A spatial analysis of childhood poverty in Montana: Are food programs reaching the children?

David E. Highness

The University of Montana
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A Spatial Analysis of Childhood Poverty in Montana: Are Food Programs Reaching the Children?

By

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B.S. The University of Alaska, 1988

presented in partial fulfillment of the requirements

for the degree of

Master of Arts

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Approved by:

Chairperson

Dean, Graduate School

3-6-98 Date
A Spatial Analysis of Childhood Poverty in Montana: Are Food Programs Reaching the Children?

Director: Paul B. Wilson

Childhood poverty in Montana is a complex and dynamic problem. The four aspects of childhood poverty presented in this study include the spatial distribution of childhood poverty and change in the distribution of childhood poverty, the factors related to the location of poverty, the location of school food programs, and the utilization of free and reduced meal programs.

The location and degree of poverty shifts and changes over time. Childhood poverty increased significantly on the average between 1980 and 1990. A spatial shift occurred when childhood poverty rates decreased in the eastern central portion of the state but increased in the rest of the state. The effect was a more continuous distribution across the state instead of a concentration in the eastern half of the state. Extreme childhood poverty is encountered in very rural areas and on the Native American reservations.

White and Native American poverty are associated with different factors. Poverty among the white population is lower in the economic centers of the state, while Native American poverty is reduced away from the economic centers. Native American poverty in non-reservation counties increases with the percentage of female headed households. There was no relationship between poverty and percentage female headed households for whites or for reservation Native Americans. While these factors may or may not cause poverty, differences in culture may be what allows ethnic or racial groups to have varying economic outcomes based upon where they live.

Poor nutrition is a potential problem among school children, especially poor children. The hypothesis that school food programs are not equally available to all children in the state is mostly unfounded. School lunch and breakfast programs are available to most students though a small number of poor rural children who need access may not be getting it.

The hypothesis that all Montana counties are not adequately making use of federal free and reduced meal programs can be supported. Most counties have made adequate use of these programs but usage varies. Counties that may try to increase their usage of the free and reduced meal programs are identified.
ACKNOWLEDGMENTS

I would most like to thank my wife Patty for sacrificing her freedom, her home, her time, her energy, her money, and her love necessary to see me through the completion of graduate school and this thesis. Without her moral support, editing skills, and determination this certainly would have been a much more difficult project.

Thanks are required of the entire staff of the Geography department. Special thanks to Drs. Wilson, Von Reichert, and Miller who stood by me through the meat of the project. Thanks to Dr. Kang for stepping in to help finish things off. Special thanks also to Nancy Ebel, department secretary, for her great knowledge of how things really work.

Lastly, I would like to dedicate this thesis to my mother (Ruth Highness Duckworth, M.A. Guidance and Counseling, UM 1971) who mistook youthful zeal to mean lack of academic interest but did not live to see me finish college. I know that you are proud of me!
PREFACE

In addition to fulfilling the requirements of a Masters Degree in Geography, this thesis is intended to aid the State of Montana in its policy making decisions. Poverty is an on-going problem in Montana that is made even more pressing with the transfer of responsibility for welfare from the federal government to the states. Montanan's will need to decide how they are going to treat the poor in their populace and endeavor to reduce their number.

Of primary concern are the welfare and developmental needs of Montana's children. Children represent the future of the state; lack of concern for all of the state's children represents lack of concern for the health of the state in general.

This thesis is composed of five chapters. Chapter one is the introduction; it provides a statement of the problem and outlines the research goals. Chapter Two is intended as background; it reviews and summarizes the literature relating to the research of poverty. Chapter Three explains the methods and data used in the analysis. Chapter Four details the results of the analysis. Chapter Five includes the conclusions of the research and gives recommendations for further research.
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CHAPTER 1

INTRODUCTION

Poverty is the state in which a person or family is unable to obtain the basic necessities required to sustain a minimally adequate standard of living. Though a relatively high standard of living is enjoyed by most residents of the United States of America, many people are poor and are said to exist in poverty. One in five children in the United States lives in poverty, the highest rate of all developed nations.

Montana's poverty rates reflect the trends present throughout the rest of the country. Childhood poverty in the U.S. in 1979 was 16.4%; by 1989 it was 19.6%. Between 1979 and 1989, Montana underwent an even greater transformation. In 1979 childhood poverty was comparatively low, only 13.6%, but by 1989 it was 19.5%, a figure almost exactly in line with the national trend. These numbers show that Montana has a childhood poverty problem that is worsening. Failure to act appropriately could mean dire consequences for the future of the state.

Most social scientists echo the sentiment of Ashworth et.al. that "childhood lays the foundation for adult abilities, interests, and motivations and, hence, is the keystone for

1Leatha A. Lamison-White, Income Poverty and Wealth in the United States: A Chart Book
assuring equal opportunity for adults." Consequently, childhood poverty is of critical concern in this country, and it has serious consequences for the general health of our society. Though it may be impossible to completely eliminate poverty, it is worth our effort to endeavor to reduce it. Ensuring that children are given a chance to get a healthy start could be our best investment in the future.

Because children do not participate in politics, those who create poverty policies tend to overlook their needs. They are dependent upon their parents and society in general to break free of poverty.

In October of 1996 the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 was passed into law. Otherwise known as welfare reform, this legislation vastly altered the landscape of welfare policy. Changes included the elimination of federal Aid for Families with Dependent Children (AFDC) payments, and the transfer of AFDC responsibility to the states via federal block grants. These changes also placed social criteria, time limits, and work requirements on the states distribution of welfare payments. Social criteria included elimination of most welfare benefits for all types of aliens (legal and illegal) and limits on availability of benefits to high school age mothers. Federally funded free and reduced lunch and breakfast programs were only marginally affected by the legislation. Effects included elimination of reduced priced meals with concurrent expansion of the eligibility criteria for free meals.

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Montana, having already implemented welfare reforms of its own, must now comply with the additional mandates established by the federal welfare reform legislation. A looming problem is that children are not receiving adequate nutrition for proper development. In 1996 it was estimated that as many as 51% of Montana's children did not eat adequate breakfasts. Free school meal programs will remain fully funded by the federal government and are an excellent way of ensuring minimal nutrition. At the very least, Montana should ensure that all children needing nutritional aid are getting it. To meet this requirement, all school districts will have to maintain a school food program and all children in need of nutritional aid must be enrolled in the federal meal program.

Montana has an ongoing poverty problem that needs to be addressed. In the years prior to 1990, poverty increased rather than decreased. The ultimate question lay in the effects of reducing federal welfare dollars while the number of poor continue to increase.

Two problems are to be addressed by this thesis. The first problem involves seeing how Montana's childhood poverty compares to places outside Montana, describing where poor children are located within Montana, and how these locations have changed over time. Once the location of childhood poverty is discovered then an attempt will be made to explain why it is located where it is. The second problem involves assessing Montana's school food programs. Questions that need to be answered are whether poor children have

adequate access to schools that have food programs and are they making use of federally subsidized meals at their schools.  

To gain insight into Montana's poverty problem two topics related to childhood poverty are analyzed and presented in this thesis. Each topic is further subdivided into separate subtopics.

The first topic is a spatial analysis of childhood poverty in Montana. Its subtopics are: 1) context of childhood poverty in Montana, 2) Maps of children in poverty, and 3) factors related to childhood poverty.

The goal of the first subtopic is to see how poverty in Montana compares with the west and the nation. The comparison is made at different points in time and through time to elucidate the context and recent history of poverty for the state.

In the second subtopic, maps of Montana are used to which show the spatial distributions of children in poverty. Mapping the phenomenon in question is always an initial step undertaken by geographers. The goal of mapping is to look for irregularities or patterns in the distribution of the phenomenon. Change in the distribution of childhood poverty from 1980 to 1990 is investigated.

In the third subtopic, data are gathered and analyzed which concern the various factors that might possibly be related to the distribution of childhood poverty displayed in the maps. Part of the goal is to try to find reasons for the irregularities and patterns seen in the maps.

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5Federal free and reduced price meal programs.
The second topic is a spatial analysis of elementary school food programs in Montana. Its subtopics are: 1) the location of school food programs in relation to childhood poverty and 2) the relationship between childhood poverty and usage of federal free and reduced meal programs.

In the first subtopic, data were gathered which were used to further map and analyze the location of school food programs in relation to childhood poverty. The goal of this analysis is to assess if school food programs are equally available to all children, regardless of economic status or location. The hypothesis is that equal availability was not present.

For the second subtopic, the findings regarding food programs were refined by collecting, mapping, and analyzing data which concern the utilization of federal free and reduced meal programs. The hypothesis is that usage of these programs was not proportional to childhood poverty rate in all Montana counties. Change in the utilization of free and reduced meal programs over time is investigated.

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School food programs are the hot lunch and breakfast programs that are available in school cafeterias at a minimal fee to students. These programs are organized by school districts.

Federal free and reduced meal programs are welfare programs that pay for all or part of qualifying students hot lunches and breakfasts at the school cafeteria.
CHAPTER 2
BACKGROUND

In the United States, the social sciences have intensively studied poverty for nearly 200 years. Governmental attempts to reduce poverty have continued at least that long with varying results. This chapter discusses the main aspects of the study of poverty, especially childhood poverty, within the United States. Topics to be covered include the definition of poverty and poverty thresholds, poverty theories, description of American in poverty, other phenomena that affect poverty, the geography of poverty, effects of poverty on children, and poverty policies which affect poor children.

Poverty and Poverty Thresholds

In this section, three means of defining poverty in the United States are presented. The first definition of poverty is qualitative and describes in general subjective terms what poverty is. The second definition, that concerns poverty thresholds, is quantitative and classifies people as existing in or out of poverty. The third definition describes childhood poverty by the ways that it effects their lives.

Definition of poverty

Poverty 1. the condition or quality of being poor; indigence; need 2. deficiency in necessary properties or desirable qualities, or in a specific quality, etc.; inadequacy 3. smallness in amount; scarcity; paucity
SYN.- poverty, the broadest of these terms, implies a lack of the resources for reasonably comfortable living; destitution and want imply such great poverty that the means for mere subsistence, such as food and shelter, are lacking; indigence, a somewhat euphemistic term, implies a lack of luxuries to which one was formerly accustomed; penury suggests such severe poverty as to cause abjectness, or loss of self-respect.

Webster's New World Dictionary

In the social sciences, poverty is considered to be the state in which a person or family is unable to obtain the basic necessities required to sustain a minimally adequate standard of living. A minimally adequate standard of living is a culturally defined standard that is not constant through time or space but depends upon when or where it is being defined. In 1964, the United States decided to create an absolute poverty index with which to classify individuals and families as poor or not poor.1 This index could be used to study poverty and subsequently create policy that increases the standard of living and reduces the number of poor citizens.

Poverty Thresholds

The poverty index is based solely on money income and does not reflect non-cash benefits such as food stamps, Medicaid, and public housing assistance that are received by poor persons.2 The Department of Agriculture in the 1955 Survey of Food Consumption found that the average family of three or more persons spent approximately one-third of their income on food. The department's 1961 Economy Food Plan reflected the findings of this survey and established the value of a basic nutritional diet. The

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2 Bureau of Census, 108.
poverty threshold was then fixed at three times the dollar cost of the Economy Food Plan for a three person family. Thresholds for smaller and larger families were set by multiplying the Economy Food Plan by adjustment factors. Poverty thresholds are updated yearly to reflect changes in the Consumer Price Index (CPI-U). Table 1 displays the 1989 poverty thresholds that were used in calculating poverty rates for the 1990 census. Despite their continued use, the relevance of these poverty thresholds is, has been, and will remain a hot topic of debate among people who study poverty.

Two limitations of the poverty thresholds are spatial and temporal in nature. The poverty index should be adjusted to represent geographical variations in the cost of living. Logically, the cost of maintaining a minimally adequate standard of living is highly variable from place to place. No reliable regional cost of living indices exist. Likewise, the thresholds do not address the periodicity of poverty. The poverty thresholds categorize many people as being in poverty for a given year when in fact they may have had only a short and possibly even self-imposed reduction of their income. The thresholds aggregate people who fall temporarily below the poverty line with those who are persistently below.

Furthermore, as many politicians point out, poverty thresholds do not reflect the value of non-cash government benefits. Non-cash benefits include programs such as food stamps, school lunches, public subsidized housing, subsidized child care and

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4Bane and Elwood, 1047.
Medicaid. These benefits effectively reduce the cost of living of individuals and families.5

Table 1. Weighted average poverty thresholds, 1989.

<table>
<thead>
<tr>
<th>Size of family unit</th>
<th>Threshold ($)</th>
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<tbody>
<tr>
<td>One person (unrelated individual)</td>
<td>6,311</td>
</tr>
<tr>
<td>15 to 64 years</td>
<td>6,452</td>
</tr>
<tr>
<td>65 years and over</td>
<td>5,947</td>
</tr>
<tr>
<td>Two persons</td>
<td>8,076</td>
</tr>
<tr>
<td>Householder 15 to 64 years</td>
<td>8,343</td>
</tr>
<tr>
<td>Householder 65 years and over</td>
<td>7,501</td>
</tr>
<tr>
<td>Three persons</td>
<td>9,885</td>
</tr>
<tr>
<td>Four persons</td>
<td>12,675</td>
</tr>
<tr>
<td>Five persons</td>
<td>14,990</td>
</tr>
<tr>
<td>Six persons</td>
<td>16,921</td>
</tr>
<tr>
<td>Seven persons</td>
<td>19,162</td>
</tr>
<tr>
<td>Eight persons</td>
<td>21,328</td>
</tr>
<tr>
<td>Nine persons or more</td>
<td>25,480</td>
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Yet another argument with the official poverty thresholds is that the 1961 Economy Food Plan no longer represents the cost of feeding a family which has increased over time. It has been argued recently that a better approximation of poverty

would be 125 to 150 percent of the poverty thresholds. Brooks-Gunn et al. state that all of the alternatives to the current poverty thresholds, both absolute and relative, that have been studied would increase rather than reduce the number of people who already fall below the official thresholds.

Poverty thresholds, though flawed, are still useful and thus ubiquitous in poverty studies in the United States. The thresholds, having been calculated by the same means for an extended period of time allow for the study of temporal changes in the relative amount and spatial distribution of poverty. Existing thresholds or something similar need to be maintained into the future as benchmarks against which changes can be measured.

A quantitative definition of poverty for families, although complex, pales in comparison to the complexity of the definition of poverty for children. Children are dependent upon adults for their survival and development. They are not employed, do not vote, and do not know how to protect their own rights. Poverty for children is defined by the ways that it affects their development into adults.

Poverty and Children

An expansive body of literature in the social and medical sciences addresses the effects that poverty has upon children. Issues usually addressed by the literature

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include the effects of prenatal care, postnatal care, parental psychological state, and community upon the development of poor children. Almost exclusively the articles bode ill for children raised in the grasp of poverty.

Good prenatal care, especially in the first three months of pregnancy, can improve maternal and infant health dramatically.¹⁸ Infants born to women receiving no prenatal care are more than three times as likely to die in the first year of life than those receiving care.⁹ Poor prenatal care, including improper nutrition during pregnancy, lack of health checkups, and use of harmful substances such as cigarettes, alcohol, and illegal drugs, increases the likelihood that infants will be born prematurely or with low birth weight. These infants often have a host of associated health problems and developmental concerns and are likely to spend weeks or months in expensive neonatal intensive care units. Low birthweight caused by poor prenatal care has been found to be associated with births among poor women.¹⁰

Poor children are more likely to receive less-beneficial postnatal care. Common health problems associated with poor postnatal care include malnutrition, lack of proper immunizations, illness, injury, and mortality.¹¹ Common psychological-social effects

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¹⁰Klerman, 139.

¹¹Klerman, 137-41; Rosenbaum, 278-9.

These types of psychological problems in children have been linked by some researches with high incidence of dropping out of school, deviant behavior, teenage pregnancy, unemployment, and welfare dependency in adolescence and early teen years.\footnote{Lingxin Hao, "Poverty, Public Assistance, and Children in Intact and Single-Mother Families." \textit{Journal of Family and Economic Issues} 16 (Fall 1995): 182.}


Communities in which poor children live cause additional risk factors above and beyond the effects of their own households. Dilapidated housing and schools, burned-
out teachers, and lack of access to services such as health care and child care are common in these communities. Dangerous crimes such as drug-use, drug sales, and violence, including homicide and suicide, are commonplace. These dangerous environments affect children's mental health and physical well-being. It is argued that many of these children suffer from a form of Post Traumatic Distress Syndrome as a result of their violent surroundings. Hopelessness is common as they witness the inability of their mothers to escape poverty, have no role models to help them achieve goals, and doubt that they will survive into adulthood. The overriding feeling is that no one cares about their plight.

Summary

Poverty can be defined in simple as well as complex ways. In simple terms poverty is no more than a substandard level of existence. In complex terms it is an illness that afflicts our children and renders them incapable of competing on even ground within our free market society. In a bureaucratic way the government decides who is in or out of poverty based upon a mathematical calculation.

These definitions describe what poverty is and how it effects individuals and society. The definitions do not explain how poverty is caused or what the best approach to its elimination is. In the next section, theories that try to explain these questions are presented.

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Poverty Theory

Current theories concerning the functioning of human society in general and the nature of poverty specifically are based on historic paradigms in the social sciences. Paradigms are further tied to the background ideology of the scholar or scholars who proposed the paradigms, which in turn gives insight into their world view, culture, community, and family. In short, ideology explains much about a person's understandings, attitudes and feelings toward poverty.

For these reasons there is a wide latitude of difference between paradigms of poverty even within the constructs of Western thought. Ideas about how to deal with poverty are strongly tied to the paradigm ascribed to by the policymaker. As an example, if a policymaker believes that poverty is caused by a group of people that is culturally or psychologically unable to coexist in the dominant sector of society, the policy maker might not willingly create policies to help that group of people. The reason given would be that they cannot be helped. Alternatively, a policy maker who believes that poverty is merely caused by a lack of material resources could suggest that a redistribution of resources is all that would be needed to alleviate poverty.

This section covers three aspects of poverty theory. The first traces the historic strains of thought and places scholars ideology into a theoretical background. In the second section, recent additions and revisions of prior paradigms are discussed. The third section relates to current attempts to create models for the functioning of poverty in our society.
Historic paradigms

David L. Harvey and Michael Reed developed a typology of poverty paradigms that allows the writings of poverty scholars to be classified in relation to historical paradigms. Each paradigm has one of three economic characteristics and one of three cultural characteristics. The economic characteristics of poverty paradigms include: 1) poverty is not an economic based phenomena, 2) poverty is a production based economic phenomena, and 3) poverty is a market based economic phenomena. The cultural characteristics of poverty paradigms include: 1) there is no subculture of poverty, 2) there is a negative subculture of poverty (i.e. the subculture is maladaptive), and 3) there is a positive subculture of poverty (i.e. the subculture is adaptive). Table 2 illustrates the nine different paradigm constructs. The following section summarizes Harvey and Reed's article.

In the United States, two paradigms of poverty predominate. Conservatives generally draw on the paradigm of Malthusian Political Economy and liberals on the Social Democratic Paradigm. Two other paradigms that are relatively common are Neo-Classical Economics and Social Darwinism. Most modern social scientists draw on an eclectic mix of these four paradigms.

The Malthusian Political Economy is based on the writings of Thomas Robert Malthus in the late 18th and early 19th centuries. Malthus, a demographer and political economist, was interested in finding a way to increase material wealth for the

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He did not believe that progress was natural or automatically guaranteed. He believed that population grew faster than the means of subsistence. Phenomena such as war, famine, plague, and misery were thought to be positive checks on nature's tendency to over-reproduce. In this way, vice and misery are part of a divine Christian order to test the virtue and mettle of men and women as they struggle against temptation and adversity. The poor, by practicing discretion and sexual restraint, delaying marriage, practicing abstinence prior to marriage, and thus rationally limiting their numbers, could reduce labor supply and increase wages. In this way poverty could be reduced.

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Source: Harvey and Reed, 274.
Malthus believed that the cure for poverty was in the "moral" education of the ignorant poor and their children in order to teach them the virtues of prudence and foresight. Though circumstances could occasionally deposit the "rational poor" (e.g. the moral and educated poor) into poverty, he did not believe that the government should feel responsible to provide for the poor, especially to make it seem a natural right. He believed that charity should be provided by people motivated by Christian concerns. In this way those receiving aid would be grateful to those giving and the well-off would be allowed to cultivate their Christian virtues.

The Social Democratic Paradigm is rooted in early 20th century British scholarship. In this paradigm, poverty is caused by unfair distribution of wealth; lack of access to the state and to capital are reasons that the poor remain poor. This perspective assumes that the capitalist class has evolved from a risk-taking entrepreneurial class into a group of timid persons interested only in protecting their wealth. The means to ending poverty is through the politically mediated redistribution of wealth.

According to the Neo-Classical Economics paradigm, the roots of poverty lie in the lack of education and skills of the poor. The poor also maintain a way of life which impedes their chances of social mobility and stable job-holding. In this way the blame for poverty lies entirely upon the poor and the means of ending poverty is to change the poor. The rest of society and the predominating economic system shed all responsibility for creating and maintaining poverty. The means to ending poverty were through training and education.
The Social Darwinist paradigm sees society essentially as an organism.

According to Harvey and Reed this paradigm states that "the processes that produce poverty are now seen as 'natural,' largely autonomous, and objectively determinant forces which direct the evolution of the social organism." Poverty is a corollary to natural selection in which competition allows individuals to rise or fall based on their own inherent abilities. These natural forces are only partially, if ever, affected by attempts at social reform. Attempts to alter this natural process only impairs the functioning of institutions.

**Recent paradigms**

Most recent social scientists draw on an eclectic mix of the fore mentioned strictly defined paradigms. Changes in the theoretical underpinnings of poverty research have paralleled shifts in the theories of all of the social sciences. Most social scientists have concluded that human society in general and poverty in particular are too complex to lump into one cause and effect relationship. Several recent theories include the "culture of poverty" and the "relational theory of poverty".

The "culture of poverty", originated in the Chicago School of Sociology with the work of Robert E. Park and came into popular use in the 1950s and 1960s. This cultural perspective on poverty takes the position that the lower class manifests patterns of behavior and values which are characteristically different from those of the dominant society and culture. In addition, these unique patterns of behavior and values are

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17The term "Culture of Poverty" was coined by the anthropologist Oscar Lewis in 1959. Waxman, 7.
transmitted intergenerationally through socialization and have become the subcultural determinants of the lower socioeconomic status of the poor.

These types of culturally deterministic theories were prevalent in the mid part of the 20th century in all of the social and behavioral sciences. Their main battle was with scholars espousing an environmental determinist's viewpoint. For these people, the environment determines the way that people adapt to varying situations. In the 1960s people began to realize that social phenomena were most likely caused by a complex of environmental and cultural affects.

As an example, one scholar, Chiam I. Waxman, in his text *The Stigma of Poverty: A Critique of Poverty Theories and Policies*, merged two historically divergent strains of thought to form the relational theory.\(^\text{18}\) The following two paragraphs outline Waxman's theory.

Waxman felt that there is a subculture of poverty. This subculture displays a series of values and behaviors that are passed on intergenerationally as adaptations to poverty. Some of these behaviors include formation of gangs, increased rates of schizophrenia, lack of interest in education, and increased family size.

Waxman also felt that the environment or situation of the poor caused them to adopt these cultural behaviors. Changes in situation cause cultural changes. Stigma is considered the main driving force of culture change. The poor are stigmatized as a result of their inability to attain the overwhelmingly materialistic values of the greater public.

society. Their attitudes and behaviors are adjustments to the stigma of poverty, and these adjustments are transmitted intergenerationally through socialization (ie. culture).

In truth, the cause or result issue is still argued in the literature and is central to many current studies of poverty. One example is Duncan, Brooks-Gunn, and Klebanov's study of early childhood poverty on childhood development, which concludes that neighborhood makeup affects the IQ scores of five year old children.\textsuperscript{19} Poor children living in their neighborhoods where they were surrounded by ever higher proportions of affluent neighbors had increases in IQ test results. In this finding, the effects of poverty are reduced by the relationship between the poor and non-poor. One day, poverty studies may conclude that culture is the cause of persistent poverty in some cases and the result in others.

\textbf{Poverty models}

Current scholarly work on poverty has focused mainly on studying the ecology of poverty in an attempt to create working models of the way poverty functions. Risk models are discussed in Jeanne Brooks-Gunn et al. that pertain to child development in and out of poverty.\textsuperscript{20} Risk models state that increased risks associated with poverty slow or reduce the development of children. Risk factors include low birthweight, low maternal education, female headed householdership, unemployment, maternal depression, low social support, stressful life events, and inadequate parenting.


\textsuperscript{20}Duncan, et al., 17-23.
Variations of risk models address whether risks are additive or cumulative. Another variation states that poverty puts children in double jeopardy for bad consequences. The additive risk model stipulates that poor children have more bad consequences because they have more poverty risk factors than do non-poor children. These risk factors, both biological and environmental, are additive or synergistic in effect, with adverse outcomes for children. In the cumulative model, as the number of risks increase the effects upon children increase. This model may be the reason that some poor children do well and some non-poor children do not. Accumulation of multiple risk factors would have a greater detrimental effect upon child development than would poverty. Double jeopardy states that children from poor families experience more risks than do children from non-poor families and the consequences for the poor are more severe.

Summary

Most social scientists agree today that human society is composed of a complex of sophisticated and dynamic phenomena that is nearly impossible to generalize into overarching theories or singular models. The best that can be done is to understand the workings of one group of people at one time and place. The imposition of one group's ideology on another group is thought to be culturally relativistic and possibly laced with bigotry, so most scholars attempt to be ethnically and culturally objective in their scholarship.

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21Duncan, et al., 18-19.
Description of Americans in Poverty

Poverty in the world and the United States has a variety of comparable characteristics. Six characteristics are discussed in the following section. The first subsection compares poverty between several industrialized nations. Second, poverty in the United States is compared across time. Third, poverty between racial groups is contrasted. Fourth, presents age group differences. Fifth is a comparison of family types. Sixth, contrasts poverty between families based on the education attainment of the head of household.

International comparisons

Poverty is an issue of central concern to human affairs the world across. Nations trying to lessen poverty have had varying success. Non-industrialized nations often do not have the ability to address their poverty problems. In general, industrialized nations make efforts to reduce poverty but are unable to eliminate it.

In relation to the poorest nations of the world, children in the United States are healthy. Infant mortality rates (a proxy for poverty rates) in the U.S. (10/1000) are dwarfed by nations such as Bangladesh (300/1000), Mozambique (180/1000) and Brazil (100/1000). But when compared to the other industrialized nations of the world, the U.S. ranks only 19th in infant mortality.

Although the standard of living is higher in the world's industrialized nations than at any time in history, there is still a large share of people, especially children,

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who live in poverty. Smeedling and Torrey, in a study comparing the United States with five other industrialized nations, found that the United States had the highest childhood poverty rate and the second highest rate among families with children.\(^2^3\) Australia was found to have a somewhat higher poverty rate among one-parent and two-parent poor families.\(^2^4\)

**National overview**

Though only assessed since 1959, the poverty rate in the United States shows some interesting trends since that time. The rate declined significantly between 1959 and 1969 when it fell from 22.4% to 12.1% as a result of new social reforms.\(^2^5\) The rate has fluctuated around 13% since then, and in 1989 it was 12.8%. Hidden within this overall rate are the demographics of poverty which include race, age, and family status.

Within the United States poverty is highly variable. Comparing the four continental United States census regions, the Northeast had the lowest poverty rate in 1990 (11.4%) followed by the Midwest (12.4%), West (13.0%), and South (15.8%).\(^2^6\)

\(^2^3\)The other five countries include Australia, Canada, West Germany, Sweden, and the United Kingdom. Timothy M. Smeedling and Barbara Boyd Torrey, "Poor Children in Rich Countries." *Science*, 11 November 1988, 873.

\(^2^4\)These calculations include the effects of income and tax benefits for the poor. Smeedling and Torrey, 874.


\(^2^6\)The poverty rate in the West and Midwest are not significantly different. Lamison-White, 15.
The Northeast has maintained the lowest poverty rate since 1985. The region with the largest share of the population in poverty (40.1%) has continued to be the southern region.

Racial group comparisons

Race is an important factor of poverty in the United States. Poverty is not evenly distributed between races, and the poverty rates of several minorities are significantly higher than that of the majority white population. Through time, the white poverty rate parallels about three percentage points below the total poverty rate. Blacks maintain the highest poverty rate of all groups. Similar to the entire population, the black rate fell until 1969 and has since fluctuated around 32%. The Hispanic rate increased in the late 1970s and has since stabilized at about 28% (see Figure 1).

In 1989, the year that income data were collected for the 1990 census of population and housing, blacks had the highest poverty rate (28.8%) followed by American Indians, Eskimos, and Aleuts (26.3%), Hispanics (24.3%), Asia and Pacific Islanders (14.3%), and whites (9.3%). In terms of absolute numbers, whites led with 13 million people below the poverty line and blacks followed with 7.2 million.

27 The greater cumulative number of whites in poverty controls the total poverty average. Lamison-White, 13.

28 The term blacks is used by the census for the aggregated group composed of people of African American and Caribbean descent.

Although rates vary significantly between the races, the effects of poverty are felt within all racial groups of the country.\(^{30}\)

Figure 1. Poverty rate of persons, by race, 1959-1990.

Source: Lamison-White, 13.

**Age group comparisons**

Poverty among elderly people (age 65 and above) has systematically declined since the authorization of Supplemental Security Income in 1972 and subsequent

\(^{30}\)Social statistics are published by gross racial grouping only. It must be remembered that there is vast variation within racial groupings and many ethnic affiliations are aggregated. Individual variations between the cultures of ethnic groups can greatly vary the degree of poverty and the ability to adapt to it.
increases in Social Security benefits and payments (see Figure 2). Prior to that time, elderly people had the highest poverty rate in the country. Following 1975, children (age 0-17) have been most at-risk, facing an increasing poverty rate. In the last 15 years the childhood poverty rate has fluctuated around 20%.

Figure 2. Poverty rate of persons, by age, 1959-1990.

Among all racial groups, young children less than six years of age are most likely to encounter poverty. The highest poverty rates are for young black children

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32 Lamison-White, 14.
(43.7%), followed by American Indians, Eskimos, and Aleuts (39.7%), Hispanics (33.1%), Asia and Pacific Islanders (17.9%), and whites (13.3%). The rates for all children (less than 18 years) follow one to three percentage points below that of young children. There were nearly as many black children in poverty (3.2 million) in the United States as there were white children (3.7 million) even though white children outnumber blacks nearly four to one.

Family group comparisons

The highest rates of poverty are found among female headed families, especially those with related children age five or less. In 1989, the highest poverty rate for this group was found among American Indians, Eskimos, and Aleuts (65.9%), followed by Hispanics (65.3%), blacks (65.3%), whites (50.4%), and Asia and Pacific Islanders (47.6%). Poverty rates were approximately ten percentage points lower for non-white female headed families with children less than age 18 than they were for non-white female headed families with children less than age five. The same rate for whites fell by seventeen percentage points to 33.2%. Poverty rates for married couples with children were much lower than those of female headed families (see Figure 3). White married couples with children less than age 18 had the lowest poverty rate, at 4.8%, while Hispanic married couples with children age five or less had the highest rate, at 20.4%.

33In 1990 the poverty rate for female householder, no husband present was 33.4%, which is nearly six times the poverty rate for married couples (5.7%). Lamison-White, 16.
Of poor children, the fraction who lived in single parent families has steadily increased while the fraction that lives in two parent families has declined. Two parent family poverty was more volatile and appears to be related to the status of the national economy. The percentage of children growing up in single parent homes has consistently increased over time.

Figure 3. Poverty rate of families, by type, 1959-1990.

Source: Lamison-White, 16.

Bane and Elwood state:

Changes in family structure have not come about in isolation. They took place at a time when the country witnessed massive increases in labor force participation of women, an unprecedented stagnation in the real earnings of men, worsening employment patterns for many

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young people (especially young black men), considerably greater birth control availability and use, the legalization of abortion, important changes in social policies, and altered attitudes regarding the roles of women, work, and family.\textsuperscript{35}

It appears that the relationship between poverty rates and family status is at least partially cultural. Asia and Pacific Islanders and Hispanics seem to have a better ability than other racial groups to maintain married couple families in and out of poverty. Blacks are the least likely to maintain married couple families in general, and the odds decrease even more in the face of poverty. Only 15.4\% of black families who live in poverty and have related children below the age of 18 consist of married couples.

Adolescent motherhood ranks as another high risk factor leading to family poverty. The vast majority of adolescent mothers are unwed.\textsuperscript{36} Similar to the statistics for single motherhood, pregnancy rates among young blacks are much higher than those of whites and Hispanics. However, pregnancy rates for whites age 15 to 19 have increased prior to 1985 while those of blacks age 15 to 19 have decreased.

Of special concern is the effect of adolescent motherhood upon intergenerational poverty. As Klerman states, adolescent motherhood has not always been associated with poverty; through the middle portion of the current century it was associated with young marriage.\textsuperscript{37} Adolescent motherhood today opens a host of potential problems.

\textsuperscript{35}Bane and Ellwood, 1051.


\textsuperscript{37}Klerman, 79.
including reduction of educational and employment opportunities, increased chance of subsequent pregnancies, problems with a lack of adequate parenting practices, and associated effects upon the children.³⁸

Educational comparisons

Education attainment of the parents strongly affects the economic achievement of individuals and families. Of all persons 18 years and over who fell below the poverty line in 1990, 48.3% had fewer than four years of high school; 34.3% had completed high school but had no college; 17.4% had one or more years of college.³⁹

Once again the poverty rates for educational attainment varied greatly between the races. The highest poverty rates for families whose head of household had not completed high school was for blacks (37.7%) followed by American Indians, Eskimos, and Aleuts (35.1%), Asia and Pacific Islanders (35.1%), Hispanics (30.7%) and whites (14.7%). This same trend was present for families whose head of household had completed high school, except that the rates drop to where blacks have a high rate of 19.7% and whites have a low rate of 4.5%. These differential trends may emphasize the effects of persistent racial discrimination in the United States, although poverty is still a problem among the majority. In terms of absolute numbers, the largest group of families who fell below the poverty line were white families whose head of household had graduated from high school (1.4 million families).

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³⁹Lamison-White, 15.
Summary

Several trends of poverty in the United States are evident. The number of people in poverty in the United States is high compared to other industrialized nations. The overall rate for the country is fairly stable at about 13%, and remains strongly associated with minority race, female headed households, and low educational attainment. The rate continues to be reduced among the elderly but shows growth among children.

Other Phenomena that Affect Poverty

Racial group, age group, family type, and education completion are manifestations of the demographics of poverty. Other phenomena may also affect who is in poverty and how poverty affects poor people. In this section two phenomena are presented. The first topic discussed is how the duration, timing, and severity of poverty affects children. The second item relates to how the overlying culture in which children are raised affects how they adapt to poverty.

Duration, timing, and severity

For some people, being poor is self-imposed and desirable, for others it is temporary and endured, but for most it is unintentional and unwanted. Likewise, the experience of being poor is not the same for all people. The duration and severity of poverty that is felt by families is variable and affects the experience. Extended duration and increased severity have been shown to intensify the detrimental effects
upon children. Ashworth et al. have attempted to classify the temporal patterning of poverty in order to study variations in the poverty experience.

Ashworth et al., classify poverty based on the number and duration of poverty spells over the first fifteen years of a person's life. A spell is a period of time in which a person experiences poverty. A spell can be months or years. They organize their classification into two groups, single spell patterns and multiple spell patterns.

Single spell patterns include transient poverty, persistent poverty, and permanent poverty. Transient poverty consists of one short spell lasting no more than one year. Persistent poverty has one longer spell lasting more than one year and having at least one out-of-poverty spell. Permanent poverty is unceasing poverty lasting for the entire fifteen year study period.

Multiple spell patterns include occasional poverty, recurrent poverty, and chronic poverty. Occasional poverty is composed of repeated short poverty spells lasting no more than one year. Recurrent poverty consists of multiple-poverty spells,  

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42Ashworth et al., 666-667.

43Ashworth et al., 666.

44Ashworth et al., 667.
some lasting more than one year, interspersed with out-of-poverty spells, some lasting more than one year. Chronic poverty is made up of multiple poverty spells, some lasting more than one year, interspersed with short out-of-poverty spells lasting less than one year.

Ashworth et al., using data from the Panel Study of Income Dynamics, found that recurrent poverty is the most common form of poverty and is endured by 41% of all children ever experiencing poverty. The second most common form of poverty is transient (27%) followed by persistent (14%), occasional (8%), chronic (5%) and permanent (5%). Ashworth et al. noted that although the chances of any particular child ever experiencing persistent, chronic, or permanent poverty are low, they make up 38% of all children living in poverty at any one point in time.

Ashworth et al. classification of poverty duration implies that there is a relationship between the duration and severity of poverty. Ashworth et al. compared the relative severity of poverty between their classes. Transient poverty is the least severe form of poverty. Income surplus from non-poverty years generally buffers the effects of a short spell of poverty and does not cause any significant long-term effects to the surplus. Occasional and persistent poverty are comparable. Income shortfalls incurred during spells are generally more than offset by surpluses in more prosperous years. Recurrent poverty, the most common type, is slightly more severe than occasional and persistent poverty. Income exceeds needs by approximately 30%.

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45 Ashworth et al., 669.
46 Ashworth et al., 670-671.
throughout the 15 year period. Ashworth et al. found that income during spells of poverty is approximately 70% of what is needed for those classified with transient, occasional, recurrent, and persistent poverty.

Chronic and permanent poverty are the most severe forms of poverty. Throughout the childhood of a person in chronic poverty, income is only 66% of needs. During spells of poverty, income drops to 59% of needs. Permanent poverty is most similar to poverty found in Third World countries. Income throughout the first 15 years of a child's life averages 46% of needs. No children classified in permanent poverty resided in families where income ever exceed 70% of needs.

Culture

Culture has a strong influence upon how parents raise their children. Separate ethnic groups have differing parenting beliefs and practices. Garcia-Coll and Vazquez Garcia state:

Hispanic parents differ from Caucasian and African American parents in attitudes and perceptions toward their children's development, in their behavior as caregivers, and in their developmental goals or what they value about their children's behavior, emotions, and cognitions.

Family structure and characteristics also relate to childhood poverty. Garcia-Coll and Vazquez Garcia found that adolescent childbearing and marriage were

\[^{47}\text{Ashworth et al., 672.}\]

accepted as normal practice among immigrant Puerto Rican families. Adherence to family values by poor adolescent mothers played considerable part in establishing familial support networks. In this case, culture creates a situation in which the experience of poverty is different between different ethnic groups.

Summary

The chronologic pattern of poverty spells and the spells severity affect poverty's impact on families with children. Most poverty is recurrent and occurs in multiple one year or longer spells throughout life with similar length periods out of poverty. Permanent and chronic poverty are the most severe forms and usually assure that the family will remain in poverty for an extended period of time. Recurrent poverty generally leaves families with small income reserves and increases the chance of escaping the poverty cycle.

Culture is a strong determinant of how a group of people will react to poverty. Some cultures may be adapted to periods of poverty. Others cultures may have much more difficulty adjusting to poverty.

Phenomena such as chronicity, severity, and culture are important aspects of poverty that should not be overlooked. Another aspect of poverty that is significant is the spatial distribution of poverty.

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49Garcia-Coll and Vazquez Garcia, 62.
Spatial Studies of Poverty

Poverty has a strong spatial component varying greatly at many scales both between nations and within nations. Although most spatial studies of poverty have been conducted by other social scientists, geographers have played a significant part in the study of poverty. The following section discusses the initiation of a formal geography of poverty, as well as the findings of recent regional poverty studies, studies of poverty's urban/rural and metro/nonmetro differentials, studies of poverty's spatial patterns, and studies of poverty's spatial dynamics.

The Geography of Poverty

Morrill and Wohlenberg wrote a text titled *The Geography of Poverty in the United States* which was published in 1971. In this book they framed a formal sub-field of geography, the Geography of Poverty. The Geography of Poverty was designed to summarize the significant features of poverty's spatial distribution, assess the geographic factors important in explaining both poverty pattern and poverty persistence, and help in the implementation of poverty related programs. They recognized that although poverty prevalence and persistence were mainly functions of economic and social organization, spatial organization also played an important role.

The section which follows describes some of their most salient findings which relate to this thesis. Morrill and Wohlenberg's analyses began in chapter two with a

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study of poverty's distribution within the country. Chapter three looked for environmental and spatial factors which could cause poverty. Chapter four studied the economic, and social factors that could explain the location of poverty. Chapter four also analyzed the combined spatial, economic, and social factors to see which best predict the location of poverty. Chapter five combined the findings of all the factor analysis to formulate a regional classification of poverty's distribution.

In chapter two, based upon per-capita personal income figures for the period between 1929 and 1969, the region of the United States which had shown the greatest concentration of consistently low income is in the Deep South. The Dakotas were found to be consistently lower than the rest of the country as well. The West, Midwest and Northeast maintained the highest per-capita incomes through time. Most states maintained their relative positions through time with only the metropolitan southern states (Texas and Georgia) raising their status and the least metropolitan northern and border states (Maine, Idaho, South Dakota, Vermont, and Kentucky) falling in status. Morrill and Wohlenberg related that though the country was moving toward a service economy, manufacturing seemed to remain the key to relative improvement in prosperity.

Incidence of poverty maps by state from 1949 and 1959 painted a similar picture to those of per-capita income. The southern states were in the highest sextile for poverty rate and the Dakotas in the second highest sextile. Texas, Florida and the Central Plains states were in a higher sextile for poverty rate than they were (in a relatively low sextile) for per-capita income.
Maps of poverty rate by state economic area (SEA) for 1949 and 1959 found essentially the same pattern to that found in the state maps but with some refinement in resolution. Over half of the country's area, mainly the South and the Plains, had greater-than-median poverty rate, while most of the West, with a population of generally low density, and the urban-industrial Northeast, of generally high density, had below-median levels of poverty (less than 25 percent). The most important theme was that the more metropolitan the SEA, the lower its proportion of poor.

Several other attributes of poverty's spatial distribution in the United States in 1959 were discussed. Rural-farm poverty was relatively higher than rural-nonfarm poverty. Poverty rate had a negative relationship to metropolis size and was higher at all metro size levels in the South. The North and the West were found to have a greater share of poor people (56%) than the South although the proportion of poor was double in the South as compared to the other regions. In absolute terms, poverty in the industrial Northeast and California was a metropolitan phenomenon while in the South, West and Plains it was rural. Still, roughly half of the poor lived in metropolitan areas while the other half were rural. Because population density is so much higher, the vast majority of people in poverty were found in the eastern half of the country.

Chapter three looked for environmental and spatial factors that could help explain the incidence of poverty. A widely held assumption was that rich endowment in resource relates positively to the standard of living. To test the validity of this assumption, several simple correlations were performed between incidence of poverty and variables that described agricultural, forestry, and mineral production, but no
significant relationships were found. The only significant positive correlations found were between median income per farm family and the variables wheat and corn yield per acre, but the writers felt that there were several confounding influences in the statistic and that it did not have strong explanatory value. They also tested and found no relationship between terrain roughness and incidence of poverty.

Morrill and Wohlenberg did not feel that they had found any significant relationship between resource endowment and incidence of poverty. Although not explained adequately, they asserted the feeling that the country's resource frontier had ended and increasingly regional economic health would be a function of industry and services rather than raw materials.

Economic Geography theory was used to hypothesize that spatial factors such as relative location, accessibility, and density might influence poverty's distribution. Theory asserts that the economic landscape contains a system of places connected to each other. According to this theory, these places form a hierarchy from dominant to subdominant to hinterland, with the dominant places having the highest population density and the hinterland the lowest. Points on a landscape are evaluated based on their size and accessibility to the system; the larger the place and the greater its accessibility to the system, the lower its production and distribution costs. Dominant places are more urbanized and have less expensive products and services.

According to the theory, rural areas are presumably unable to compete with cities for jobs. Small dispersed settlements are not able to attract diversified
industries. As population growth occurs in rural areas, labor surpluses in the local job markets cause reduced wages, unemployment and out-migration. Inertia keeps enough of the local residents from migrating to continue the labor surplus, and the situation is exacerbated by increased industrial mechanization and reduced labor-pool bargaining power. Small scale and distant markets makes even efficient rural industries weak in their competitive position as compared to urban producers.

Developmental diffusion theory presented another possible spatial-temporal cause of variation in production and income. In this theory, transportation networks proceed from the hinterland to the core areas. At the core capital, power, and production are present. Cheap raw materials are collected in the hinterlands, transported to the core areas, transformed into exports, and sold back to the hinterland at a higher price.

To test the theories, the relationship between relative location and poverty incidence at the national, state, and local levels were explored. Most correlations were performed between SEAs or counties and distance to the nearest standard metropolitan statistical area (SMSA). Strong relationships were found at the national, state and local levels. The strongest relationship was found at the local level for the area surrounding the Dallas-Fort Worth SMSAs \((r=0.82)\). They concluded that relative location, accessibility, and density were significant factors of poverty's spatial distribution.

\(^{51}\)Natural resource extraction industries are more volatile than manufacturing, as income is tied directly to the state of the market for each individual natural resource. Prices for raw materials are set by the markets in the industrial core cities.

\(^{52}\)Often it is the most educated and experienced who are lost to a more competitive market place.
In chapter four, Morrill and Wohlenberg hypothesized that the main economic causes of poverty's location are labor supply and demand imbalance. Three aspects of labor supply and demand including occupational structure, industrial structure, and labor organization were analyzed.

Eleven broad occupational categories were used to study the effects of occupations upon poverty. Of the eleven categories, multiple regression found that four of the categories made the best regression model for family poverty. The four occupational categories include proportions of the male workforce employed as clerical workers, professionals, craftsmen, and laborers. The clerical portion accounted generally for distinctions between more metropolitan and more rural areas, while proportions of professionals, craftsmen, and laborers accounted for differences in poverty between the various metropolitan areas and between assorted nonmetropolitan areas.

Income variation existed within industries, between industries, and regionally. Six variables from thirteen broad industrial categories composed 72% of the variation of poverty incidence. The variables, in order of strength, were the proportion of people employed in agriculture, personal service, finance, entertainment, professional services, and durable goods manufacturing. Morrill and Wohlenberg decided this finding was intuitive and unexciting in that finance and professional industries were

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53 The four occupational categories (independent variables) composed 73% of the variance in the dependent variable, family poverty.
indeed concentrated in the largest places and agriculture and mining were found in the countryside.

A third surmised proxy for poverty incidence was level of union organization. One characteristic common to most of the low-wage industries is a low level of union organization (for example, in agriculture and personal service generally and in such individual industries as textiles, southern sawmills and wood products, apparel in the South). Data from SEAs was unavailable for testing this hypothesis.

Distribution of certain occupation types and industries affects poverty incidence. The lesson learned is that low income could result from investors' unwillingness to locate good paying industries in many regions. More specifically, high unemployment rate and predominance of low-wage employment could be caused by employment reductions due to agricultural and mining mechanization in rural places, industry loss in technologically depressed places, and people's unwillingness to move away from such regions. Failure to produce new job opportunities is caused by lack of organization.

Although economic factors had a strong effect upon poverty, Morrill and Wohlenberg felt that "social characteristics of people at any point in time may well be the most direct or overt reasons for their poverty or success." Social factors found to affect poverty status included education level, sex, age, race or national origin, institutional status, and family structure. The highest risk groups for poverty were those with low educational attainment, female head of families, people younger than 25 or older than 65, racial or cultural minorities, inmates of institutions, students, and members of the armed forces. Multiple regression found that the median years of
school, proportion under 18 living with parents, proportion over 65, population under 18, and males in the labor force explained 81% of poverty incidence variance.

To take advantage of this newfound knowledge concerning the incidence of poverty's social, economic, and spatial aspects, two general models were created to gain further understanding of the distribution of poverty. The first model concerned the poverty of agricultural areas and the second was a general geographical poverty model.

The agricultural model was conducted by evaluating thirteen environmental, spatial, and economic variables. Multiple regression using poverty incidence in rural SEAs as the dependent variable found that average corn yield, number of tractors per farm, proportion of farms operated by tenants, percent of farmland in crops, value of farm products sold per acre, and average size of farm comprised 73% of the variance. In general, this model disclosed that the rural areas having greater poverty were those with low yields, low capital investment, high tenancy, small farm size, and dependence upon off-farm work.

The general geographical model evaluated fifty-one environmental, spatial, economic and social variables. Individually, each variable category was able to explain a certain amount of poverty incidence variance. The model's purpose was to test the explanatory strength of the combined categories and variables within the categories. Stepwise regression was performed using all the variables available. It was found that
seven variables accounted for 93% of poverty incidence variance. The seven strongest variables were median school years completed, nonwhite population proportion, percent employed as farmers, percent of men 18 to 65 years old not in the labor force, percent in construction, population potential, and percent craftsmen. The categories that explained the most variance were, respectively, social characteristics, economic conditions, and spatial conditions (relative location). In summary, the model found that approximately half of the country had inadequate opportunities, undesirable social characteristics, and location unfavorable for improving economic opportunities of poor families.

Morrill and Wohlenberg reminded the readers that correlation does not mean causation. Although a model was created that accounted for a large amount of the variance of poverty, this did not mean that these seven variables were the main causes of poverty. One variable could be another's result. They surmised that in nonmetropolitan America, poverty seems to have been a function of the inability to attract alternative opportunities to the declining or stagnant resource dependent areas. Unfavorable social characteristics in poor rural areas were more of a result of poverty than a cause. In relatively prosperous metropolitan areas, the large population of poor in absolute numbers seemed to be a function of social discrimination, low-wage persistent industries, and the economic inability to provide enough jobs.

54The model showed little evidence of multicollinearity and no spatial autocorrelation. Morrill and Wohlenberg, 105.
The previous findings were the results of cross-sectional models. A longitudinal poverty change model of the period 1949 to 1959 was also analyzed. A model of this type could show how changes in the social and economic characteristics of regions and changes in policy affect the distribution of poverty. The model used was an initial conditions model in which independent variables from the early period are added to the regression equation. Percentage poor in 1949 was also added as a controlling independent variable. The dependent variable was percentage point change between percentage poor 1949 and 1959.

Eight variables were found to be significantly related to percentage point change in percentage poor 1949 to 1959. The variables starting with the strongest were percent poor in 1949, change in percentage unemployment, change in percent on farms, percent on farms 1950, median age in 1950, change in median age, percent nonwhite in 1950, and median years of school. The most interesting result is that the most poverty stricken areas of 1950 showed the greatest improvement in 1960. Other areas with reductions in poverty were the most farming dependent areas and areas with high nonwhite populations.

Morrill and Wohlenberg did not feel confident in their temporal change analysis results. They express concerns about limitations caused by changes in the way that data were collected and tabulated between 1949 and 1959. They felt that the most important variables that effect change had been missed, mainly changes in industrial mix and differential growth rates for industries.
Chapter five presented a regional classification of poverty based on the seven variables isolated in the general geographic model. For the regionalization, each variable was standardized and grouped using an iterative computerized nearest neighbor classification method. Seven regions with twenty-one subregions were created. The relative attributes of the regions and subregions were later tallied using a relative scaling method of the region means.

The seven regions were given names and described according to their attributes. Region 1, the Metropolitan North, had high accessibility, average to high education levels, low levels of farming, very high labor force participation, and average to low levels of nonwhite population. Poverty in this region was low in relative terms but high in absolute terms. This region maintains some of the highest population densities in the country. Region 2, the Nonmetropolitan Periphery, was similar to Region 1 except it had very low accessibility. This region had below the national average poverty rates. Region 3, the Urban South, had poverty slightly higher than the national average, high levels of nonwhite population, and prevalence of low-wage industries. Region 4, the Inland Hills, had intermediate levels of poverty, low proportions of nonwhite population, high underemployment, and low educational levels. Region 5, the Agricultural Interior, had intermediate levels of poverty, small nonwhite population, little unemployment, high proportion of farmers, and abnormally low levels of education. Region 6, the Agricultural South, had the most severe incidence of poverty, high levels of nonwhite population, very high unemployment, and low to very low education levels. Region 7, the Appalachian Coal Fields, had severe incidence of
poverty, and was similar to the Agricultural South in all respects except for very low levels of nonwhite population.

Morrill and Wohlenberg felt that these functional regions could be very useful in formulating regional development policy. The regions were homogeneous and could be seen as needing the same sorts of treatments within a region. In this classification, metropolitan area effects were separated from nonmetropolitan areas as they have differing needs. Policy might be created that strengthened both types of areas separately and in conjunction.

Morrill and Wohlenberg's text laid a foundation for further studies of the spatial distribution of poverty. The main aspects were that poverty was a function of economic, social, and spatial characteristics. Physical environment richness did not alter the incidence of poverty to any great extent, at least within the United States. The economic characteristics that affected poverty were lack of adequate jobs and prevalence of low wage jobs. Social characteristics included low level of education and racial discrimination that limited access to good jobs. Spatial characteristics included concentration of economic activity interspersed with voids in the location of productive economic activity. Elimination of natural resource extraction and low tech industries and the increased efficiency of these industries had caused reduced economic activity in some areas. Reduced employment in areas that were historically dependent on these industries without a subsequent reduction in population or industry replacement, had left them in an economically depressed state.
Recent regional studies

Although a formal "Geography of Poverty" never grew into a significant subdiscipline of geography, many social scientists have recently began to look into poverty's spatial aspects once again. Two examples of these types of studies are discussed in this section. The first study examines variations in the characteristics of poverty between agricultural regions. The second study looks at variations between sociocultural/natural regions.

In the first study, Linda M. Labao and Michael D. Schulman tested the validity of two perspectives of rural economic organization, the agrarian political economy perspective and the rural restructuring perspective. The agrarian political economy perspective, which stems from debates concerning the sociology of agriculture in the 1970s, is concerned with postwar changes in farming patterns and their effects on rural economic well-being. Most changes are manifest in movement away from small family farms to larger farms and industrial farming. The rural restructuring perspective grounded in economic geography, industrial sociology, and regional science of the 1980s, addresses the social consequences accompanying rural areas' incorporation into mainstream capitalist development. Mainly this perspective involves studying declining rural areas' effects on rural industries, changes in the balance of power between industry and labor, and the geographic inequality of the development process. Labao and Schulman saw that the two perspectives had been treated exclusively of one another.

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by previous scholars. As the two perspectives related to the same phenomena, they wanted to compare their strengths to see if they could be integrated into one perspective.

Labao and Schulman adopted the regional classification developed by Carlin and Green who based their ideas on the earlier work of Fuguitt and Beale used for analyzing differences in county's farm structure. The five regions that they used include the Urban Northeast, Eastern Mountains and Uplands, Southeast Plains, Central U.S. Agriculture and the West. The major criteria for this classification were similarity of farming patterns (particularly farm size), industrial base, and environmental landscape. Cross-sectional and longitudinal multiple regressions were performed between incidence of poverty in 1980 and the various independent variables over the time period between 1970 and 1980. The variables included employment type, farm type and size, percentage of workers unionized, per capita AFDC payments, percentage of nonwhites, median education, and indices of rurality and metropolitan adjacency.

Labao and Schulman found rural poverty to be largely a function of the prevailing economic structure. With respect to the agrarian political economy, the

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57 Cross-sectional data describes a phenomena at the point(s) of collection at one point in time. Logitudinal data describes a phenomena at the point(s) of collection over a period of time.

58 Labao and Schulman, 595-596.
incidence of poverty was linked to greater quantities of small family farms while areas with larger family farms had lower poverty. Industrialized farming effects were weaker and less consistent across regions and seemed to be linked more to the local economic structure. Social characteristics tended to explain the variance in the rural poverty rate better than did farming patterns. This, of course, tends to support the perspective of rural restructuring. The authors concluded that the agrarian political economy perspective should be integrated into the rural restructuring perspective.

In the second regional study, Ed Knop and Sheila Knop looked for reasons for the varying distribution of poverty in Colorado.\(^5\) The working hypothesis was that people who do not have access to the more nontraditional aspects of the economy and social opportunity structure of the state are more likely to be impoverished.\(^6\) Reasons for reduced access were geographic remoteness and social-cultural dynamics. Social-cultural dynamics include lack of access due to personal choice or culturally imposed stigma by others.

The researchers took the sixteen census Public Use Microdata Sample (PUMS) regions in Colorado and aggregated them into six regions, referred to as Denver, Rest SMSA, Other SMSAs, West Mountains, East Plains, and South Central/Southwest.\(^7\) The six regions include one primate central city, one region of metropolitan suburbs


\(^6\)Nontraditional occupations are described as those that have appeared after 1945.

\(^7\)Knop and Knop, 2-3.
with developing high-tech industries, one region with small SMSAs and transitional growth, one nontraditional and nonmetropolitan region, one rural region with contemporary Great Plains agriculture, and one remote rural region with large and small scale farming and ranching, a large traditional Spanish population, and Indian reservations. Correlations and multiple regressions were performed on all of the social, economic and spatial variables included in the 1% 1980 PUMS-A tapes.

The findings generally supported Knop and Knop's hypothesis. In particular, incidence of poverty was highest among the young in the Denver central city and the young and old in traditional non-metropolitan areas. Those at risk for poverty were female head of households, minorities, people with limited English language skills, single parent families, disabled persons, less educated persons, migrants, those out of the labor force and unemployed, laborers, those working in traditional versus recent industries, and service workers in smaller SMSAs and some non-metropolitan areas. The strongest relationships statewide with poverty were location, marital status, minority status, and employment status. Access, either spatial or social seemed to affect the incidence of poverty.

Labao and Schulman and Knop and Knop's studies supported Morrill and Wohlenberg's findings and paralleled their design. Poverty was found to be strongly related, respectively, to social, economic, and then spatial characteristics. Both studies cite the importance of studying the spatial variation of poverty and its causes.63

62Knop and Knop, 8-9.

63Labao and Schulman, 597; Knop and Knop, 2.
Studies of urban/rural and metro/nonmetro differentials

Some of the most recent spatial studies have looked at urban/rural and metropolitan/nonmetropolitan differentials without putting a great deal of thought into spatial variation within these types of places. The studies have been conducted by Non-geographers and as such display little knowledge of geographical issues. Four of these studies were found and are summarized below. The first two examine the variation between the poverty of rural and urban places. The third and fourth look at metropolitan/nonmetropolitan differentials.

The first study conducted by Garret et al. asked the question "is rural residency a risk factor for childhood poverty?" Using data from the National Longitudinal Study of Youth and classifying children as rural or urban, the study showed that rural residency significantly affected chances of living in poverty. For children born in rural areas, the odds of spending the majority of their life in poverty were 1.27 times that of children born in an urban setting. For children who live half of their lives in rural areas, the odds of spending the majority of their lives in poverty were estimated at 1.32 times that of children born in an urban setting.

64 The classifications urban/rural and metropolitan/non metropolitan are specifically defined by the census bureau and refer to places meeting precise population and spatial characteristics.

65 The standard census definition of urban and rural is used. Patricia Garret, Nicholas Ng’andu, and John Ferron. "Is Rural Residency a Risk Factor for Childhood Poverty?" Rural Sociology 59 (1994): 66.

66 Garret et al., 79-81.
In the second study, Paul R. Amato and Jiping Zuo looked at rural poverty and urban poverty and the effects of both on the psychological well-being of residents.\(^{67}\) Performing multiple regressions using the National Survey of Families and Households, they found that poor African American families were happier and less depressed when living in rural areas, whereas poor whites were happier and less depressed when living in urban areas. In the case of depression, the trends were much more pronounced for males than for females.

Amato and Zuo felt that the lack of well-being among poor urban African Americans, especially males, is caused by living in concentrated poverty areas.\(^{68}\) Well-being among poor rural African Americans was caused by increased social support from the rural community. Lack of well-being among poor rural whites, especially single males, was caused by lack of social support and even stigma from the community.\(^{69}\)

The third article, Elizabeth S. Morrissey's "Characteristics of Poverty in Nonmetro Counties," contrasted the one hundred poorest nonmetro counties with the one hundred most prosperous nonmetro counties in the United States.\(^{70}\) The study used

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\(^{67}\) A non-standard definition of urban and rural is used. Paul R. Amato, and Jiping Zuo, "Rural Poverty, Urban Poverty, and Psychological Well-Being." *The Sociological Quarterly* 33 (Summer 1992): 229-240.

\(^{68}\) Amato and Zuo, 237-239.

\(^{69}\) The difference in the cultures of whites and African Americans surely has some effect upon these outcomes.

purely descriptive statistics and incorporated data acquired from many federal sources that described the economy and social status of the counties.

Morrissey found that nonmetro counties with high poverty rates had sparsely settled populations and low wage industry concentration. In some agriculture-dominated high poverty nonmetro counties, evidence of a dual economy existed where there was a sharp distinction between rich land owners and the poor. High poverty areas also had a concentration of minority, dependent, and other poverty-prone populations. In summary, high poverty non-metropolitan counties had an inequitably large share of the groups which were especially vulnerable to poverty.

The fourth paper, "Poverty Among Southern Workers: Metro and Nonmetro Differentials," by Donald R. McDowell and Joyce E. Allen-Smith used demographic and work related-variables from the 1988 Current Population Survey. The hypothesis was that working-poor heads of families in the South tend to have characteristics resembling the welfare-poor. The welfare-poor in the U.S. are described as more likely to be black, to be female heads of households, to have larger families, to have fewer years of education, to be younger, and to have lower income and earnings.

McDowell and Allen-Smith's findings showed that the strongest factors relating to poverty in the combined metro and nonmetro South and the metro South were, respectively, the number of wage earners per family, race (black or white), and family

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71 Morrissey, 9.

type (female headed or other). For the nonmetro South the strongest factors were, respectively, race, number of wage earners, and family type. The authors felt that their findings supported their hypothesis. Employed working poor heads of families in the South tended to have characteristics similar to those of the welfare poor. The number of wage earners, family type, and the race of the head of household influenced the odds of a family being in poverty.

These four papers looked at poverty differences between urban/rural and metropolitan/nonmetropolitan places. All concluded that there is a difference in poverty between urban/rural and metropolitan/nonmetropolitan residents. Only one study used a nonstandard classification for urban/rural, which tends to leave its results in some doubt. Studies such as McDowell and Allen-Smith's that probe differences within better defined regions probably have more reliable results than do those that use data from the entire nation. These more defined studies control better for the effects of between region differences.

The regional studies of poverty just described build upon and confirm the results of Morrill and Wohlenberg, Labao and Schulman, and Knop and Knop. According to them, poverty is most strongly linked to local social and economic structures although location has some explanatory value.

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73McDowell and Allen-Smith, 800.
Studies of pattern

Geographic studies of pattern are conducted to determine whether the locations of particular phenomenon occur on the surface of the earth in some sort of describable design. Such studies can tell a geographer whether a particular phenomena is dispersed or clustered. If a phenomenon is dispersed it can be arranged in an orderly manner, randomly arranged or somewhere in-between. If clustered, the clusters can be nucleated (have a central core with surrounding rind) or non-nucleated.

Most pattern studies of poverty try to demonstrate that poverty has become more concentrated in metropolitan areas. Theory asserts that the concentration of poverty in metropolitan areas started around 1880 with the mechanization of farming and the subsequent reduction in the agricultural labor force. This economic shift produced a near constant out-migration from rural areas to urban areas. More recent trends, such as decay in durable goods manufacturing and suburbanization of economic activity, have increased racial concentration and segregation within cities. Two examples of pattern studies are presented in this section.

In the first study, Douglass S. Massey and Mitchell L. Eggers in "The Spatial Concentration of Affluence and Poverty During the 1970s," looked at the share of high poverty, lower middle class, upper middle class, and affluent census tracts in large American cities. Overriding trends in U.S. cities were found to be a progressive

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concentration of the poor and affluent in segregated areas and middle class decay.\(^75\)

Most class segregation occurred in the larger, older metropolitan areas. Poverty areas became less and less likely to interact with affluent areas, with racial concentration exacerbating the situation. The result of these phenomena was unequal access to economic opportunities.

In the second paper, Richard Greene looked at the same concentrations during the same time period but used a more geographical approach that took into account two dimensional census tract positioning rather than just the share of census tracts within a city.\(^76\) Extreme poverty tract (EPT) centroids were plotted for each city and the geographic mean and standard radius computed. He also isolated EPT clusters within cities and performed the same spatial statistics for the years 1970 and 1980 to study change in dispersion.

Greene found two types of EPT distributions, dispersed and nucleated.\(^77\) Cities with dispersed distributions had EPTs that were significantly distant from other EPTs. Cities with nucleated distributions had core clusters of older EPTs with an outer rind of newer EPTs surrounding the core. The nucleated distribution was found mostly in large primate cities such as Chicago and New York. The findings generally supported the hypothesis that poverty is becoming more concentrated in the older and large cities.


\(^{77}\)Greene, 249.
Research has shown that poverty within cities is becoming more concentrated and segregated from the rest of society. This observation has lead Richard Greene to state that this trend is leading to the formation of an urban underclass.\textsuperscript{78}

Studies of spatial dynamics

One mechanism that affects spatial distribution is migration. The mass movement of people into or out of a place can rapidly change the way that place is organized. Net migration away from nonmetropolitan areas into metropolitan areas has been documented as occurring at high although declining rates since World War II.\textsuperscript{79} The absolute poverty population amounts in nonmetro and metro places have become reversed in this time period. In 1959, 56\% of all people in poverty lived in nonmetro places while 44\% lived in metro places. In 1983, 38\% lived in nonmetro places and 62\% lived in metro places.\textsuperscript{80}

Not all migration has been from nonmetro to metro places. Recently it was discovered that in some places poor families migrate from urban to rural places. Janet M. Fitchen, in her case study of a small town in New York State, found that most families that moved into the relatively depressed small community were poor single mothers with children.\textsuperscript{81} Their most common reasons for moving to the community were inexpensive rents, escaping failed relationships, or to stay with friends or

\textsuperscript{78}Greene, 240.

\textsuperscript{79}Frank Giarratani and Cynthia Rogers, 214-217.

\textsuperscript{80}This increase is partially accounted for by the inclusion of many newly classified metropolitan areas.

\textsuperscript{81}Janet M. Fitchen, "Spatial Redistribution of Poverty through Migration of Poor People to Depressed Rural Communities." Rural Sociology 60 (1995): 195-196.
relatives. Although the rural community had high unemployment rates, the lower cost of living made it attractive, especially to families receiving public assistance. Thus, there was an incentive for moving from a more expensive urban area to a less expensive rural area. Aid recipients were also able to take advantage of local training and educational programs to make themselves more competitive in the job market.

Phenomena of this sort have been found in several other case study areas across the country. In most places the shift was initiated by the decay of an existing industry or institution with a subsequent out migration of workers. The ensuing decline in rental prices in the area increased in-migration of the poor.

Migration is undertaken by various groups of people for very complex reasons. Instead of simple reasons for moving, such as hoping to obtain a better paying job, the reasons are often counterintuitive, as in the case of movement of poor people to poor rural areas just described. Migration does have a profound effect upon regions and is a major mechanism by which regions adjust to economic change.

Summary

The geography of poverty is not well developed and geographers have largely been nonparticipants in the spatial analysis of poverty; most recent spatial studies have been undertaken by people from other social sciences. The limited findings to date confirm that an area's poverty is most strongly associated with its social and economic characteristics. Spatial characteristics do have a significant though smaller effect and should be considered when hypothesizing the reasons for the existence of poverty.

Fitchen, 194.
Poverty pattern studies mainly discuss the concentration and segregation of poverty within an urban setting. The spatial dynamics of poverty show a net migration of people away from rural places to urban places in the past fifty years but also show that the reverse can happen under certain circumstances.

**Poverty Policies Affecting Poor Children**

People's views on how to deal with poverty depend upon their ideologies and political paradigms. In general, liberal thinkers adhere to a paradigm in which poverty results from inequitable distribution of income. The system and society are the cause of poverty; social responsibility through income redistribution is the cure.

Conservative thinkers, on the other hand, adhere to a paradigm in which the poor's shortcomings posit themselves in poverty. The individuals have the power to change, and poverty can be alleviated through education, moral enlightenment, and individual responsibility. This "rugged individualist" philosophy prevailed in American government prior to the 20th century.\(^3\)

The first major changes in American welfare policy came in 1935 with the Social Security Act and in 1939 with the New Deal Legislation.\(^4\) Two tracks were created to provide benefits to single mothers. Widows of insured male workers were tracked into the social security system and received unsupervised survivors benefits. Widows of uninsured men, divorced mothers, and unwed mothers were tracked into the

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Aid to Dependent Children (ADC) program. ADC was a supervised benefit program that had barriers to eligibility including employable mother rules and residency requirements. ADC also had moral supervision such as "man in the house" rules and "suitable home" tests.

In 1950, ADC was amended to include a grant for mothers. The next changes occurred in 1964 with the War on Poverty Bill. Passage of this bill created the Poverty Thresholds, revised ADC into Aid for Families with Dependent Children (AFDC), and created the Food Stamp and Head Start programs. The AFDC program relaxed the previous barriers to eligibility and moral supervision rules. The greatest advances were made in elderly poverty following the enactment of the Supplemental Security Income (SSI) program in 1972. SSI replaced the Old Age Assistance, Aid to the Blind, and Aid to the Permanently and Totally Disabled programs.

As a result of these programs, all forms of poverty were significantly reduced in the 1960s and 1970s. The policies were viewed as a test to see if extensive income transfers could significantly reduce or even eliminate poverty. Though reduced, poverty was not nearly eliminated.

Between 1972 and 1996 two types of programs were available to people in poverty: monetary transfers and non-cash benefits. Monetary transfer programs

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85 Gwendolyn Mink, 115.
87 Morrissey, 1-2.
included the Aid for Families with Dependent Children (AFDC), the Earned Income Tax Credit (EITC), and the Supplemental Security Income (SSI). Non-cash benefit programs included food stamps, Medicaid (health insurance), housing allowances, child nutrition programs, and child day care assistance programs. Some state and local governments have offered interventive programs and programs that try to collect delinquent child support payments.

In the midst of an economic recession in the early 1980s, conservative policymakers rolled back many of the income transfer programs. A significant increase in poverty rates resulted that has continued since that time. Childhood poverty received the greatest impact.

At present, federal legislation is drastically reshaping poverty policy. The vehicle for change is the Personal Responsibility and Work Opportunity Reconciliation Act of 1996, recently signed by President Clinton. Under the guise of welfare reform, this bill significantly alters the landscape of government transfer payments to the poor.

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90Children's Defense Fund, "CDF Summarizes Conference Bill."
The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 effected penetrating changes upon both monetary and nonmonetary benefit programs, completely eliminating some programs. Six major types of changes were stipulated and include elimination of the federal AFDC program, new mandates placed on state welfare programs, new eligibility requirements for SSI, changes to nonmonetary benefit programs, and elimination of benefits for legal aliens. These changes are detailed in the following section.

The first and largest change was the elimination of the federal AFDC program, the Emergency Assistance to Families with Children program, and the Job Opportunities and Basic Skills (JOBS) program (work training for AFDC recipients). Responsibility for welfare was transferred to the states and is now partially funded by federal welfare block grants.

The second change places new mandates on states for welfare including a two year work requirement, a five year lifetime limit, and a minor parent stipulation. The two year work requirement stipulates that welfare recipients must have a job within two years of obtaining aid. The five year lifetime limit specifies that federal funds can be used to provide a total of five years aid in the lifetime of a head of household. The minor parent stipulation states that parents who are minors can only receive welfare funds if they are living at home or in another adult-supervised setting. States failing to

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91 The rest of this section comes from the cited article. Children's Defense Fund, "CDF Summarizes Conference Bill."
meet these mandates will have their federal welfare block grants reduced in subsequent years.

Third, the act limited children's access to SSI. SSI applicants must now meet a listing of accepted medical conditions prior to receiving benefits.

The fourth change affected nonmonetary benefit programs. The act eliminated the guaranteed child care help law. Prior to the act, families with at-risk children, those on welfare, and those recently off of welfare were eligible for some assistance with child day care. The Food Stamp program toughened eligibility criteria. School food programs remained mostly untouched, but child day care food programs received deep cuts. Medicaid, which remains unchanged, is available to all people who meet prior AFDC criteria.

Fifth, the act established a federal child support collection scheme. This collection scheme created a means to track noncustodial parents and enforce collection of unpaid child support.

The sixth and possibly most serious change was the elimination of benefits for legal aliens. Effective October 1, 1996, all aliens were not eligible for SSI or Food Stamps. As of January 1, 1997, it became a state option to deny legal aliens welfare, child day care, social services, and non-emergency Medicaid. Availability of these benefits for immigrants arriving after the enactment date of the bill have been reduced even further.

Discussions of the means to alleviate poverty are highly controversial. The system, prior to the 1996 welfare reform, worked but not as well as many had hoped.
In certain circumstances, the old system was counterproductive, leaving people dependent upon welfare. The concern remains that millions of children may possibly grow up in poverty with little chance of escaping poverty's dire consequences. If no changes are made, the poverty status quo will be preserved.

Welfare reform has vastly altered Federal poverty relief programs. The effects that these changes will have on poverty in the United States are speculatory. Only time will tell if they were the right ones.

Summary of Background

The health of the country is affected by the growing number of poor people. Creating policies to deal with poverty require an understanding of why people are in poverty, how they became poor, when they become poor, what keeps them poor, and where they live. Social scientists know that people will not allow themselves to be studied like laboratory animals, making it difficult to obtain answers. Conclusions are often based on indirect and generalized evidence.

Some things that are known is that poverty affects people, especially children, both mentally and physically. It is linked with increased occurrence of disease, physical injury, reduced mental development, abnormal behavior problems, and death. Poor people's environment as a whole is less healthy and more dangerous then that of the rest of the population. Combinations of these risk factors throughout childhood often leads to continuation of the cycle of intergenerational poverty.
Poverty is especially prevalent among certain groups of people including, racial minorities, families with female heads of household, and families in which householders are poorly educated. Households led by adolescent single mothers are especially at risk for poverty and are often dependent upon society for aid.

The experience of poverty varies based on circumstances. For certain ethnic groups, the effects of poverty are mediated by cultural adaptations to being poor. For the less adapted, the period of time spent in poverty and its severity can greatly influence the outcome.

Poor people tend to congregate in areas with lower economic potential. They lack access to good jobs because of social discrimination or physical distance from economically active areas. Migration away from poverty areas may increase a family's economic chances but it may also adversely impact their psychological well-being.

Recent governmental changes to poverty policies further highlight the need to continue the study of poor people. Reductions in the scope and funding of these policies are going to drastically affect the prospects of many groups of poor people. Children, who are dependent upon others for their welfare, will likely receive the brunt of the impact.
CHAPTER 3
METHODS AND DATA

Two research topics involving five methodological approaches were used in order to achieve the goals set for this thesis. The first topic was a spatial analysis of childhood poverty in Montana. The methodological approaches used to study this topic were: 1) to examine childhood poverty in Montana in its context with the rest of the nation, 2) to build various maps of Montana relating to issues concerning children in poverty, and 3) to use these maps as the basis for researching the factors related to childhood poverty in the state. The second research topic involved conducting a spatial analysis of school food programs in Montana. The methodological approaches used in the study of this topic were: 1) to study the relationships of school food programs to the factors and spatial patterns of childhood poverty, and 2) to examine the utilization of federal free and reduced meal programs as they are employed in Montana schools.

Since the methodological approaches were central to the way the research was conducted, they and their topics are used as the organizational basis for the sections which follow. Each topic and each method is discussed in detail. The results of the research are presented in Chapter 4.
A Spatial Analysis of Childhood Poverty in Montana

The poverty rates of populations vary from place to place. Moreover, poverty rates for any given place vary from one point in time to the next. Montana is no exception. Montana's poverty varies in relation to the rest of the nation, the West, and other individual states. It also changes through time. Variations also occur within the borders of Montana. To learn why these variations occur, poverty can be studied in relation to various factors thought to affect poverty. In this section the methods and data used to study these phenomena are presented.

Context of Childhood Poverty in Montana

The first step in almost any geographical study is to define the study area and place it into the context of space and time. Once the study area is defined and placed into context, the researcher is ready to delve deeper.

To compare Montana through time to the trends of the nation and the West, statistics for childhood poverty were obtained from the census report Poverty in the United States: 1995. These statistics were summarized and a line graph was made using SPSS. Most of these statistics came from the Current Population Survey (CPS) which is a small yearly sample collected by the Census Bureau for tracking recent changes in poverty and other phenomena. The CPS is not useful for studying


\[ \text{Reference 2: Statistical Package for the Social Sciences Version 6.0 (SPSS 6.0)(Chicago: SPSS Inc.).} \]
individual states, especially states with small populations, as the sample is too small to provide accurate estimations. Statistics for Montana came from the decennial census.

To compare Montana to the rest of the states, maps were made of childhood poverty by state for 1979 and 1989. Percentage of childhood poverty was mapped by county using the 1980 and 1990 Census of Population and Housing sample data acquired from the USA Counties CD-ROM. Percentage childhood poverty was calculated by dividing all children under age 18 who live in households below the poverty threshold by the total number of children under age 18 then multiplying by 100. The resulting percentages were geocoded to match the FIPS codes of the state polygons on the map. This allowed them to be attached as attributes of the states in Atlas GIS. Choropleth maps were then generated using four equal interval classes that neatly fit the data ranges for both 1979 and 1989. Using the same scale to map both 1979 and 1989 shows how the states increased or decreased in percentage poverty relative to one another.

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3All income related data represents the year prior to the decennial census.


5Geocoding is the process by which unique id codes are given to both areas on a map and their corresponding records within a database. The relational database capabilities of a geographic information system (GIS) are then used to link the appropriate data records with their map areas.

Maps of Children in Poverty

An initial step to almost any geographical study is to map the phenomenon in question so that any irregularities in the distribution might be observed. Once patterns and irregularities are discerned, relationships with other phenomena can be studied to endeavor to discover why and how a phenomenon exists where it does. To map childhood poverty within Montana, two different geographic units were used: counties and elementary school districts.

Counties

Counties were used to map childhood poverty in 1979 and in 1989. They were also used to map change in childhood poverty between these years. The reason that counties were used is based mainly on the availability of data. Counties are the smallest consistent geographic units available for mapping data from 1979 and 1989. Decennial census years are the only years for which the study of poverty change by county are possible.

The percentage childhood poverty was calculated and mapped by county using the 1980 and 1990 Census of Population and Housing sample data, acquired from the USA Counties CD-ROM. The maps were produced with Atlas GIS using the same procedured used to created the state maps. Choropleth maps were generated using four equal interval classes that neatly fit the data range of the 1979 and 1989 data.

Percentage point change in childhood poverty from 1979 to 1989 was mapped by subtracting 1979 percentage childhood poverty from 1989 percentage childhood poverty. Two choropleth maps of change were made, one that shows counties that had
increased childhood poverty and one that shows decreased poverty. The classification method chosen to depict change in childhood poverty was "natural breaks".\footnote{Natural breaks are determined by making a detailed histogram or frequency polygon of your data. Significant depressions in the frequency distribution are interpreted as separations between groups of similar values.}

To find out if average change in the childhood poverty rate of counties from 1979 to 1989 was significant or not, a significance test was performed. The hypothesis was that the average poverty rate had increased. The test performed was a paired sample t-test; it was conducted using SPSS.\footnote{All statistical analysis presented in this thesis use standard parametric statistical techniques. Appendix A lists the standard forms of the formulas. \textit{Statistical Package for the Social Sciences Version 6.0 (SPSS 6.0)}(Chicago: SPSS Inc.).}

\textit{Elementary School Districts}

Elementary school districts were used to map the sub-county distributions of childhood poverty. One reason elementary districts were used was because they are more numerous than highschool districts and are relatively regular in size and shape as compared to census tracts or block groups. Another reason is that data relating to elementary school children was readily available from the 1990 Census School District Special Tabulation (CSDST).\footnote{National Center for Education Statistics. \textit{1990 Census School District Special Tabulation: Summary File Set I on CD-ROM}, Washington: U.S. Department of Education, 1992. Developed by The Mesa Group, Alexandria, VA.} Poverty by school district is also important because it is used in the spatial analysis of school food programs in Montana.

The sub-county elementary age poverty rate was mapped using attribute data from the 1990 CSDST and school district boundary lines from the 1992 Census Bureau.
TIGER/Line Files. The population used for the elementary age poverty maps was relevant elementary age children for whom poverty status had been determined. To calculate percentage poverty, the number of elementary age children who live in households below the poverty threshold was divided by the total number of elementary age children and then multiplied by 100.

School district boundaries were assembled by county from the 1992 Tiger Line Files using the Doctor Doolittle program. School districts that straddled county boundaries were merged to form complete school district boundaries. Percentage poverty figures were geocoded and attached as attributes to the school districts by using the GIS program. Two choropleth maps of school age poverty rate were created. The first map used two thematic classes, either above or below the state elementary age percentage poverty (19.9%). The second map classified school districts as either above or below 40% elementary age poverty. In the literature, areas with greater than 40% poverty are often considered extreme poverty areas.

Two potential problems were noted in the CSDST elementary school district figures. The first problem relates to a lack of data points for all of the school districts in the state and the second problem relates to the possibility of error in the estimation.

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11Doctor Dolittle is a computer program used to convert raw Tiger Line boundary data into a format readily importable to Atlas GIS. Doctor Dolittle Version 3.0A (Hummelstown, PA: BonData).

of percentage poverty because of sampling error. The lack of data points is problematic in that no mention of why the data are missing is present in the data documentation. Most data sources maintain an additional field in their data structure that explains why data for certain areas are missing. It was found, however, that in observing the locations of the school districts with missing data that all of these districts were extremely remote and had very low populations. It is likely that no children were sampled within these school districts. For this reason, they were left out of the analysis. The second problem was that several school districts were recorded with either zero or with 100% elementary age poverty. As all of these school districts represent extremely small samples; it is thought that sampling error could be involved in skewing some of these extreme cases. Mapping with the 19.9% and 40% cutoff points was used to minimize the effects of some of these problems. School districts with small populations and percentage poverty less than the state average likely do have low poverty. Similarly, places with small populations and percentage poverty greater than 40% likely have high poverty.

Factors Related to Childhood Poverty

As was noted at the beginning of this chapter, the third method involved in this thesis is an analysis of the factors related to childhood poverty. This analysis is necessary in order to follow up on and offer explanations for what was found in the maps of childhood poverty. The analysis is based on the methods of Morrill and
Wohlenberg, and Labao and Schulman, who investigated the correlation and regression factors contributing to the location of poverty.\(^\text{13}\)

The poverty rate of households with children was used as the dependent variable for the correlation and regression analysis. There are three reasons this should be used rather than the childhood poverty rate (individuals rather than households). The first is that childhood poverty is determined by the incomes of the households in which children live. The second reason is that most of the factors that are available to be related to childhood poverty are recorded by household rather than by child. The third reason is that children are raised in households and obtain most of their livelihood from the adults in those households. Employment and occupation variables are tabulated by adult individuals so it was thought that household poverty would be the most accurate means of capturing this difference in the population universe. The poverty rate of households with children was obtained from the 1990 CSDST.

Independent variables (factors) were social, spatial, and economic in nature. They were derived from the 1990 CSDST, 1990 Census of Population and Housing Summary Tape File 3a (STF3a), and the Montana Highway Map (MTHM).\(^\text{14}\) The variables are expressed as rates, as opposed to percentages; each sub-population is


divided by its relevant total population. Both the CSDST and STF3a are Census products derived from the 1990 Census sample long-form.

All fifty-six Montana counties were used in the analysis of both total households and white households. To analyze Native American households, the study was limited to the eighteen counties that possessed sixty or more of these households. This limitation was necessary to deal with the problems associated with limited sample size. The study of Native American households was further broken down to study differences between those living in reservation counties and those in non-reservation counties.

_Social Variables_

Social variables were selected based on their importance in studies such as those by Morrill and Wohlenberg and Labao and Schulman. In these studies, social variables had the strongest explanatory value for the location of poverty. In both studies, median education and percent non-white explained a large percentage of the variation in the percentage of poverty.

Table 3 contains all of the social variables included in the analysis. Social variables are comprised of the rate of households with Native American householders, female householders rate, and rate of households by education completion of the

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15 As long as you are consistent, using either rates or percentages does not alter the results of correlation or regression analysis.

16 The 18 counties with 60 or more households in the sample are displayed in Figure 11 in Chapter four.

17 Morrill and Wohlenberg, 94; Labao and Schulman, 587 and 594.
householder. Median years of school completed, used in the other studies, was not available in the 1990 census. All social variables came from the 1990 CSDST. There was no problem with ecological fallacy in the analysis of the social variables as all social variables came from the same source and the same population universe.\footnote{Ecological fallacy is the danger of making an analysis at one level apply to other levels. In this case, relating the poverty of Native Americans to the unemployment rate of the entire population could be a fallacy of logic. \textit{Susan Mayhew and Anne Penny, The Concise Oxford Dictionary of Geography,} (New York: Oxford University Press, 1992).}

Table 3. Social variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>hse pov</td>
<td>household poverty rate</td>
<td>CSDST</td>
</tr>
<tr>
<td>all fhhd</td>
<td>rate of female householders, no husband present</td>
<td>CSDST</td>
</tr>
<tr>
<td>all nah</td>
<td>rate of Native American householders</td>
<td>CSDST</td>
</tr>
<tr>
<td>all hnhg</td>
<td>rate of householder did not graduate high school</td>
<td>CSDST</td>
</tr>
<tr>
<td>all hgh</td>
<td>rate of householder is a high school graduate with no further education</td>
<td>CSDST</td>
</tr>
<tr>
<td>all hph</td>
<td>rate of householder has post high school education</td>
<td>CSDST</td>
</tr>
<tr>
<td>na povrt</td>
<td>Native American (NA) household poverty rate</td>
<td>CSDST</td>
</tr>
<tr>
<td>na fhhd</td>
<td>rate of NA female householders, no husband present</td>
<td>CSDST</td>
</tr>
<tr>
<td>na hnhg</td>
<td>rate of NA householder did not graduate high school</td>
<td>CSDST</td>
</tr>
<tr>
<td>na hgh</td>
<td>rate of NA householder is a high school graduate with no further education</td>
<td>CSDST</td>
</tr>
<tr>
<td>na hph</td>
<td>rate of NA householder has post high school education</td>
<td>CSDST</td>
</tr>
<tr>
<td>wh povrt</td>
<td>white household poverty rate</td>
<td>CSDST</td>
</tr>
<tr>
<td>wh fhhd</td>
<td>rate of white female householders, no husband present</td>
<td>CSDST</td>
</tr>
<tr>
<td>wh hnhg</td>
<td>rate of white householder did not graduate high school</td>
<td>CSDST</td>
</tr>
<tr>
<td>wh hgh</td>
<td>rate of white householder is a high school graduate with no further education</td>
<td>CSDST</td>
</tr>
<tr>
<td>wh hph</td>
<td>rate of white householder has post high school education</td>
<td>CSDST</td>
</tr>
</tbody>
</table>

The universe is all households with children.
Spatial Variables

Spatial variables were selected based on their importance in Morrill and Wohlenberg and in Labao and Schulman. Table 4 lists all of the spatial variables included in the analysis. The first three are based on a qualitative classification of the census; the other two variables are quantitative and were derived from distance and population data.

Table 4. Spatial variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>all hru</td>
<td>rate of households that are rural</td>
<td>CSDST</td>
</tr>
<tr>
<td>na hru</td>
<td>rate of N.A. households that are rural</td>
<td>CSDST</td>
</tr>
<tr>
<td>wh hru</td>
<td>rate of white households that are rural</td>
<td>CSDST</td>
</tr>
<tr>
<td>dist town</td>
<td>distance from county seats to nearest major Montana town</td>
<td>MTHM</td>
</tr>
<tr>
<td>pot int</td>
<td>potential interaction, within the State of Montana</td>
<td>MTHM</td>
</tr>
</tbody>
</table>

The universe of all households are households with children.

Morrill and Wohlenberg and Labao and Schulman found that the variable percentage urban had fairly strong explanatory value for the location of poverty. In all cases, percentage urban was negatively related to poverty rate. The rate of households that were rural (the inverse of percentage urban) was derived from the 1990 CSDST. It comes from the same universe as the dependent variable, household poverty. Urban households, as defined by the Bureau of Census, are households located in urbanized areas and households located outside of urbanized areas in places

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\(^{19}\)Morrill and Wohlenberg, 93; Labao and Schulman, 594.
with 2,500 people or more. All other households are classified rural. Thirty of fifty-six counties in Montana are classified 100% rural.

Distance from county seats to the nearest major Montana town was obtained from the distance matrix of the 1990 Montana Highway Map (MTHM). This variable is similar to the one used by Morrill and Wohlenberg named distance to 250,000 SMSA. The variable was derived by finding the distance of each county seat to the nearest of any of seven major Montana population centers. These population centers include Billings, Bozeman, Butte, Great Falls, Helena, Kalispell, and Missoula.

Potential interaction, similar to Morrill and Wohlenberg's population potential, was calculated for each Montana County using the population of counties and the road distances between county seats. Population potential was a strong enough variable to be included in Morrill and Wohlenberg's general model of poverty. Potential interaction is a gravity model that uses population (mass) and distance to estimate the population potential (gravity) of places among a network (solar system) of places. Potential interaction was calculated by creating a matrix in which each cell contains the population of a row county divided by the squared distance between the matching row and column county seat. The columns of quotients were then summed to acquire the interaction index of each county.

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21 Morrill and Wohlenberg, 69 and 93.

22 Population potential relates to places accessibility to markets. Morrill and Wohlenberg, 94.

23 Potential interaction is similar to Morrill and Wohlenberg's Population potential. Morrill and Wohlenberg, 65.
Potential population interaction is an index of the potential interactions of places within a network of places. Large county seats that are centrally located have the greatest potential interactance. Small isolated places have the least potential interactance.

Economic Variables

Similar to Morrill and Wohlenberg, economic variables used in the analysis included unemployment rate and the rate of employment by industrial sectors and by occupation categories. These variables were used in the analysis to see if variations in industrial or occupational structure affect the poverty rates of counties. Three other variables were used; they included median household income, rate of households with public assistance income, and households with no earnings rate. These three variables were considered to be potential covariates of poverty and were thus treated separately of the other economic variables.

Table 5 contains the descriptors for the unemployment rate used in the analysis. Percentage unemployment was strongly positively related to poverty rate in the study by Labao and Shulman. Unemployment rate was obtained by dividing the unemployed civilians in the labor force age 16 years old and over by the number of civilians in the labor force 16 years old and over. These statistics were obtained from the 1990 STF3a.

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24Morrill and Wohlenberg, 73-79.
25The positive relationship between poverty rate and unemployment rate should be examined in the context that Labao and Schulman studied only non-metro counties. The present study includes metro and non-metro counties. Labao and Schulman, 594.
Table 5. Unemployment rate.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>unemp rt</td>
<td>unemployment rate</td>
<td>STF3a</td>
</tr>
</tbody>
</table>

The universe is civilians 16 years old and over that are in the labor force.

Table 6 identifies the employment rate variables for each of the 17 one digit standard industrial code (SIC) sectors found in the 1990 STF3a. The universe for the employment rate variables is employed persons 16 years old and over. Morrill and Wohlenberg found that the location of poverty was positively related to employment in the agriculture and personal services sectors and negatively related to employment in finance, professional services, and durable goods manufacturing.

Table 7 summarizes the occupation variables by employment rate in each of 13 broad occupational categories present in the 1990 STF3a. The universe for the employment rate variables is employed persons 16 years old and over. Morrill and Wohlenberg included percent craftsmen and percent farmers into their general model of poverty. Percent farmers was strongly positively related to poverty and percent craftsmen strongly negatively related.

Table 8 lists three other economic variables related to poverty that were added to the correlation analysis, they include median household income (medhinc), rate of households with public assistance income (per_hwpa), and rate households with no earnings (per_nern). These three variables are derived from the 1990 CSDST. The universe of these variables is households with children.
Table 6. Industrial variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>ag f f</td>
<td>employment rate in the agriculture, forestry and fishing sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>mining</td>
<td>employment rate in the mining sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>constrct</td>
<td>employment rate in the construction sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>nd manu</td>
<td>employment rate in the non-durable goods manufacturing sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>d manu</td>
<td>employment rate in the durable goods manufacturing sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>trans</td>
<td>employment rate in the transportation sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>comm utl</td>
<td>employment rate in the communications and utilities sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>wholes tr</td>
<td>employment rate in the wholesale trade sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>retail</td>
<td>employment rate in the retail trade sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>fire</td>
<td>employment rate in the finance, insurance, and real estate sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>b r serv</td>
<td>employment rate in the business and repair services sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>per serv</td>
<td>employment rate in the personal services sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>e r srv</td>
<td>employment rate in the entertainment and recreation services sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>hlhserv</td>
<td>employment rate in the health services sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>edu serv</td>
<td>employment rate in the educational services sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>other sv</td>
<td>employment rate in the other services sector</td>
<td>STF3a</td>
</tr>
<tr>
<td>pub adm</td>
<td>employment rate in the public administration sector</td>
<td>STF3a</td>
</tr>
</tbody>
</table>

The universe is employed persons 16 years old and over.

Median household income (medhinc) was added to the correlation analysis to show that the poverty rate is an income based measure. Median income is a measure of income. In places where peoples incomes are low, median income is low. As poverty is an income based measure, places where peoples incomes are low are also places where the poverty rate is high.
### Table 7. Occupational variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Economic variables</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>exadmman</td>
<td>employment rate in executive, administrative, and managerial occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>profspec</td>
<td>employment rate in professional specialty occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>techsupt</td>
<td>employment rate in technician and related support occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>sales</td>
<td>employment rate in Sales occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>admnsupt</td>
<td>employment rate in administrative support occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>manprof</td>
<td>employment rate in managerial, professional, and specialty occupations (sum of</td>
<td>STF3a</td>
</tr>
<tr>
<td></td>
<td>exadmman, profspec, techsupt, sales, and admnsupt)</td>
<td></td>
</tr>
<tr>
<td>privhse</td>
<td>employment rate in private household occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>protcsrv</td>
<td>employment rate in protective service occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>othrserv</td>
<td>employment rate in service occupations other than privhse and protcsrv</td>
<td>STF3a</td>
</tr>
<tr>
<td>servoccu</td>
<td>employment rate in all service occupations including privhse, protcsrv, and</td>
<td>STF3a</td>
</tr>
<tr>
<td></td>
<td>othrserv</td>
<td></td>
</tr>
<tr>
<td>frmforfs</td>
<td>employment rate in farming, forestry, and fishing occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>precprod</td>
<td>employment rate in precision production, craft, and repair occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>machopr</td>
<td>employment rate in machine operator, assembler, and inspector occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>transmov</td>
<td>employment rate in transportation and material moving occupations</td>
<td>STF3a</td>
</tr>
<tr>
<td>handclen</td>
<td>employment rate in handlers, equipment cleaners, helpers, and laborers occupations</td>
<td>STF3a</td>
</tr>
</tbody>
</table>

The universe is employed persons 16 years old and over.

The other two variables, though closely correlated with poverty, are related to it in confusing ways. Depending upon the observers paradigm, the rate of households with public assistance income and the rate of households with no earnings could either cause poverty or be caused by poverty. These variables were excluded from the
regression analysis as they were thought to be related to poverty in ways that are difficult to interpret.

An ecological fallacy occurs when relating the economic figures from the STF3a with data from the CSDST. The economic data in the STF3a is from the population Employed persons 16 years and over while the statistics from the CSDST are from the population Households with children. The ecological fallacy was noted but could not be eliminated from the aggregated census data set. Census micro-data would be necessary in order to conduct disaggregated employment analyses.

Table 8. Co-variates of poverty.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>med hinc</td>
<td>median household income</td>
<td>CSDST</td>
</tr>
<tr>
<td>per hwpa</td>
<td>rate of households with public assistance income</td>
<td>CSDST</td>
</tr>
<tr>
<td>per nern</td>
<td>rate of households with no earnings</td>
<td>CSDST</td>
</tr>
</tbody>
</table>

The universe is all households with children.

Correlation and Regression Analysis

Following the example set by Morrill and Wohlenberg and Labao and Schulman, analysis was performed using first Pearson's correlation and then multiple linear regression. Correlations and regressions were performed to analyze direction and strength of relationships between the dependent variable, the percentage household

\[\text{Morrill and Wohlenberg}, \ 10; \ \text{Labao and Schulman}, \ 578-580.\]
poverty, and the independent variables listed in the aforementioned tables. For the purposes of this thesis, correlations and regressions were conducted more for exploratory and descriptive purposes, than for model building. All statistical analyses were performed using standard statistical procedures incorporated in the SPSS software. Results of the correlation and regression analysis are given in Chapter 4.

Pearson's correlation was conducted between the dependent variable and all of the independent variables individually.\textsuperscript{27} Correlation was used to assess the worthiness of variables for use in the multiple regression analysis. Independent variables were considered worthy of entry into the multiple regression equation when the two tailed significance values of their correlation coefficients (R) were less than 0.05. Only the variables with significant correlation coefficients are displayed in the tables in Chapter 4. All variables not displayed had insignificant coefficients.

Multiple linear regression was then performed between the dependent variable (household poverty) and the remaining independent variables that had significant correlation coefficients. The three dependent variables, all household poverty (hse_pov), white household poverty (wh_povrt), and Native American household poverty (na_povrt), with their related independent variables were treated separately. The first multiple regressions entered the independent variables of similar types (social, spatial, and economic) into the equations. The purpose of these grouped tests was to see which of the independent variable types explained most of the variation of the dependent variable.

\textsuperscript{27}The formula for Pearson's (product-moment) correlation is presented in Appendix A.
Five statistical measures were recorded in the tables that summarized the results of the regression analysis. These measures included unstandardized and standardized (beta) regression coefficients, significance of linear relationship of individual regression coefficients, adjusted $R^2$, and the significance of overall regression F test.

Unstandardized regression coefficients were the values entered into the tables in parenthesis. They are the values that regression enters into the resulting predictive equation. The relative value of unstandardized regression coefficients does not give any insight into the relative strength of the variable in the equation only the direction of the relationship (+ or -). Standardized (beta) coefficients on the other hand give an indication as to the relative strength of each coefficient. In general, the larger a beta coefficient the more influential it is. But, Marija Norusis warns that "beta coefficients still depend upon the other independent variables in your model, so they don't reflect in any absolute sense the importance of individual independent variables."\(^{28}\)

$T$ tests of individual regression coefficients were used to test the null hypothesis that each individual coefficient had a slope of zero. Coefficients were determined to have a slope of zero if their probability of $T$ was less than 0.05. Coefficients with a slope of zero show that there is not a linear relationship between that factor and the dependent variable. That factor is not contributing to the explanation of the variation of the dependent variable.

The $R^2$ (coefficient of determination) and adjusted $R^2$ were used to determine the goodness of fit of the regression model. An $R^2$ of 1 indicated that the independent

variables 'explain' all of the variation in the dependent variable. Adjusted $R^2$ is an estimate of how well a regression model would fit another data set of the same population. Adjusted $R^2$ is always a more conservative value than $R^2$ and is often used in its place.

The test for a linear relationship within a regression was performed using the overall regression F test. The test addresses the null hypothesis that there is no linear relationship between the dependent variable and the combined independent variables. When the resulting significance of F was less than 0.05 the null hypothesis was rejected and a linear relationship was considered present.

Next, a multiple regression entering all of the independent variables was performed. This regression tells which of all of the independent variables explains most of the variation of household poverty while effects of other, non-significant, independent variables are controlled. This regression also lets the researcher see what the upper limit of $R^2$ is with the current independent variables. $R^2$ only increases as variables are added to the regression, it does not decrease.

Finally, step-wise multiple linear regressions were conducted between household poverty rates and all of the factors in order to determine the strongest model

The reader is cautioned that the word 'explain' when used in the statistical sense means that there is a strong relationship between the variables. In reality, there is no way of interpreting causation from the statistics. Causation must come from the theories of the relevant study. Gareth Shaw and Dennis Wheeler, Statistical Techniques in Geographical Analysis (New York: Halsted Press, 1994), 181.

Marija J. Norusis, 404.
with the least amount of multicollinearity for the location of poverty in Montana.\textsuperscript{31} Stepwise variable selection is the most commonly used method for linear regression model building. The criteria used to select independent variables that were entered into the regression equation was a significance of $t$ less than 5%. The criteria used to remove independents from the equation was a significance of $t$ greater than 10%. Regression was concluded when $R^2$ did not significantly change by adding more independent variables.

All partial plots and summary statistics were reviewed to determine whether or not the assumptions for Pearson's correlation and linear regression were met. Census Bureau samples employ random sampling techniques to satisfy the need for independence of observations.

**A spatial Analysis of Elementary School Food Programs in Montana**

As poverty rates vary from place to place within Montana, so does the quantity and quality of school food programs.\textsuperscript{32} In addition to these school district provided programs, the federal government will help to subsidize the price of school meals for qualifying children.\textsuperscript{33} Some counties have made better use of these federal programs than have others. In this section, the methods used to assess Montana's attempts to

\textsuperscript{31}Multicollinearity refers to the problem of having high correlations between independent variables in multiple regression. This is mostly a problem when building mathematical models. Shaw and Wheeler, 256.

\textsuperscript{32}School food programs are the hot lunch and breakfast programs that are available in school cafeterias at a minimal fee to students. These programs are organized by school districts.

\textsuperscript{33}Federal free and reduced meal programs are welfare programs that pay for all or part of qualifying students hot lunches and breakfasts at the school cafeteria.
provide school lunches to its elementary students and its usage of federally subsidized lunch programs are presented.

The Relationship of School Food Programs to Childhood Poverty

Comparative study of the allocation of school food programs was conducted by entering coded data concerning the types of school food programs available to elementary school districts into the school district poverty database. Food program data were acquired from the Montana State Office of Public Instruction. Seven codes for different types of food programs were created and entered (see Table 9). Once entered, the food program database was recoded to identify school districts offering no food programs, lunch programs, and lunch and breakfast programs.

Table 9. School food program type coding.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>no program</td>
</tr>
<tr>
<td>2</td>
<td>milk only</td>
</tr>
<tr>
<td>3</td>
<td>lunch only</td>
</tr>
<tr>
<td>4</td>
<td>breakfast only</td>
</tr>
<tr>
<td>5</td>
<td>lunch and kindergarten milk</td>
</tr>
<tr>
<td>6</td>
<td>lunch and breakfast</td>
</tr>
<tr>
<td>7</td>
<td>lunch, breakfast and kindergarten milk</td>
</tr>
</tbody>
</table>

A map showing the location of districts providing no food programs, lunch programs, and lunch and breakfast programs was created using Atlas GIS. The map is presented and discussed in Chapter 4.
The poverty rate and the elementary school age population were summarized by food program type using SPSS. Summaries were computed in order to generally describe the school food program situation.

An analysis was performed to assess if the percentage poverty and the school age population varied between school districts that had no food programs, had lunch programs, or had a lunch and breakfast programs. The first hypothesis was that percentage poverty is significantly higher in school districts that do not have school food programs than those that do. The second hypothesis was that the populations of school districts with no food programs are significantly smaller than those with food programs.

To perform significance tests between the three sub-types of school districts (no food programs, lunch programs, and lunch and breakfast programs), log transformations of the variables school age poverty rate and school age population were conducted in order to normalize any skewed raw data distributions. The number 10 was added to the school age percentage poverty scores prior to log transformation in order to deal with the problem of log transforming zero value scores.

Significant differences in average poverty rates and population were tested with one-way analyses of variance (ANOVA) and Bonferroni tests using SPSS. ANOVA was used to determine if there was a significant difference in the poverty rates and population means of counties by food program type. The Bonferroni test was used to

---

34Analysis of Variance (ANOVA) is a widely accepted statistical technique that allows for the comparison of more than two population means. ANOVA determines whether or not there is a significant difference between population means. The Bonferroni procedure is a multiple comparison procedure that expands upon ANOVA and allows the researcher to see precisely which means differ.
determine which of the means were significantly different from the others. The Bonferroni test was performed with a critical value of 5%.

The significance tests were performed with both the zero percent poverty school districts included and excluded. Inclusion of the zero percent poverty score districts drastically skewed the poverty rate distributions and invalidated the results of the statistical tests. As stated earlier, zero percent poverty districts seem to be caused by sampling error as all of these districts have extremely small populations.

The Utilization of Federal Free and Reduced Meal Programs

Analysis of the usage of federal free and reduced meal programs was performed to see if students across Montana are equally making use of the subsidized meal programs. The hypothesis was that equal usage is not occurring. In addition, percentage free and reduced meal utilization was analyzed to see if counties had adjusted their utilization of these federal programs over time. The hypothesis in this case was that the average county usage of these programs has increased over time.

Data used in this analysis include the number of school age children by county living below the poverty level acquired from the 1990 CSDST. Free and reduced meal usage and school enrollment by county were obtained from the Montana State Office of Public Instruction. The percentage difference was calculated by subtracting the number of children who accepted free and reduced meals by the number of children living below the poverty level then dividing the difference by the number of children living below the poverty level. The fraction was then converted to a percentage by multiplying by 100.
The percentage difference between the number of students accepting free and reduced meals and the number of students below the poverty threshold was used to assess counties' success in enrolling students in the free and reduced meal programs. Two maps were made of this measure. The first map shows the counties that had less children enrolled in the federal food programs than they had children below the poverty level. The second map identifies the counties that had more children enrolled in the food programs than they had children below the poverty threshold. Each map has three classifications for identifying which counties had relatively higher or lower enrollment.

Change in free and reduced meal usage was analyzed by conducting a significance test of the difference between an early and a late period. As usage of these programs appears to be somewhat variable from year to year, the test was performed on two rolling averages. The first period is the rolling average of percentage free and reduced meal usage for the years 1990, 1992, and 1993. The second period includes the years 1993, 1994, and 1995. A paired sample t-test was conducted between these two periods using SPSS.

Summary

Two research topics involving five methodological approaches were used in order to achieve the goals set for this thesis. The first topic was a spatial analysis of childhood poverty in Montana. The methodological approaches used to study this topic were: 1) to examine childhood poverty in Montana in its context with the rest of the nation, 2) to build various maps of Montana relating to issues concerning children in poverty, and 3)
to use these maps as the basis for researching the factors related to childhood poverty in
the state. The second research topic involved conducting a spatial analysis of school food
programs in Montana. The methodological approaches used in the study of this topic
were: 1) to study the relationships of school food programs to the factors and spatial
patterns of childhood poverty, and 2) to examine the utilization of federal free and
reduced meal programs as they are employed in Montana schools.

The methods used included mapping and statistical analysis. The data that were
used included map boundaries and population statistics. In some cases, the population
statistics were attached as attributes to their respective map areas. Results of the methods
used in the analysis of the data are presented in the following chapter.
CHAPTER 4

RESULTS

The previous chapter set forth the methods and data necessary to approach the research questions proposed in the introductory chapter of the thesis. In this chapter the results of the analysis are presented. The analysis is organized around the same two research topics discussed in the previous chapter: a spatial analysis of childhood poverty in Montana, and a spatial analysis of elementary school food programs in Montana. Each of these topics are further subdivided into various subtopics which are discussed in the following sections.

A Spatial Analysis of Childhood Poverty in Montana

As described in previous chapters, the three subtopics addressed in this topic are context of childhood poverty in Montana, maps of children in poverty, and factors related to childhood poverty. The first subtopic puts the State of Montana into a context of poverty relative to the nation, the western census region, and the rest of the states. The second topic examines childhood poverty within Montana by county and elementary school district and includes change in poverty between 1980 and 1990. The third subtopic assesses the factors (social, spatial, and economic) that may be related to the presence of childhood poverty in Montana.
Context of Childhood Poverty in Montana

To place the poverty situation in Montana into some sort of context, it can be compared to trends in the poverty of the nation and the West Census Region (see Figure 4).¹ In 1979 the overall poverty rate for the U.S. was 11.7%, for the West 10%, and for Montana 12.3%. In 1989 it increased to 12.8% in the U.S., 12.5% in the West, and 16.1% in Montana. During both census years, the nation and the West were at low

Figure 4. Total poverty rate of persons, by census region, 1969-1995.

Source: Baugher, Elanor and Lamison-White, Table 9.

¹The West census region includes the states Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming.
points in the poverty cycle and were positioned just prior to an upward trend. In 1989, poverty in the West was on its way to making up the gap in the national trend, which it would exceed in 1991. Poverty was on the rise faster in the West than it was in any of the other three census regions. Poverty in Montana appears to have operated somewhat independently of the nation and the West.

Childhood poverty in the U.S. in 1979 was 16.4% and in 1989 it was 19.6% (see Figure 2 on page 26). Between 1979 and 1989, Montana's childhood poverty increased dramatically. In 1979 it was comparatively low (13.8%) but by 1989 was in line with the national trend (19.9%). Similar to the total poverty rate, Montana's childhood poverty rate increased sharply from a relatively low rate to match the National average.

Figure 5 demonstrates that when childhood poverty in 1979 is mapped by state, the worst concentration was in the Deep South and Appalachian states. New Mexico (22%) and South Dakota (20%) stood out as having relatively high childhood poverty as well. Most of the West, especially the central and Pacific Northwest had relatively low childhood poverty. Montana's childhood poverty was below the mean and the median for the rest of the states.

Figure 6 illustrates how the large increase in the national childhood poverty rate from 1979 to 1989 occurred. In 1989, very few states had reduced their percentage poverty, most increased. All states with reduced childhood poverty were on the Atlantic

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2 Upward trends in the overall poverty rate coincide with periods of economic recession.

Figure 5. Percentage childhood poverty by state, 1979.

Washington D.C. 27%

Equal intervals
- 6% to 13% [16]
- 13% to 20% [24]
- 20% to 27% [9]
- 27% to 34% [2]

Figure 6. Percentage childhood poverty by state, 1989.

Washington D.C. 25%

Equal intervals
- 6% to 13% [10]
- 13% to 20% [22]
- 20% to 27% [13]
- 27% to 34% [3]
seaboard. All states west of the Mississippi had increased poverty with some states increasing by large increments. Montana was one of the states with a large increase. Montana's rank out of the 50 states and Washington D.C. for childhood poverty moved from 30th highest in 1979 to 14th in 1989. Montana had the 4th largest percentage point increase in childhood poverty (6.1%).

Compared to its adjacent states in 1979, Montana had slightly lower childhood poverty (13.8%) than did Idaho (14.3%) or North Dakota (14.3%), considerably lower poverty than South Dakota (20%), but substantially higher poverty than did Wyoming (7.7%). In 1989, Montana's childhood poverty (19.9%) grew to equal South Dakota's (20.1%) and surpassed that of Idaho (15.8%), North Dakota (16.9%), and Wyoming (14.1%).

**Maps of Children in Poverty**

Although Montana had sharp increases in poverty relative to the rest of the West and the Nation, childhood poverty varied greatly within the borders of the state. To get a feeling for this variation, poverty is mapped and discussed at two spatial scales in the following sections. The first spatial scale is at the level of counties and the second is at the level of elementary school districts.

**Counties**

The distribution of poverty changed significantly from 1979 to 1989 at the county level. Figures 7 and 8 illustrate a distribution that shifted from concentration in the mostly rural eastern counties and reservation counties to a much more continuous distribution across the state. The most noticeable increases in poverty were in western
Figure 7. Percentage childhood poverty by county, 1979.

Dotted lines are reservations.

equal intervals

- 5 to 15 [22]
- 15 to 25 [25]
- 25 to 35 [7]
- 35 to 45 [2]

Figure 8. Percentage childhood poverty by county, 1989.

Dotted lines are reservations.

equal intervals

- 5 to 15 [6]
- 15 to 25 [35]
- 25 to 35 [10]
- 35 to 45 [5]
and southeastern Montana. Most of the reservation counties increased to the highest poverty class (35-40%) in 1989 as did Carter county. Jefferson, Stillwater and Yellowstone counties were able to maintain between 5% and 15% poverty.

Figure 9 shows that reductions in poverty rates occurred in sixteen of the most rural eastern counties. Several of the counties in eastern Montana that had the highest poverty rates in 1979 also had the greatest reductions in 1989. Prairie County, which includes the towns of Terry and Fallon, had the single largest reduction of childhood poverty when its rates dropped by 26.6 percentage points. Overall, reductions were relatively extreme as compared to increases.

Figure 10 demonstrates that some reservation counties, especially Bighorn, Glacier, Sanders, and Roosevelt, had the largest increases in childhood poverty. Other counties with double-digit percentage point increases were Powell, Park, Dawson, and Powder River. The majority of counties, especially heavily populated counties, had large increases. Nearly all of the mountainous counties in western Montana had impressive increases in childhood poverty.

Shifts in the county poverty rates were extreme. A paired sample T-test found that the average shift of 3.6 percentage points, from 1979 to 1989, was significant (two tailed probability of $T = 0.002$).

These poverty changes in Montana, though extreme, must be kept in context. The total poverty rate for the state increased by 3.8 percentage points and the childhood poverty rate for the state increased by 6 percentage points between the two census counts.

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4Sampling error is a potential problem in small counties such as Prairie County.
Figure 9. Percentage point decrease in childhood poverty, 1979-1989.

Unshaded counties had increased poverty. Dotted lines are reservations.

natural breaks
-27.2 [1]
-17 to -9 [3]
-9 to 0 [10]

Figure 10. Percentage point increase in childhood poverty, 1979-1989.

Unshaded counties had decreased poverty. Dotted lines are reservations.
There were two recessions during this period and a significant change in the demographics of the state. Over all, there were approximately 10,000 fewer children in Montana in 1990 than 1980, a 4.2% reduction. All but one of the counties that had reduced childhood poverty were also counties that had a diminished population of children. The only county in which childhood poverty decreased but population of children increased was Stillwater County in southcentral Montana. In counties where childhood poverty increased, population of children decreased in some and increased in others with no noticeable trend. Population loss was greatest in the eastern plains, where fifteen counties experienced 20 to 40% reductions in their populations of children.

In the period 1979 to 1989, Montana had a significant increase in childhood poverty and a drastic change in its statewide distribution. Changes occurred at the county level and tell much about the dynamics of poverty within the state. But, further variation in poverty occurs within counties.

**Elementary school districts**

Elementary school districts were used to capture the subcounty distribution of childhood poverty in 1990. In this section, the two maps are used to portray elementary age poverty.

Figure 11 maps the locations of elementary school districts with poverty above or below the state elementary school age percentage poverty (19.9%). Roughly 51% of

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5Percentage child population change and percentage child poverty change from 1980 to 1990 for Montana counties are positively correlated (R = 0.57).
Figure 11. Elementary school age poverty, above and below the state rate.

Figure 12. Extreme elementary school age poverty (greater than 40%).
the state's school districts are below the state school age poverty rate, 43% are above the state rate, and 6% had missing data.

Although geographical patterns are difficult to see at first glance, nevertheless, the maps display several. Most school districts located within Native American reservations have above average poverty, especially those containing large reservation towns. Clusters of school districts with above average poverty are either within or surround each of the reservations.

Several clusters are evident in non-reservation areas that contain incorporated towns. One of these clusters includes most of Ravalli County, all of Granite County, the north half of Deer Lodge County and the southern tip of Powell County. This area contains the towns of Hamilton, Darby, Drummond, Philipsburg, Deer Lodge, and Anaconda. Another cluster in the central plains includes the east half of Fergus County, all of Petroleum County, the west half of Garfield County, the northwestern third of Rosebud County, all of Treasure County, nearly all of Musselshell County, all of Golden Valley County, and the north east half of Wheatland County. This area contains the towns of Grass Range, Winnett, Roundup, Melstone, Levina, Ryegate, Harlowton, and Judith Gap. Anther major cluster is located east of the Northern Cheyenne Reservation and includes most of Powder River County and all of Custer County. This area contains the towns of Broadus and Ekalaka. Several smaller clusters are present elsewhere in the state.

The most noticeable unifying trend concerning the nonreservation school district clusters with poverty above the state rate is that they are all located in very rural areas
of Montana. All of the major population centers of the state are located in school districts that fall below the state poverty rate.

Figure 12 maps school districts with greater than 40% elementary school age poverty. Again the trend is apparent that many extreme poverty areas are contained within or adjacent to Native American reservations. All of the remaining extreme poverty areas are isolated and located in remote rural areas. Most extreme poverty school districts are not associated with any town, even with a very small unincorporated town.

Of the 161 incorporated places in Montana, only two are located in school districts with greater than 40% poverty that are outside of a reservation. The two towns include Harlem which is located just outside of the Fort Belknap reservation and Ismay (population, 19 persons), 40 miles east of Miles City. The remaining non-reservation areas include relatively well known poor communities. For example, familiar extreme poverty areas in the westcentral part of the state include the school districts of Trout Creek and Hot Springs in Sanders County, De Borgia in Mineral County, Swan Lake in Lake County, Ovando in Powell County, and Hall in Granite County. These are predominantly poor white communities with a degraded or almost non-existent economic base. This seems to be the trend across the state.

Thirteen incorporated towns are located in extreme poverty school districts within reservations. Some school districts classified as extreme poverty districts may be

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Areas with greater than 40% poverty rate are often considered extreme poverty areas in the literature. Richard Greene, "Poverty Concentration Measures and the Urban Underclass." *Economic Geography* 67 (3 1991): 242.
improperly classified due to sampling error. However, it is likely that most people residing in these districts are low income, based upon their remote locations.

In summary, the state elementary school age poverty rate is high. Roughly half of the school districts are below it while the rest are either above it or have missing data. The most extreme poverty areas are on the reservations and in remote rural areas, away from population centers. In the following subtopic the reasons for these variations in the spatial distribution of poverty are explored.

Factors Related to Childhood Poverty

As seen in Morrill and Wohlenberg, Labao and Schulman, and others, poverty is spatially related to a host of social, spatial and economic factors. This subtopic looks at the factors related to the poverty of households with children in Montana. Three household groups are analyzed; all households, white households, and Native American households.

All households with children

The first analyses looked at the factors of the poverty rate of households with children regardless of race. The initial step was to perform Pearson’s correlation between the dependent variable and each of the independent variables (factors) individually. Pearson’s correlation was used to determine which independent variables were significantly correlated with the dependent variable and thus worthy of use in the multiple regression analysis.
Following the correlation analysis multiple regressions were performed between the dependent variable and the independent variables by grouping types. Grouping types of independent variables included in the regression analysis are social, unemployment, occupational, and economic. The second to the last regression forces all of the variables into the regression equation. This regression does two things, it is a gauge for the height of the adjusted R² and it shows the strength of the individual independent variables relative to one another. The final regression was a stepwise regression. This regression uses all of the independent variables similar to the last, but it selects the few that, in concert, best describe the variation in the dependent variable. These variables isolated by stepwise regression would be the best variables to use in predicting the location of poverty. This type of analysis was repeated for white households with children and Native American households with children.

Pearson's correlation found that twelve variables had significant correlation coefficients (see Table 10). Positive correlations were with the rate of native american householders (all_nah), rate of households with public assistance income (per_hwpa), rate of households where the householder has not graduated high school (all_hngh), unemployment rate (unemp_rt), rate of households with no earnings (all_nern), and rate of female headed households (all_fhhd). In Montana, where the above rates are higher, the poverty rate is higher as well. Where poverty rates are lower, these rates are lower.

---

7Only independent variables that had significant correlations were used in the multiple regression analysis. Statistical significance is assessed as two-tailed probability that a correlation in present of less than 0.05. This is the reason that all of the variables are not listed in the multiple regression tables.
Negative correlations were with the factors median household income (med_hinc), employment rate in technicians and related support occupations (techsupt), rate of householder has post high school education (all_hph), employment rate in executive, administrative, and managerial occupations (exadmman), employment rate in precision production, craft, and repair occupations (precprod), and employment rate in sales occupations (sales). In Montana, where the poverty rate is higher, these rates are lower. Where these rates are lower, poverty rates are higher.

Table 10. Significant correlation coefficients with poverty rate of all households with children.

<table>
<thead>
<tr>
<th>Negative Correlation Coefficients</th>
<th>Variable</th>
<th>Coef.</th>
<th>Signif.</th>
<th>type</th>
</tr>
</thead>
<tbody>
<tr>
<td>med_hinc</td>
<td>-0.69</td>
<td>0.000</td>
<td>covar</td>
<td></td>
</tr>
<tr>
<td>techsupt</td>
<td>-0.39</td>
<td>0.003</td>
<td>occupa</td>
<td></td>
</tr>
<tr>
<td>all_hph</td>
<td>-0.35</td>
<td>0.009</td>
<td>social</td>
<td></td>
</tr>
<tr>
<td>exadmman</td>
<td>-0.30</td>
<td>0.026</td>
<td>occupa</td>
<td></td>
</tr>
<tr>
<td>precprod</td>
<td>-0.30</td>
<td>0.026</td>
<td>occupa</td>
<td></td>
</tr>
<tr>
<td>sales</td>
<td>-0.27</td>
<td>0.041</td>
<td>occupa</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Positive Correlation Coefficients</th>
<th>Variable</th>
<th>Coef.</th>
<th>Signif.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>all_nah</td>
<td>0.68</td>
<td>0.000</td>
<td>social</td>
<td></td>
</tr>
<tr>
<td>all_hwpa</td>
<td>0.66</td>
<td>0.000</td>
<td>covar</td>
<td></td>
</tr>
<tr>
<td>all_hngh</td>
<td>0.53</td>
<td>0.000</td>
<td>social</td>
<td></td>
</tr>
<tr>
<td>unemp_rt</td>
<td>0.51</td>
<td>0.000</td>
<td>unempl</td>
<td></td>
</tr>
<tr>
<td>all_nern</td>
<td>0.51</td>
<td>0.000</td>
<td>covar</td>
<td></td>
</tr>
<tr>
<td>all_fhhd</td>
<td>0.35</td>
<td>0.008</td>
<td>social</td>
<td></td>
</tr>
</tbody>
</table>

n = 56 counties
Tables 3 through 8 contains the variable name descriptions.
Type refers to the variable category (ie. soc is social, occu is occupational, etc.)

These significantly correlated variables described above were subsequently subjected to multiple regression analysis. Three types of variables (factors) were found to have significantly correlated variables; social, unemployment, and occupational. Each type of variable had an individual regression analysis performed. None of the spatial variables were found to have significant correlation coefficients and were thus excluded.
from the regression analysis. Because they are potential covariates of poverty, median household income (med_hinc), households with public assistance income (all_hwpa), and households with no earnings (all_nern) were not considered in the regression analysis.

Table 11 shows the results of the regression analysis. Of the three types of variables that had significant correlations, social variables had a higher adjusted $R^2$ (0.462) than did unemployment (0.248) or the occupation variables (0.14). Most of the high adjusted $R^2$ for the social variables is composed of the variable rate of households native american (all_nah). This is exemplified by the variables significance and high standardized coefficient. Similar to the findings of Morrill and Wohlenberg and Labao and Schullman, social variables, especially race, seem to be the best predictors of the location of poverty.

Regression with all of the independent variables shows how high the adjusted $R^2$ can go with the available variables. In this case the adjusted $R^2$ reaches 0.72. This means that when all nine variables are entered into the multiple regression, they are accounting for 72% of the variation in the dependent variable. In this equation, the significant variables listed respectively by strength of explanatory power are employment rate in the technical support occupations (techsupt), employment rate in precision production occupations (precprod), rate of households Native American (all_nah), and rate of householders has not graduated highschool (all_hngh). In this regression, with the effects of many non-significant variables included, occupational variables had the greatest explanatory power followed by social variables.
Table 11. Regression of poverty rate of all households with social, unemployment, and occupational factors.

<table>
<thead>
<tr>
<th>factors</th>
<th>social</th>
<th>unemployment</th>
<th>occupational</th>
<th>all variables</th>
<th>stepwise</th>
</tr>
</thead>
<tbody>
<tr>
<td>all_nah</td>
<td>0.689**</td>
<td>0.331*</td>
<td>0.312**</td>
<td>0.426**</td>
<td>0.260</td>
</tr>
<tr>
<td>(0.260)</td>
<td>(0.125)</td>
<td>(0.161)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all_hgh</td>
<td>-0.057 (0.071)</td>
<td>-0.074*</td>
<td>-0.083</td>
<td></td>
<td></td>
</tr>
<tr>
<td>all_fhhd</td>
<td>-0.033 (0.038)</td>
<td>0.275 (0.341)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>all_hph</td>
<td>-0.202 (0.167)</td>
<td>-0.128</td>
<td>-0.106</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unemp_rt</td>
<td></td>
<td>0.511 (0.768)</td>
<td>0.292 (0.438)</td>
<td>0.377**</td>
<td></td>
</tr>
<tr>
<td>(0.768)</td>
<td></td>
<td>(0.438)</td>
<td>(0.566)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>techsupt</td>
<td></td>
<td>-0.306 (-0.020)</td>
<td>-0.414** (-2.588)</td>
<td>-0.404** (-2.624)</td>
<td></td>
</tr>
<tr>
<td>exadmman</td>
<td></td>
<td>-0.223 (-0.005)</td>
<td>-0.166</td>
<td>-0.394</td>
<td></td>
</tr>
<tr>
<td>precprod</td>
<td></td>
<td>-0.160 (-0.004)</td>
<td>-0.328** (-0.759)</td>
<td>-0.292** (-0.676)</td>
<td></td>
</tr>
<tr>
<td>sales</td>
<td></td>
<td>0.109 (0.002)</td>
<td>0.066 (0.126)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adi. R²</td>
<td>0.462</td>
<td>0.248</td>
<td>0.140</td>
<td>0.720</td>
<td>0.705</td>
</tr>
<tr>
<td>Signif. F</td>
<td>0.0000</td>
<td>0.0001</td>
<td>0.019</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Unstandardized coefficients are in parentheses.
* Significant at p < .05.
** Significant at p < .01.

Tables 3 through 8 contain the variable name descriptions.

Stepwise regression with all nine of the variables created a model which accounts for 70.5% of the variance in household poverty with four variables. Stepwise regression eliminates all but the significant variables from the regression equation. The four variables left in order of strength are rate of households Native American (all_nah), employment rate in technical support occupations (techsupt), unemployment rate (unemp_rt), and employment rate in precision production occupations (precprod). If
someone were to try to predict where the highest poverty rates in Montana occur by county, these are the variables that they would want to use in their predictive equation.

The stepwise regression model seems to show that the best predictors of household poverty rate in Montana are social effects (all_nah), economic effects (techsupt, precprod), and unemployment (unemp_rt). It is unknown if any of these variables actually cause poverty or prevent it. Logically, high unemployment in a county could be considered a cause of poverty. As well, lack of modern high-tech occupations with good wages could be considered a cause of poverty.

Race, is not considered a direct cause of poverty. Different racial groups may have different causes for their poverty. If the groups are studied exclusive of one another, separate causes for poverty among each group would hopefully be discerned.

There are two main racial populations in Montana that are distinctly different from one another. Whites and Native Americans likely have different social, spatial, economic and even cultural factors that cause their poverty. In subsequent tests, white and Native American household poverty were treated independently to determine if they are related to different factors.

White households with children

Table 12 shows the 19 variables that had significant Pearson’s correlation coefficients with the rate of white households having children below the poverty threshold. Significant negative correlations were obtained with 16 of the independent variables. Of these, one was with a potential covariate of poverty, seven were with
occupation variables, seven were with industrial variables, one was with unemployment (unemp_rt), and one was rate of white householders has post highschool education.

Table 12. Significant correlation coefficients with poverty rate of white households with children.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coef.</th>
<th>Signif.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>med hinc</td>
<td>-0.49</td>
<td>0.000</td>
<td>covar</td>
</tr>
<tr>
<td>manprof</td>
<td>-0.49</td>
<td>0.000</td>
<td>occupa</td>
</tr>
<tr>
<td>admssupt</td>
<td>-0.48</td>
<td>0.000</td>
<td>occupa</td>
</tr>
<tr>
<td>techsupt</td>
<td>-0.47</td>
<td>0.000</td>
<td>occupa</td>
</tr>
<tr>
<td>precprod</td>
<td>-0.43</td>
<td>0.001</td>
<td>occupa</td>
</tr>
<tr>
<td>profspec</td>
<td>-0.37</td>
<td>0.005</td>
<td>occupa</td>
</tr>
<tr>
<td>other sv</td>
<td>-0.37</td>
<td>0.006</td>
<td>industri</td>
</tr>
<tr>
<td>comm util</td>
<td>-0.36</td>
<td>0.006</td>
<td>industri</td>
</tr>
<tr>
<td>sales</td>
<td>-0.35</td>
<td>0.009</td>
<td>occupa</td>
</tr>
<tr>
<td>constrct</td>
<td>-0.34</td>
<td>0.010</td>
<td>industri</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coef.</th>
<th>Signif.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>unemp rt</td>
<td>-0.34</td>
<td>0.011</td>
<td>unempl</td>
</tr>
<tr>
<td>e_r serv</td>
<td>-0.33</td>
<td>0.012</td>
<td>industri</td>
</tr>
<tr>
<td>fire</td>
<td>-0.33</td>
<td>0.013</td>
<td>industri</td>
</tr>
<tr>
<td>exadmman</td>
<td>-0.32</td>
<td>0.016</td>
<td>occupa</td>
</tr>
<tr>
<td>retail</td>
<td>-0.31</td>
<td>0.019</td>
<td>industri</td>
</tr>
<tr>
<td>whsle tr</td>
<td>-0.31</td>
<td>0.020</td>
<td>industri</td>
</tr>
<tr>
<td>wh hph</td>
<td>-0.30</td>
<td>0.024</td>
<td>social</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coef.</th>
<th>Signif.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>sales</td>
<td>-0.35</td>
<td>0.009</td>
<td>occupa</td>
</tr>
<tr>
<td>constrct</td>
<td>-0.34</td>
<td>0.010</td>
<td>industri</td>
</tr>
</tbody>
</table>

n = 56 counties
Tables 3 through 8 contain the variable name descriptions.

(wh_hph). The potential covariate was median household income (med_hinc). The occupational variables were employment rate in managerial, professional, and specialty occupations (manprof), employment rate in administrative support occupations (admsupt), employment rate in technician and related support occupations (techsupt), employment rate in precision production, craft, and repair occupations (precprod), employment rate in sales occupations (sales), and employment rate in executive, administrative, and managerial occupations (exadmman). The industrial variables were employment rate in the other services sector (other_sv), employment rate in the communications and utilities...
sector (comm_util), employment rate in the construction sector (constrct), employment rate in the entertainment and recreation services sector (e_r_serv), employment rate in finance, insurance, and real estate sector (fire), employment rate in the retail sales sector (retail), and employment rate in the wholesale trade sector (whse_tr). In Montana, where white poverty rate is higher, these rates are lower. Where these rates are lower, poverty rates are higher.

Significant positive correlations were with only two independent variables. The variable with the biggest positive coefficient was occupation rate in farming, forestry, and fishing. The other positive coefficient was the spatial variable rate of white households that are rural. In Montana, where the white poverty rate is higher, these variables are also higher. Where these rates are lower, white poverty is lower as well.

Based on the correlations, white household poverty seems to be tied to the economy present in counties. In rural counties where most employment is in farming, ranching, and forestry, incomes are low, and there are not many post high school educated people, there is a lot of white household poverty. In urban counties with diversified economies, higher incomes, and a larger fraction of college educated people, white poverty is scarce. White poverty does not seem to be strongly related to social conditions.

Interestingly, unemployment rate was negatively related to white household poverty. Where one goes up the other goes down. White unemployment is higher in urban counties of Montana than it is in rural counties. The opposite is true for poverty.
The significantly correlated independent variables were subsequently entered into the multiple regression analysis. Since there were five types of variables (factors) isolated by the correlation analysis, each type had an individual regression analysis performed. The potential covariate, median household income (med_hinc) was excluded from the regression analysis. Results of the regression analysis are displayed in Table 13.

As a group, industry variables were found to account for the largest quantity of variance in white household poverty (adjusted $R^2 = 0.442$). Industry variables were followed by occupational variables (0.361), the spatial variable fraction of white households rural (0.110), unemployment rate (0.098), and the social variable fraction of white households where the householder has post high school education (0.073).

Although the adjusted $R^2$ of the industry type variables was higher than that of the occupational variables, the occupational variables had two variables that were prominent. These variables include rate of employment in the managerial, professional, and specialty occupations (manprof) and employment rate in the precision production, craft, and repair occupations (precprod). Both are negatively related to poverty. These types of employment require educated and skilled work forces that are found mainly in urban places. The strength of these two variables actually changed the signs of the coefficients for employment rate of farming, forestry, and fishing (frmforfs) and executive, administrative, and managerial (exadmman) in the regression equation.

No strong overall model was found for white poverty. When all of the independent variables were forced into the regression equation, the adjusted $R^2$ reached
Table 13. Regression of poverty rate of white households with social, spatial, and economic factors.

<table>
<thead>
<tr>
<th>independents</th>
<th>social</th>
<th>spatial</th>
<th>unemp.</th>
<th>occupa.</th>
<th>industr.</th>
<th>all</th>
<th>stepwise</th>
</tr>
</thead>
<tbody>
<tr>
<td>pw_hph</td>
<td>-0.301* (-0.198)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pw_hru</td>
<td></td>
<td>0.356** (0.057)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>unemp_rt</td>
<td></td>
<td></td>
<td>-0.381* (-0.401)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>manprof</td>
<td></td>
<td></td>
<td>-1.353* (-0.655)</td>
<td></td>
<td>-1.540 (-0.746)</td>
<td>-0.393** (-0.190)</td>
<td></td>
</tr>
<tr>
<td>admsupt</td>
<td></td>
<td></td>
<td>-0.051 (0.085)</td>
<td></td>
<td>0.224 (0.373)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>frmforfs</td>
<td></td>
<td></td>
<td>-0.535 (-0.182)</td>
<td></td>
<td>-0.829 (-0.282)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>techsupt</td>
<td></td>
<td></td>
<td>-0.212 (-1.086)</td>
<td></td>
<td>-0.374 (-1.916)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>precprod</td>
<td></td>
<td></td>
<td>-0.495** (-0.904)</td>
<td></td>
<td>-0.476* (-0.869)</td>
<td>-0.309* (-0.563)</td>
<td></td>
</tr>
<tr>
<td>sales</td>
<td></td>
<td></td>
<td>0.575* (0.842)</td>
<td></td>
<td>1.035 (1.568)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>exadmman</td>
<td></td>
<td></td>
<td>0.337 (0.631)</td>
<td></td>
<td>0.415 (0.778)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>other_sv</td>
<td></td>
<td></td>
<td>-0.015 (-0.039)</td>
<td></td>
<td>0.251 (0.643)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>comm_utl</td>
<td></td>
<td></td>
<td>-0.284* (-0.601)</td>
<td></td>
<td>-0.266* (-0.564)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>constrct</td>
<td></td>
<td></td>
<td>-0.267 (-0.880)</td>
<td></td>
<td>-0.192 (-0.633)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e_r_serv</td>
<td></td>
<td></td>
<td>-0.098 (-0.739)</td>
<td></td>
<td>0.025 (0.192)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fire</td>
<td></td>
<td></td>
<td>-0.047 (-0.147)</td>
<td></td>
<td>-0.115 (-0.356)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>retail</td>
<td></td>
<td></td>
<td>-0.034 (-0.037)</td>
<td></td>
<td>-0.383 (-0.425)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>whsl_tr</td>
<td></td>
<td></td>
<td>-0.245 (-0.879)</td>
<td></td>
<td>-0.370* (-1.327)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|            | adj. R² | 0.073 | 0.110 | 0.098 | 0.361 | 0.442 | 0.464 | 0.298 |
|            | signif. F | 0.0243 | 0.0071 | 0.0108 | 0.0001 | 0.0004 | 0.0003 | 0.0000 |

Unstandardized coefficients are in parentheses.
* Significant at p < .05.
** Significant at p < .01.

Tables 3 through 8 contain the variable name descriptions.
only 0.464. This means that with all of the variables, only 46% of the variation in white household poverty rate was explained. Over, half of the variability remains unexplained.

The stepwise regression model eliminated all variables except for rate of employment in the managerial, professional, and specialty occupations (manprof) and employment rate in the precision production, craft, and repair occupations (precprod). This model is still not overly impressive as the adjusted $R^2$ is only 0.298. The model does show how the occupational variables were stronger than the industrial variables, even though the adjusted $R^2$ of the occupational type regression was lower.

Although it is not present in Table 13, the potential covariate, median household income, accounts for 23% of the variance in white household poverty on its own. When this variable is added to the overall regression model the adjusted $R^2$ raises to 0.58. This indicates that white household poverty is strongly dependent upon the prevailing income of counties.

White poverty occurs in areas where incomes are low. White poverty is strongly inversely related to the employment rates in managerial and professional occupations and precision production, craft, and repair occupations. Where employment in these occupations increases, poverty decreases. These occupations are high paying, require skills and education, and are predominantly found in more urban counties. Overall, the relative strength and health of a counties economy seems to be the driving factor of white household poverty within Montana.
Native American households with children

Only five independent variables were found to have significant correlations with the dependent variable poverty rate of Native American households with children (see Table 14). The significant positive coefficients were rate of Native American female headed households (na_fhhd) and employment rate in service occupations (servoccu). Both of these variables are higher in areas where poverty is higher and lower where it is lower. The significant negative coefficients were employment rate in the durable goods manufacturing industries (d_manu), employment rate in machine operators, assemblers, and inspectors occupations (machopr), and employment rate in handlers, equipment cleaners, helpers, and laborers occupations (handclen). The two occupation variables are components of employment in the durable goods manufacturing sector and are thus multicollinear with it. Where employment in durable goods manufacturing is higher, Native American poverty is lower.

Table 14. Significant correlation coefficients with poverty rate of Native American households with children.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coef.</th>
<th>Signif.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>d_manu</td>
<td>-0.64</td>
<td>0.004</td>
<td>industr</td>
</tr>
<tr>
<td>machopr</td>
<td>-0.53</td>
<td>0.023</td>
<td>occupa</td>
</tr>
<tr>
<td>handclen</td>
<td>-0.45</td>
<td>0.059</td>
<td>occupa</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coef.</th>
<th>Signif.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>na_fhhd</td>
<td>0.70</td>
<td>0.001</td>
<td>social</td>
</tr>
<tr>
<td>servoccu</td>
<td>0.63</td>
<td>0.005</td>
<td>occupa</td>
</tr>
</tbody>
</table>

n = 18 counties with 60 or more Native American households in the sample. Tables 3 through 8 contain the variable name descriptions.

The significantly correlated independent variables were subsequently entered into the multiple regression analysis. Three types of independent variables were isolated in the
correlation analysis; social, industrial, and occupational. The two occupation variables
employment rate in machine operators, assemblers, and inspectors occupations (machopr)
and employment rate in handlers, equipment cleaners, helpers, and laborers occupations
(handclen) were excluded from the regression analysis because of their multicollinearity
with the employment rate in the durable goods manufacturing sector.

Table 15 presents the results of the regression analyses. The two types of
variables had nearly identical adjusted R^2. When all three variables were entered into a
regression equation, the adjusted R^2 increased to 0.706. Stepwise regression isolated the
variables rate of Native American female headed households (na_fhhd) and employment
rate in service occupations (servoccu). These two variables were significant in the all
variables regression as well. In this case, where either of these variables are higher,
poverty is higher as well. The stepwise regression accounted for 67% of the variability
in the dependent variable poverty rate of Native American households.

Table 15. Regression of poverty rate of Native American households
with social and economic factors.

<table>
<thead>
<tr>
<th>independents</th>
<th>social variables</th>
<th>economic vars.</th>
<th>all variables</th>
<th>stepwise</th>
</tr>
</thead>
<tbody>
<tr>
<td>na_fhhd</td>
<td>0.696**</td>
<td></td>
<td>0.518**</td>
<td>0.578**</td>
</tr>
<tr>
<td></td>
<td>(0.722)</td>
<td></td>
<td>(0.538)</td>
<td>(0.600)</td>
</tr>
<tr>
<td>d_manu</td>
<td>-0.442 (-1.055)</td>
<td>-0.258 (-0.646)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>servoccu</td>
<td>0.397 (3.303)</td>
<td>0.365* (3.035)</td>
<td>0.495** (4.119)</td>
<td></td>
</tr>
<tr>
<td>Adj. R^2</td>
<td>0.452</td>
<td>0.459</td>
<td>0.706</td>
<td>0.677</td>
</tr>
<tr>
<td>Signif. F</td>
<td>0.0013</td>
<td>0.0039</td>
<td>0.0001</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Unstandardized coefficients are in parenthesis.
* Significant at p < .05.
** Significant at p < .01.
Table 3 through 8 contain the variable name descriptions.
According to the analysis, Native American household poverty is most strongly related to areas with large proportions of female headed households. Large proportions of female headed householders is probably related to other social and cultural phenomena. Female headed householdership is either a symptom or a cause of much of the high Native American poverty found in Montana.

Native Americans seem to have better economic outcomes when they live in counties with less employment in service occupations and more employment in durable goods manufacturing. Counties where Native Americans do better are counties with more employment in manual labor. Where there is a high proportion of service employment there is high Native American poverty. This finding exposes the difference between the economies of Native Americans and Whites in this day and age.

Differences between reservation and nonreservation Native Americans

For comparison purposes, the eighteen counties with greater than sixty Native American households were further classified into reservation counties and non-reservation counties (See Figure 13). The eight non-reservation counties contain all of the urban centers of the state including Bozeman, Butte, Great Falls, Kalispell, Helena, and Missoula. The remaining non-reservation county Lincoln, contains the towns of Libby, Eureka, and Troy.

Scatter plots were made between Native American household poverty and all of the social, economic, and spatial variables to determine if trends differ between reservation and non-reservation counties. Several interesting relationships were found between the variables and the poverty of Native American counties.
Figure 13. Counties containing more than sixty Native American households with children.

Figure 14. Native American poverty by rurality rate of households.
The first interesting association was between the poverty of Native American households with children and the rurality rate of the households (see Figure 14). In this instance poverty was lower in counties with a greater percentage of rural households. This relationship was present separately for both reservation and non-reservation counties, although it should be noted that reservation counties have a higher degree of household rurality. The relationship between poverty and rurality was nearly identical to poverty's association with employment rate in service occupations, except that it was reversed. Where poverty was low, so was employment in service occupations. These relationships illustrate how Native Americans have less poverty in more rural places. This finding contrasts with white populations, which have less poverty in urban places.

Figure 15 demonstrates an interesting association between the poverty rate of Native American households with children and the rate of Native American female headed households with children. A strong positive relationship was found with regard to the non-reservation counties where the rate of female householders increased approximately one to one as the poverty rate increased. In reservation counties, excluding Pondera County, percentage female householdership varied between 26% and 43% with no apparent relationship with poverty rate. Pondera County had remarkably low poverty and low female householdership.\(^8\)

The rate of Native American householders who have not graduated high school was related to Native American household poverty rate in an interesting way. The relationship was essentially opposite for reservation as opposed to non-reservation

---

\(^8\)One hundred percent of Pondera County households were classified rural.
Figure 15. Native American poverty by rate of female headed households.

Figure 16. Native American poverty by the rate of high school non-graduates.
 counties. For reservation counties the relationship was positive. In reservation counties where poverty was high, the rate of householders who had not graduated highschool was high. Exceptions to this phenomena were Valley and Pondera Counties. Valley County had an exceptionally high poverty rate and low percentage of householders who had not completed highschool. This means that Valley county has relatively high Native American educational completion but it still has high poverty. Pondera County had a high percentage of householders who had not completed highschool and low poverty. On reservations, having more people with highschool or better educations generally decreases poverty.

In non-reservation counties, where the rate of Native American householders who have not graduated high school increases, the poverty rate decreases. In these counties, having a higher percentage of more educated Native Americans is related to increased poverty rate. Native Americans actually seem to do better in non-reservation counties where education is not necessary for economic survival. Silver Bow county had the highest rate of education completion and the highest Native American household poverty rate.

Potentially significant differences were found between Native American populations in reservation and non-reservation counties. Statistical tests were not performed due to the small number of cases and limitations of the data. A more meaningful study of the differences between reservation and non-reservation Native Americans would need to be expanded beyond the borders of Montana.
A Spatial Analysis of Elementary School Food Programs in Montana

The two subtopics addressed in this topic are the relationship of school food programs to childhood poverty and the utilization of free and reduced meal programs. The first subtopic studies the states effectiveness in providing school lunch and breakfast programs to children who need them. The second subtopic looks to see if Montanan's are making use of the federal free and reduced priced school meal programs.

The Relationship of School food Programs to Childhood Poverty

One of the greatest concerns about children who live in households below the poverty threshold is that they do not receive adequate nutrition necessary for normal growth and development. The 1996 Montana Kids Count stated that as many as 51% of Montana children may not eat adequate breakfasts. School lunch and breakfast programs are among the most effective ways of ensuring that children receive adequate nutrition.

In this subtopic, the hypothesis is tested that school districts in Montana with high poverty rates are not adequately serviced by school lunch and breakfast programs.

The map of elementary school districts with food programs, Figure 17, shows that the vast majority of Montana school districts have food programs. The town of Kevin, Montana is the only incorporated place located in a school district with no school food program data. There were no children recorded in the 1990 Census School District Special Tabulation in this school district. Kevin is only 15 miles from Sunburst and 19 miles from Shelby, both of which have lunch programs.

---

Figure 17. Elementary school food programs in Montana.

Layers
- Elementary School Districts
- County boundaries
- Highways
- Reservation boundaries
- Census Places

Programs, 95-96
- no program
- lunch program
- lunch & breakfast prog.
- missing data

Miles
0 20 40 60 80
All of the other districts without lunch programs were rural districts. The largest clusters of these districts are found in the eastcentral region, the southeastern corner, and the southwestern corner of the state. These are some of the most rural areas of one of the nations most rural states.

Although elementary school districts with lunch and breakfast programs are much less densely distributed than districts with only lunch, several clear patterns are present. The most noticeable gross patterns are a cluster of districts with these programs in western, southwestern, southcentral and northeastern Montana. These coincide with the major population centers for the state. All of the incorporated towns found in Native American Reservations have school lunch and breakfast programs. Most rural areas of reservations are covered as well. All of the major Montana cities have lunch and breakfast programs. The average population of places with lunch and breakfast programs in 1990 was 4,719 persons and those with lunch only programs was 1,045. Only two incorporated places, Ismay and Fort Peck, had no lunch programs. Their 1990 total populations were 19 and 325 respectively.

Summary statistics were calculated using 1990 enrollment figures for elementary school districts and 1995 data on the locations of school feeding programs. The statistics showed that 97.3% of elementary students in Montana go to school in a district that offers at least a lunch programs to the students. Overall, 73.5% of Montana's

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10A certain amount of error is surely present when using data from disparate times and places. The Census bureau received their data on location and received school district names from the Office of Public Instruction. The assumption is made that the quality of feeding programs did not change significantly in the five year period.
elementary students have lunch and breakfast programs, 23.8% have lunch only programs, 0.8% have milk only programs, and 1.9% have no program at all. The vast majority of children have access to at least a lunch program.

Statistical tests were performed to see if there were statistically significant differences between the poverty rates of elementary school districts that have lunch programs, those with lunch and breakfast programs, and those that have no programs. A base ten logarithmic transformation was performed on percentage poverty to normalize the independent samples which were skewed to the right. The number 10 was added to the raw scores to deal with the problem of log transforming zero value scores.

Significance tests concerning the school age poverty rate were performed with and without the zero poverty rate districts. Including the zero percent poverty scores greatly skewed the poverty rate distributions of the independent samples toward zero. Zero score districts were eliminated from the statistical tests so that the normal distribution of observations assumption could be met. Table 16 lists the mean poverty rates for the three types of lunch programs with zero scores included and excluded.

One-way analysis of variance (ANOVA) found a statistically significant difference in the food program's mean poverty rates (p(F)=0.0001). A Bonferroni test with 0.05 critical value indicated that the poverty rates for districts with lunch programs were significantly lower than those with no programs and those with lunch and breakfast programs. No significant difference was found between the poverty rates of districts with

---

Notice how inclusion of zero score poverty rate districts pulls down the school age population mean. This indicates that zero poverty rate scores may be caused by sampling error in low population school districts.
no programs and those with lunch and breakfast programs. When zero poverty rate
districts were included there were no significant differences between the means of the
various program types (p(F)=0.0721).

Table 16. Means of log transformed variables.

<table>
<thead>
<tr>
<th>Means</th>
<th>no program</th>
<th>lunch program</th>
<th>lunch &amp; breakfast</th>
</tr>
</thead>
<tbody>
<tr>
<td>school age poverty rate*</td>
<td>15.3</td>
<td>16.8</td>
<td>20.2</td>
</tr>
<tr>
<td>school age poverty rate*</td>
<td>28.1</td>
<td>17.7</td>
<td>22.6</td>
</tr>
<tr>
<td>school age population*</td>
<td>34</td>
<td>155</td>
<td>406</td>
</tr>
<tr>
<td>school age population*</td>
<td>49</td>
<td>165</td>
<td>486</td>
</tr>
</tbody>
</table>

*includes 0% poverty score districts
*excludes 0% poverty score districts

Statistical tests were performed to see if there was a significant difference between
the school age populations of districts by the three types of programs. The population
was transformed by \(\log_{10}\) to normalize the data; zero poverty score districts were
included, as they had no effect upon the districts' population distribution. A one-way
ANOVA test found significant difference in the sample means (p(F)=0.0000).

Bonferroni tests, with a 0.05 critical value, found that all three means were significantly
different from one another. Respectively, school districts with no lunch or breakfast
programs have the smallest populations of school age children, followed by districts with
lunch programs, and districts with lunch and breakfast programs.

The preceding analysis shows that the hypothesis that high poverty school districts
are not adequately serviced by school food programs is only partially true.

Approximately 97% of all Montana elementary students live in school districts that
support school lunch programs. The poverty rate is relatively high in school districts that
do not have food programs but their populations are so small as to render them fiscally unable to support such programs. Small rural school districts with high poverty may contain children that desperately require nutritional assistance.

**The Utilization of Free and Reduced Meal Programs**

A second aspect of school feeding is the utilization of Federal free and reduced meal programs for augmenting the nutrition of qualifying low income children. The hypothesis is that free and reduced meals are not equally distributed in relation to the poverty of counties. In this section, the distribution of free and reduced meal usage by county will be analyzed in relation to school age poverty rate to determine if the two are connected and which counties are making the most and least use of the programs available. Change in free and reduced meal utilization will also be analyzed to determine if there was a significant shift between 1990 and 1995.

**Counties utilization of free and reduced meals**

Since the criteria for eligibility in federal free and reduced meal programs (FRMP) is 185% of the poverty threshold, the number of children using the programs should exceed the number of children below the poverty threshold. To assess the extent to which counties are making use of FRMPs, the percentage difference between the number of children who received the programs and the number of children below the poverty threshold was calculated. With this measure it was possible to see which counties had FRMP usage that exceeded childhood poverty and which counties had FRMP usage that was deficient. The measure also shows how much a county was in excess or deficit.
Figure 18 displays the counties that in 1990 had fewer children enrolled in FRMP than were calculated as being below poverty in 1989. Patterns are fairly obvious on the map. Most of the deficit counties are rural and non-reservation. Clusters of deficit counties were found in northwest, southwest, eastcentral and southeast Montana. The only two major Montana cities that were found in deficit counties were Kalispell (Flathead County) and Helena (Lewis and Clark County), but these counties did not have large deficits. The counties with the largest FRMP deficits were Lincoln, Granite, Deer Lodge, Madison, Petroleum, Garfield, McConé, Custer, Powder River, and Carter, which are all rural counties. The eastern contingent of these counties have some of the least populated districts with largest land areas anywhere in the state, and many of their school districts have no feeding programs.

Figure 19 identifies the counties that had more children enrolled in FRMP than were calculated as being below poverty. All of the reservation counties had positive FRMP enrollment. As well, most of the counties surrounding reservations had positive enrollment. The largest clusters were in westcentral, northcentral, and southcentral Montana. Missoula, Butte, Great Falls, Bozeman, and Billings all were cities located in positive enrollment counties. The counties with the largest positive enrollments were Pondera, Sweet Grass, and Roosevelt.

Urban counties are trying to fully implement the FRMPs. Reservation counties and a few other counties have made better than normal use of the programs. Several rural counties have made poor use of the available programs but may not have the
Figure 18. Percentage that students receiving free and reduced meals (1990) fell below the number students below the poverty level (1990).

Figure 19. Percentage that students receiving free and reduced meals (1990) exceeded the number of students below the poverty level (1989).
facilities available to provide lunch programs at all, therefore not being able to make use
of the federally funded meal programs.

Change in free and reduced meal utilization

FRMP utilization rate in 1990 was somewhat similar to the 1989 county school age poverty rate. This relationship was strong enough that FRMP could potentially be considered a proxy for poverty in intercensus years given the proposition that counties do not change their rates of program usage. Most likely changes in FRMP usage rate would indicate changes in the poverty rate and changes in the program implementation rate. FRMP utilization increased at the state level from 19.5% in 1990 to 22.4% in 1995. The county averages increased from 19% to 23.1%, similar to the rate for the entire state.

To determine if usage of FRMPs did significantly increase in the period 1990 to 1995, three year rolling averages were computed of the early half of the period (1990, 1992, and 1993) and the late half (1993, 1994, and 1995). The sample periods were normalized with log transformations and a paired sample t-test was performed between the two periods. A statistically significant average increase of 1.065 percentage points (p=0.000) was found in percentage FRMP usage between the two periods.

There was a statistically significant increase in free and reduced meal plan usage during the period starting in 1990 and ending in 1995. The data do not indicate if this increase was attributable to higher poverty rates or augmented program utilization. Most likely the increase was caused by a combination of both of these events.
Summary

In this chapter the results of the analysis were presented. The first topic concerned the spatial analysis of childhood poverty in Montana. Poverty in Montana increased significantly from 1979 to 1989. In relation to the 50 other states, Montana had the 4th largest percentage point increase in childhood poverty. Montana's childhood poverty ranking was 14th among the 50 states and Washington D.C. in 1989.

Within Montana, childhood poverty changed from a distribution that was concentrated in Eastern Montana to a more continuous distribution across the state. The greatest increases were in Western Montana while most decreases occurred in Eastern Montana. Poverty was studied at the subcounty level using elementary school districts. It was found that the highest elementary age poverty is located on the Native American reservations and in very rural districts that do not contain incorporated places. All of the larger towns and cities had below average elementary age poverty.

The factors related to poverty in Montana were studied in three ways. The first analysis looked at all households in Montana with children, the second white households with children, and the third Native American households with children. Four factors were found to best describe the location of all household poverty in Montana. These included rate of households Native American, rate of employment in technician and related support occupations, rate of employment in precision production, craft, and repair occupations, and rate of unemployment. In the case of Montana, where there was a high rate of Native American households and high unemployment, there was high poverty. Where there was a high rate of employment in technician and related support occupations
and high rate of employment in precision production, craft, and repair occupations there was low poverty.

For white households with children, poverty was a largely an economic phenomenon. Two factors were found to best describe the location of white household poverty in Montana. Both of these factors were occupational and included the rate of employment in the managerial, professional, and specialty occupation, and rate of employment in precision production, craft, and repair occupations. Where there was a high rate of employment in either of these occupation types, there was lower poverty. Both of these occupation categories require educated and skilled workforces.

Native American household poverty was related to factors that contrasted to those of whites. The two strongest factors were rate of Native American female headed households and rate of employment in service occupations. Where there was a high rate of either of these factors, there was increased Native American household poverty. The one factor that seemed to be related to reduced Native American poverty was rate of employment in the durable goods manufacturing sector. Native Americans seemed to do best in counties where there were jobs that did not require skilled labor forces.

A difference was also found between reservation and nonreservation Native Americans. In all cases, Native Americans had lower poverty in more rural counties. The difference between reservation and nonreservation counties was that reservations counties were more rural than nonreservation counties. In nonreservation counties, where there was a high rate of female headed households, there was a high rate of poverty. This relationship was not found in reservation counties where female
householdership was generally high but not a predictor of poverty. The rate of education achievement of householders was related to poverty in opposite ways between reservation and nonreservation counties. In nonreservation counties, Native American poverty was higher where the rate of more educated householders was higher. In reservation counties, Native American poverty was higher where the rate of more educated householders was lower. In other words, education hindered Native Americans in nonreservation counties but generally helped them in reservation counties.

In the spatial analysis of school food programs it was found that, the vast majority of children within the state had access to at least a school lunch program. Many children had access to breakfast programs in addition to lunch. School districts with lunch programs only were found to have had significantly lower school age poverty than did districts without any program and those with breakfast and lunch programs. Districts that did not have food programs had the smallest enrollments compared to the other districts.

Not all counties made equal use of federal free and reduced meal programs. Areas of the state that had fewer enrolled students than were qualified included northwest, southwest, eastcentral and southeast portions of Montana. These areas consist mainly of very rural, non-reservation counties; they include the cities of Kalispell and Helena. Areas that had more students enrolled than students below the poverty threshold included westcentral, northcentral, and southcentral Montana. These counties contain the largest cities in the state, all of the reservations, and most of the counties surrounding the reservations. The usage of federal free and reduced meals increased significantly from the early 1990s to the mid 1990s.
In the fifth and final chapter of this thesis, conclusions are drawn from the results of the analysis just given. The conclusions are also placed in context to prior research discussed in the background chapter. Suggestions for future research are presented.
CHAPTER 5

CONCLUSIONS

The previous chapter detailed the results of the analysis. In this chapter these results are summarized and conclusions are made. The analysis was composed of two research topics. The first was a spatial analysis of childhood poverty in Montana; the second was a spatial analysis of elementary school food programs in Montana. Each of these topics and their relevant subtopics are discussed in sections which follow.

A Spatial Analysis of Childhood Poverty in Montana

Three methodological approaches were used to analyze childhood poverty in Montana. First, Montana was placed into a context relative to the United States as a whole and to the other individual states by comparing relevant statistics that concern poverty. Second, maps were made that displayed many of the attributes of poverty within Montana both for counties and for elementary school districts. These maps were examined for any irregularities and for any spatial patterns which might exist in the distribution of poverty within the state. Third, social, spatial, unemployment, and economic factors associated with childhood poverty within were studied and analyzed in order to seek explanations for the patterns found on the maps.
Context of Childhood Poverty in Montana

Poverty in Montana, which was fairly low in 1979, worsened in the decade prior to 1990. The total population poverty rate in Montana was higher than the overall rates of the states in the West Census Region and the nation in both 1979 and 1989. In 1989, the Montana rate was 3.8 percentage points higher than the national rate.

From 1979 to 1989, the Montana childhood poverty rate increased by 5.9 percentage points to 19.5%. In relation to the national trend in childhood poverty, Montana's rate in 1979 was comparatively low, but the 1989 rate was identical to the nation. Montana had the fourth largest gain in childhood poverty from 1979 to 1989. In 1989 it was ranked 14th highest among the states.

Maps of Children in Poverty

Although Montana had sharp increases in poverty relative to the rest of the West and the nation, childhood poverty varied greatly within the borders of the state. To learn about this variation, poverty was mapped and discussed at two spatial scales: at the county level and at the level of elementary school districts.

Counties

The maps of childhood poverty by county (Figures 7 and 8, pg. 95) showed a major spatial shift between 1979 and 1989. In this time period, childhood poverty moved from being concentrated east of the mountains to being distributed more continuously across the state.

Thirteen counties, all made up of extremely rural areas of eastern Montana, had reduced childhood poverty (see figure 9, pg. 97). Several of these counties had high
poverty in 1979 but low poverty in 1989. Most reductions in poverty were great as compared to the relatively smaller increases that took place in other counties around the state. A linear group of counties starting with Judith Basin County and running all the way to the North Dakota border at Wibaux and Fallon counties made up the most noticeable area of poverty decline. These are some of the most remote and unpopulated counties in the entire nation. Among the possible reasons for this decrease in poverty are the vastly changed demographics of the area. It is noted that all but one of these counties had significantly reduced populations of children from 1980 to 1990. Fifteen counties in the eastern plains saw 20% to 40% reductions in their numbers of children.

The remaining forty-three counties had increased childhood poverty as expressed by the statistically significant increase in the county childhood poverty average (3.6 percentage points) for the state. In many counties, poverty rates grew in the double digits. Three of the Native American reservation counties, Big Horn, Glacier, and Roosevelt, had the largest increases in childhood poverty. All reservation counties (counties with large proportions of their areas falling within Native American reservation boundaries) had growth in poverty but several non-reservation counties in eastern and western Montana had substantial growth as well. All western and most northern and southern counties had increased poverty. It should also be noted that two periods of economic recession occurred between the two census counts. Stagnation of wages and
Increased unemployment related to economic recession were strong causes of these increased poverty rates, especially among young families with children.¹

**Elementary School Districts**

The map of elementary school age poverty in 1990 above the state poverty rate (Figure 11, pg. 99) illustrates a similar trend as that shown in the 1990 childhood poverty map by county (Figure 8, pg. 95). Above average (19.9%) poverty by elementary school districts was not concentrated in one large section of the state or another. None of the state's major population centers had above average poverty. Most school districts located within reservation counties had above average poverty; nearly all incorporated places located within reservations were in above average districts. Several clusters of non-reservation above average poverty districts were evident. All of these districts were in rural areas of the state.

The map showing 1990 elementary school age poverty above 40% (extreme poverty) embellished what was shown in the above average poverty map (see Figure 12, pg. 99). Extreme poverty school districts were prevalent on the Native American reservations. Many incorporated places located on reservations were in extreme poverty school districts. The remaining extreme poverty districts were located in very rural reservation and non-reservation areas. Only two of these districts contained an incorporated place and most contained no recognized place at all. Many of these places were acknowledged as being low income areas.

¹Mary Jo Bane and David T. Ellwood, "One Fifth of the Nations Children: Why are They Poor?" *Science*, (8 September 1989): 1049.
In Montana, childhood poverty was concentrated mainly on the Native American reservations and in rural areas. The most prevalent nonreservation poverty was located in extremely rural areas. The findings agree with the conclusions of Morrill and Wohlenberg, Labao and Schulman, Knop and Knop, Garrett et al., McDowell and Allen-Smith that poverty rates are generally higher in rural areas than urban areas.\(^2\)

**Factors Related to Childhood Poverty**

As seen in Morrill and Wohlenberg, Labao and Schulman, and others, poverty is related to a host of social, spatial, unemployment, and economic factors. In this section the factors related to the poverty of households in which children live in Montana, was studied. Three household groups were analyzed; all households, white households, and Native American households. The goal of this analysis was to try to find reasons for the irregularities and patterns seen in the poverty maps.

The analysis was performed by using Pearson's correlation to identify variables that would then be entered into multiple regression analyses. Several multiple linear regression analyses were performed for each variable type grouping; social, unemployment, spatial, and economic. Additionally, the variables from all three groupings were combined into one regression that compared all of the variables and one

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that narrowed the variables down to the few that made up the best regression model.

Each of these analyses were performed for the three household type groupings; all households, white households, and Native American households.

*All households with children*

The first tests looked at the factors related to the poverty of all households with children. The strongest factors were from three of the variable groups, social, unemployment, and economic. Spatial variables were not found to be related to household poverty at the county level.

When the stepwise regression method was used, the strongest regression model contained four independent variables (factors). Of these four factors, two were positively related to household poverty and included the fraction of the households in which the householder is Native American and the county unemployment rate. The other two factors were negatively related to household poverty and included employment rate in technicians and related support occupations and employment rate in precision production, craft, and repair occupations.

The strength of the variable percentage Native American householders as a predictor of the location of poverty resembles the findings of Morrill and Wohlenberg and Labao and Schulman.\(^3\) Morrill and Wohlenberg found that the variable percent nonwhite was strong enough to include it in their general model of poverty. Labao and Schulman found that percent nonwhite was the second best predictor of the location of

\(^3\)Morrill and Wohlenberg, 94; Labao and Schulman, 592 and 593.
poverty in the rural West after median years of education. Native Americans make up nearly all of the minority population within Montana.

Unemployment rate was positively related to poverty. Logically, one would expect that poverty would increase in relation to unemployment. This seems to be the case in Montana.

Economic factors also ranked highly in this model for all household poverty. The negative relationship between employment rate in technicians and related support occupations on the one hand, and employment rate in precision production, craft, and repair occupations on the other, indicates that poverty tends to increase in places where high paying skilled labor jobs decrease.

These findings support the results of Knop and Knop's research in Colorado. Using the 1980 census Knop and Knop found that poverty in Colorado was more prevalent in "traditional" non-metropolitan areas with the exception of Denver central city. People who were more at risk for poverty were female heads of households, minorities, people with limited English language skills, single parent families, disabled persons, less educated persons, migrants, those out of the labor force, the unemployed, laborers, those working in traditional versus recent industries, and service workers in smaller metropolitan areas and non-metropolitan areas. Access, both spatial and social, seemed to be the greatest cause of poverty.

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5Traditional industries are described as those that were present prior to 1945.
In Montana, there are two predominant and very different racial populations, whites and Native Americans. To determine if the poverty of the two main racial groups of Montana are related to different factors, separate analyses were performed for each group.

White households with children

The second set of tests looked at the factors related to the poverty of white households with children. The strongest factors were from the variable group economic variables. Social, unemployment, and spatial variables were found to be only weakly related to white household poverty at the county level.

When the stepwise regression method was used, the strongest regression model contained two independent variables. The two variables were employment rate in the managerial and professional occupations and employment rate in the precision production, craft, and repair occupations. Relationships were negative for both variables. Both of these occupation types require educated and skilled workforces. Employment rate in these fields increases in more urban counties.

White households were related to social and spatial variables though these variables were eliminated by stepwise regression. The fraction of white households in which the householder has post high school education was negatively related to poverty. This relationship shows that more education is related to reduced poverty. The percentage rurality of counties in which white households live was positively related to poverty. White household poverty increases as counties become more rural.
Interestingly, white household poverty increases where unemployment rates decrease. This is the opposite of the finding for all households and seems to be the result of the relationship between unemployment and agricultural employment. Rural agricultural areas have full employment but generally low wages. Low wages reduce income and increase the poverty rate.

Overall, the results of the regressions seem to show that white household poverty is most strongly related to the underlying economy. Where the economy is strong and diversified, there is a larger percentage of high wage occupations and low white household poverty.

**Native American households with children**

The third set of tests looked at the factors related to the poverty of Native American households with children. The strongest factors were from the variable groups social and economic variables. Unemployment and spatial variables were found to be partially related to Native American household poverty at the county level.

When the stepwise regression method was used, the strongest regression model contained two independent variables. The two variables were rate of female headed households and employment rate in the service occupations. Relationships were positive for both of these variables. In cases where either one of these variables were increased, poverty also increased.

Native American household poverty was found to have its strongest relationship with the social variable, rate of female headed households. According to this relationship, the number of single parent families is potentially a strong cause of Native
American poverty in Montana. Unless, of course, poverty is causing a lot of broken households.

Native American poverty was related to the overall economy. The relationships found differ markedly to those of whites. In this case, poverty was positively related to the employment rate in service occupations. Where there were more service occupations then there was more Native American poverty. Service occupations are generally located in more urban places.

The employment rate in durable goods manufacturing was negatively related to Native American poverty. Where there was more employment in this sector there was less poverty. This finding was supported by the negative correlations between Native American poverty and handlers, cleaners, helpers, and laborers occupation and employment rate in the machine operators, assemblers, and inspectors occupation. These occupations make up most of the workforce in the durable goods manufacturing sector. Durable goods manufacturing jobs in Montana are located in rural and urban places alike. Durable goods manufacturing requires mostly manual labor; little education is necessary.

Native American poverty in Montana was related to very different factors than was white poverty. Whereas white poverty was less where there was a need for educated and skilled employees, the opposite was true for Native Americans. Female householdership was not significantly related to white poverty but it had strong ties to the poverty rate of Native American households.
Differences between reservation and nonreservation Native Americans

Within the Native American population there are further differences between those who live on reservations and those who do not. The most interesting differences between these two populations were found with the variables percentage of households that are rural, percentage of female headed households, and percentage of households by education completion of the householder.

Native Americans were found to have less poverty in the more rural counties -- the more rural a county, the lower the Native American household poverty rate. This was true for both reservation and non-reservation counties. The difference between these two types of counties was that reservation counties have a higher rate of rurality. This relationship was further exemplified by poverty's positive association with percentage employment in service occupations.

Reservation and non-reservation Native American poverty reacted differently with respect to the percentage of female headed households. On reservations, the level of female headed households was relatively constant and varied independently between 26% and 43%. In non-reservation counties, there was a strong positive relationship between the percentage of female headed households and poverty. Where the percentage of female headed households increased, poverty was more prevalent.

Education level had interesting relationships with Native American poverty. In most cases, education generally reduced poverty in reservation counties. In non-reservation counties, however, education completion rates were negatively related to poverty rate. The lowest poverty rates were present in nonreservation counties that did
not have a high degree of education completion. In other words, education hindered
Native Americans in nonreservation counties but generally helped them in reservation
counties.

Summary of poverty factor research

Both Native American and white poverty correspond to their cultures. In the case
of white people, poverty is mainly related to the underlying economic system. Whites do
best in more urban places with a vigorous and diversified economy. For Native
Americans the problem may lie in their inability to adjust to, become accepted in, and
become integrated in the dominant culture’s economic system. Cultural problems may be
expressed in the increased rates of female headed householders. Native Americans have
less poverty when they are physically removed from the dominant economic system.

These findings are supported by the findings of Amato and Zuo and Garcia-Coll
and Garcia. Amato and Zuo and Garcia-Coll and Garcia found that culture affects the
outcomes of poverty-stricken ethnic groups in different ways. In the study by Amato and
Zuo, poor blacks were happier and less depressed when residing in rural areas and poor
whites were happier and less depressed when living in urban areas. Garcia-Coll and
Garcia found that poor Hispanic families have adaptive strategies for dealing with
poverty.

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These studies do not discuss the actual increase of household income that was found in Native American families that live outside of the dominant economic system. They do discuss the phenomenon of different ethnic groups reacting to the stress of poverty in different ways and in different locations.

This study does not purport to find reasons for why Native American households have better financial outcomes in more rural places. Further, qualitative case-study and quantitative micro-sample analysis would be necessary to test hypotheses relating to culture specific causes of poverty and to the difference between Native American and white poverty in Montana. This study does indicate that it is worthwhile to study these differences so that welfare policies could be created that will aid specific ethnic groups. Failure to address these issues as they relate to specific ethnic groups could lead to failed policies.

A Spatial Analysis of Elementary School Food Programs in Montana

Two methodological approaches were used to analyze the relationship between elementary age poverty and school food programs. First the locations of the various types of school food programs were mapped and compared to the elementary age poverty rates. The hypothesis was that equal access to food programs was not present. Second, the utilization of federal free and reduced meal programs as they are employed by Montana counties was assessed. The hypothesis was that enrollment in these programs was not proportional to the number of children living below the poverty thresholds.
The Relationship of School Food Programs to Childhood Poverty

It has been stated that up to 51% of Montana's children may not eat an adequate breakfast prior to going to school. School food programs are one of the best means of ensuring that children receive adequate nutrition. School is the only time that most children are in the care of a non-family institution and beyond the influence of their guardians. At school, districts can insure that federal free and reduced meal programs are targeted to needy children.

Montanans appear to have done an excellent job of making available school food programs to their children. Roughly 97% of all children in Montana lived in a school district that had at least a school lunch program. Approximately 73% had lunch and breakfast programs, 24% had lunch only, 1% had milk only, and 2% had no program at all. All major cities, many towns, and all towns on reservations had both lunch and breakfast programs available to students. School districts on Native American reservations did an excellent job of providing both lunch and breakfast programs.

The only school districts that did not have food programs were the very small ones located in rural areas where limited resources and enrollment rendered maintaining food programs impractical. But, it is these districts that had some of the highest poverty rates. Statistical tests found that poverty rates were significantly higher in school districts with no lunch program and those with lunch and breakfast programs than they were for school districts with lunch only programs.

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The hypothesis that all children do not have equal access to school food programs could not be supported though the results were mixed. Most children in Montana have access to school lunch programs. But, poor children living in small rural elementary districts with no school food programs may have been receiving less adequate nutrition than were their more populous neighbors. Unfortunately, it is impractical for very small school districts to provide lunch, let alone breakfast. Without impeding upon local autonomy, it may be worthwhile for the state to track small school districts and recommend to local charitable groups where school food programs are needed.

The Utilization of Free and Reduced Meal Programs

In districts where school food programs are available, free and reduced price meals are subsidized by the federal government for qualifying families. Criteria for the programs are below 125% of the poverty threshold for free meals and between 125% and 185% for reduced priced meals. With full enrollment in these programs, the enrollment rate should exceed the county poverty rate. The relationship between these rates was assessed to see if Montana counties are making use of these resources. Change in the rate of usage over time was also assessed.

Roughly half of the counties (29) had fewer children enrolled in the free and reduced price meal program in 1990 than were calculated as being below poverty in 1989. Ten counties had 40% or more children below poverty than were using the program. None of the deficit counties were reservation counties. Clusters of deficit counties are found in northwest, southwest, eastcentral and southeast Montana. Only two major Montana cities were found to be in deficit counties; Kalispell and Helena. The
counties with the largest deficits were rural, even by Montana standards, and contain many school districts that do not have lunch programs.

The remaining counties had more children enrolled in the free and reduced price meal program in 1990 than were below poverty in 1989. All of the reservation counties and most of the counties surrounding reservations had positive enrollment. The remaining large cities, Billings, Bozeman, Butte, Great Falls, and Missoula all were in this category. The counties with the greatest enrollments were Pondera (Blackfeet Reservation), Roosevelt (Fort Peck Reservation), and Sweet Grass. These counties had 40% or more children in the program than were below the poverty threshold.

The hypothesis was true, enrollment in these programs was not proportional to the number of children living below the poverty threshold. Most urban counties are trying to fully implement the free and reduced meal plans. Reservation counties and a few other counties have made better than normal use of the programs. Several rural counties have made poor use of the available programs but may not have the facilities available to provide lunch programs at all, let alone make use of the federal meal programs.

Since use of these programs could be associated with the poverty rate of counties, change in program usage from 1990 to 1995 was analyzed. A statistical test did find that there was a significant rise in average free and reduced meal usage over this time period. There are potential problems with interpreting this finding as a rise in childhood poverty, however. It is unknown if the rise in free and reduced price meal plan usage is due to increased implementation of the programs or to increased poverty. It is unlikely that childhood poverty decreased significantly over the period. With the results of the next
census, we may be able to determine if program usage altered significantly and see how well free and reduced price meal usage predicts childhood poverty.

Counter Point

No one can deny that in 1989 Montana had one of the highest poverty and child poverty rates in the United States. As well, Montana had one of the largest increases in poverty from 1979 to 1989. But, someone could argue that the poverty thresholds from which the poverty rate is calculated does not apply to Montana.

Montana is undeniably a rural and poor state. Although it is the fourth largest state, in 1990 it had the seventh smallest population (cows and sheep far out number people). Montana's citizens have incomes lower than most of the other states. In 1990, Montana's median household and percapita incomes were $22,988 and $11,213, the 7th and 9th lowest among the states. Compare this with the highest income state, Connecticut, with median and percapita incomes of $41,721 and $20,189 and the disparity in the incomes of areas is readily seen. Yet, all states use the same poverty thresholds to determine who is or is not in poverty. As noted in Morrill and Wohlenberg and Bane and Ellwood, one problem with the poverty thresholds is that they do not account for variability in cost of living from place to place. Without controlling for this variability, it is impossible to assume that all areas maintain a similar standard of living based on a fixed level of income.

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Several costs vary greatly by location; these include the costs of housing, heating, food, transportation, health care, insurance, water, waste disposal, and recreation. All of these expenses added together define an area’s cost of living. The ability of the people in an area to pay these costs with their normal wages and to maintain an acceptable standard of living should determine whether or not they are in poverty.

In Missoula, housing costs have been found to consume as much as 60% of an AFDC recipient’s welfare payments and income. In other places, housing costs are much less. To see if cost of living within Montana varies between counties in relation to income, a small test was performed in which median household income and percentage poverty were correlated with three indices of housing cost.

Cost of living variables found in Table 17 come directly from the Summary Tape file 3a. The variables are related to housing costs. An ecological fallacy is present when these variables are related to median income of households with children and household poverty rate, as the cost of living variables are not desegregated for households with children.

Pearson’s correlations found that housing costs were strongly positively related to median income (see Table 18). In counties where incomes were higher, housing costs were higher and vice-versa. Since housing costs can consume an inordinate proportion of a poor person’s income, they have the potential of greatly impacting that

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person's standard of living. Pearson's correlation also found that county poverty rates are negatively related to housing costs. In counties where poverty rates are higher, housing costs are lower.

Table 17. Cost of living variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>mgr</td>
<td>median gross rent, specified renter occupied housing units paying cash rent</td>
<td>STF3a</td>
</tr>
<tr>
<td>msmocm</td>
<td>median selected monthly owner costs and mortgage status</td>
<td>STF3a</td>
</tr>
<tr>
<td>mvochu</td>
<td>median value, selected owner occupied housing units</td>
<td>STF3a</td>
</tr>
</tbody>
</table>

The universe is all households.

Using the poverty thresholds, poverty in Montana is mainly a rural phenomenon. As people living in rural counties have generally lower incomes, a larger proportion of the population logically falls below the set poverty thresholds. The opposite is true in higher income urban counties.

Table 18. Correlation coefficients of cost of living.

<table>
<thead>
<tr>
<th>Variables</th>
<th>hse pov</th>
<th>med hinc</th>
</tr>
</thead>
<tbody>
<tr>
<td>mgr</td>
<td>-0.30</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>msmocm</td>
<td>-0.40</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>mvochu</td>
<td>-0.30</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.000)</td>
</tr>
</tbody>
</table>

n=56

Tables 3, 5, and 14 contain the variable name descriptions.

Alternatively, although rural counties have lower housing costs than urban counties, they could have other costs that exceed those of urban counties. Some of these
higher costs might include costs of food, transportation, health care, and water. Many differences between urban and rural counties are difficult to quantify. Some non-quantifiable benefits of rural places are associated with a more self-sufficient non-cash economy. Some examples include self-collected heating fuel, subsistence gardening, animal husbandry, hunting, and water hauling. Another confounding factor is found in the calculation of farm and ranch income as opposed to other forms of employment income.

The poverty thresholds were created in hopes that all people in all places would be guaranteed the same level of assistance based upon their income. But, some places require more income assistance than do others to maintain a minimal standard of living. Certainly, all persons that live below the poverty threshold are poor, but they may not necessarily be in poverty. It could be that these people should not be counted among the ranks of the poverty stricken. Alternatively, people whose income falls above the poverty threshold but they live in expensive high income areas may be living in poverty.

The poverty thresholds are used on a nationwide basis. As Montana is one of the most rural states in the nation, the thresholds may be missing the mark for the entire state. To accurately study poverty and distribute aid where it is needed, variations in the cost of living of different places should be incorporated into the calculation of the poverty thresholds. Further study of this problem would be necessary to determine what cost of living factors should be used in an updated version of the poverty thresholds.

This thesis uses the official federal poverty thresholds to determine poverty rates in Montana and elsewhere. Though there are many criticisms of the poverty thresholds,
no better measure is currently available. The poverty thresholds are widely used to study poverty and to distribute aid. They are the generally accepted indices of poverty. Use of any other poverty indices would invalidate the results of this thesis.

Summary

This thesis has shown that poverty, especially childhood poverty, is a prevalent and worsening problem in Montana. Montana's poverty rates are among the highest in the nation and have shown no inclination to reduce.

Recently, the states have been given more power to make policies to help the poor in their midst. In order to make informed policy decisions, research is needed. It is hoped that this thesis and research from other sources will fill this roll.

In this thesis several points were made that should both reassure and hopefully raise concern among Montanans. It was found that the distribution of childhood poverty in Montana has changed in recent years. Most of the state had increased childhood poverty between 1979 and 1989. In 1989 poverty was prevalent in most areas of the state. The worst poverty was prevalent in rural areas and on the reservations.

The two main ethnic groups found within Montana appear to have very different relationships with poverty. For whites, poverty is mainly an economic phenomena. Whites do best economically when they live in urbanized areas and have access to high tech or skilled labor jobs. For Native Americans, poverty is mostly a social/cultural phenomenon with some economic aspects. The strongest relationship was with the number of families with female heads of household. Poverty increases where female
headed households increase. Native Americans do best economically when they live away from the places where whites do best. These are places with laborer jobs in the durable good manufacturing sector. These jobs do not require much education or skills. Flexible policies would necessarily be needed to target aid to the various ethnic groups within the state. Rigid, one size fits all, policies would most likely aid one group to the detriment of the other.

While Montana is a relatively poor state, Montanans have done a good job of providing school lunch programs for their children. Most children have access to at least school lunch programs. Many have access to both lunch and breakfast programs. The only problem is found in the very rural school districts with small school enrollments. For practical reasons it is nearly impossible for these districts to maintain school lunch programs. Yet, some of these districts are the poorest in the state. It would be good if the state or counties could track these districts and possibly recommend to charitable groups where help may be needed.

The United States government provides a means of subsidizing poor children's lunches in school lunch programs on a voluntary basis. School districts must administer this program and assure the anonymity of the participating students. Half of the counties in the state have made sufficient use of this program, but the other half have not. The state should try to educate the school districts on the availability of this program and set forth a standard for its implementation.
Hopefully these findings will help the state's citizens come to the aid of and reduce its population of poor people. After all, our children are our best resource for the future and their future depends upon us.

**Recommendations for Further Research**

Several avenues for further research were uncovered during the preparation of this thesis. Each section of this report contained one of these avenues.

As concerns the maps of childhood poverty, it was found that there was the possibility of sampling error in some of the lesser populated school districts. It would be good if someone could take a sampling of the school districts and go into the field to do a field check of the data. An added benefit would be the collection of qualitative data about these small rural school districts. A more detailed mapping and analysis of childhood poverty at the blockgroup level would also be useful, especially for analyzing the distribution of poverty within cities.

A more solid analysis of the factors that are related to poverty should take into account a larger area than just the 56 counties within Montana. The study should be extended to regions such as the Northern Plains or the Northern Rocky Mountains. Analyses of the census public use micro sample (PUMS) data from these regions would allow researchers to do more fundamental analysis of the differences between white and Native American poverty.

A more thorough mapping and accounting of the school districts and associated school lunch programs within Montana should be created. The information made
available for this purpose was sketchy at best. It would be a good project to set up a GIS for the Montana Office of Public Instruction that would contain this type of information and any other type of information that they may use. With a system of this sort it would be much easier for them to track the states school districts and study the effects of policies.

The Montana Office of Public Instruction maintains records of the number of children per county making use of the federal free and reduced meal program each year. These records are potentially an indicator of changes in childhood poverty rate. But, there is a problem with using the meal programs as an indicator. The problem is that it is not known if an increase in meal program usage is caused by increased poverty or by increased program implementation. When the results of the 2000 census are received, a temporal analysis of the meal program usage and poverty should be conducted in an attempt to establish the relationship between the two. Percentage Free and Reduced Meal program usage may be a useful proxy for poverty in inter-census years.


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