Map Image]

Hot and Cold Spots: 18-19 Year-Old Black Adolescents

[Map Image]
Appendix A (Continued)

Hot and Cold Spots: 13-17 Year-Old Hispanic Adolescents

Hot and Cold Spots: 18-19 Year-Old Hispanic Adolescents
Appendix A (Continued)

Hot and Cold Spots: 13-17 Year-Old White Adolescents with Socio-Economic Inequality Index

Hot and Cold Spots: 18-19 Year-Old White Adolescents with Socio-Economic Inequality Index
Appendix A (Continued)

Hot and Cold Spots: 13-17 Year-Old Black Adolescents with Socio-Economic Inequality Index

Hot and Cold Spots: 18-19 Year-Old Black Adolescents with Socio-Economic Inequality Index
Hot and Cold Spots: 13-17 Year-Old Hispanic Adolescents with Socio-Economic Inequality Index

Hot and Cold Spots: 18-19 Year-Old Hispanic Adolescents with Socio-Economic Inequality Index
ABOUT THE AUTHOR

Kathleen Maes moved to Tampa in 1993 from Green Bay, Wisconsin. In 1996, she completed her Master’s Degree in Applied Anthropology at the University of South Florida, and shortly after, decided to pursue her Ph.D.

Over the past 17 years, Kathleen has been employed as a Research Associate at the Lawton and Rhea Chiles Center for Healthy Mothers and Babies at the University of South Florida and at the Juvenile Welfare Board in Pinellas County, Florida. Dr. Maes currently works in the Research and Evaluation Department of the Children’s Board of Hillsborough County.