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Ellis George Hanson

Iowa State University

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IMPACT OF DEMOGRAPHIC CHANGE ON LOCAL SCHOOL DISTRICT
ORGANIZATION IN IOWA, MISSOURI, NEBRASKA, AND SOUTH DAKOTA

by

Ellis George Hanson

A Dissertation Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
DOCTOR OF PHILOSOPHY

Major Subject: Educational Administration

Approved:

Signature was redacted for privacy.

In Charge of Major Work

Signature was redacted for privacy.

Head of Major Department

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Dean of Graduate School

Iowa State University
Of Science and Technology
Ames, Iowa

1967
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER I. STATEMENT OF THE PROBLEM</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need for the Study</td>
<td>1</td>
</tr>
<tr>
<td>The Problem</td>
<td>2</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>8</td>
</tr>
<tr>
<td>Definitions</td>
<td>8</td>
</tr>
<tr>
<td>Sources of Data</td>
<td>9</td>
</tr>
<tr>
<td>Delimitations of the Study</td>
<td>10</td>
</tr>
<tr>
<td>Organization of the Study</td>
<td>10</td>
</tr>
<tr>
<td>Summary</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER II. REVIEW OF RELATED LITERATURE</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area Economic Development</td>
<td>13</td>
</tr>
<tr>
<td>Iowa Economic Areas</td>
<td>16</td>
</tr>
<tr>
<td>Missouri Economic Areas</td>
<td>18</td>
</tr>
<tr>
<td>Nebraska Economic Areas</td>
<td>20</td>
</tr>
<tr>
<td>South Dakota Economic Areas</td>
<td>21</td>
</tr>
<tr>
<td>Summary</td>
<td>23</td>
</tr>
<tr>
<td>School District Organization</td>
<td>24</td>
</tr>
<tr>
<td>The Community</td>
<td>25</td>
</tr>
<tr>
<td>Administrative District Size</td>
<td>32</td>
</tr>
<tr>
<td>Summary</td>
<td>41</td>
</tr>
<tr>
<td>Criteria</td>
<td>42</td>
</tr>
<tr>
<td>Research Studies</td>
<td>43</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS (CONTINUED)  

<table>
<thead>
<tr>
<th>CHAPTER III. METHODS AND PROCEDURES</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description of the Population</td>
<td>46</td>
</tr>
<tr>
<td>Description of Demographic Variables</td>
<td>47</td>
</tr>
<tr>
<td>Description of Economic Areas</td>
<td>50</td>
</tr>
<tr>
<td>Description of the Data</td>
<td>55</td>
</tr>
<tr>
<td>Analysis of the Data</td>
<td>56</td>
</tr>
<tr>
<td>Summary</td>
<td>57</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER IV. FINDINGS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Data by Counties Within States</td>
<td>60</td>
</tr>
<tr>
<td>Variable Data by Economic Areas Within States</td>
<td>78</td>
</tr>
<tr>
<td>Relationship between Variables</td>
<td>90</td>
</tr>
<tr>
<td>Analysis of Variance</td>
<td>102</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>122</td>
</tr>
<tr>
<td>Demographic Variable Data</td>
<td>122</td>
</tr>
<tr>
<td>School Type Variables</td>
<td>129</td>
</tr>
<tr>
<td>Relationship between Variables</td>
<td>131</td>
</tr>
<tr>
<td>Analysis of Variance</td>
<td>134</td>
</tr>
<tr>
<td>Conclusions</td>
<td>135</td>
</tr>
<tr>
<td>Recommendations</td>
<td>139</td>
</tr>
<tr>
<td>Recommendations for Research</td>
<td>140</td>
</tr>
</tbody>
</table>

| CHAPTER VI. LITERATURE CITED                        | 142  |
| CHAPTER VII. APPENDIX                               | 151  |
LIST OF TABLES

Table 1. Characteristics of Upper Midwest trade center areas 15

Table 2. Mean area in square miles, counties of Iowa, Missouri, Nebraska, and South Dakota, 1960 60

Table 3. Mean change in area population, counties of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960 62

Table 4. Urban population changes, 1940-1960, major cities of Iowa, Missouri, Nebraska, and South Dakota 65

Table 5. Mean change in density per square mile, 1940-1960, counties of Iowa, Missouri, Nebraska, and South Dakota 66

Table 6. Mean change in area population under age 18, 1940-1960, counties of Iowa, Missouri, Nebraska, and South Dakota 67

Table 7. Mean change in number of persons employed in agriculture, 1940-1960, counties of Iowa, Missouri, Nebraska, and South Dakota 69

Table 8. Mean change in median family income, 1940-1960, counties of Iowa, Missouri, Nebraska, and South Dakota 70

Table 9. Mean change in median years school completed, population 25 years old and over, 1940-1960, counties of Iowa, Missouri, Nebraska, and South Dakota 71

Table 10. Mean change in number of retail trade establishments, 1939-1963, counties of Iowa, Missouri, Nebraska, and South Dakota 72

Table 11. Mean change in total volume of retail trade, counties of Iowa, Missouri, Nebraska, and South Dakota, 1939-1963 73
**LIST OF TABLES (CONTINUED)**

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 12</td>
<td>Mean change in the number of non-operating school districts, counties of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>74</td>
</tr>
<tr>
<td>Table 13</td>
<td>Mean change in the number of elementary school districts within counties of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>75</td>
</tr>
<tr>
<td>Table 14</td>
<td>Mean change in number of unified school districts, counties of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>77</td>
</tr>
<tr>
<td>Table 15</td>
<td>Mean area in square miles, economic areas of Iowa, Missouri, Nebraska, and South Dakota</td>
<td>79</td>
</tr>
<tr>
<td>Table 16</td>
<td>Mean change in total population, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>80</td>
</tr>
<tr>
<td>Table 17</td>
<td>Mean change in population density per square mile, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>81</td>
</tr>
<tr>
<td>Table 18</td>
<td>Mean change in area population under age 18, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>82</td>
</tr>
<tr>
<td>Table 19</td>
<td>Mean change in number of persons employed in agriculture, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>83</td>
</tr>
<tr>
<td>Table 20</td>
<td>Mean change in median family income, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>84</td>
</tr>
<tr>
<td>Table 21</td>
<td>Mean change in median years school completed, population 25 years old and over, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>85</td>
</tr>
<tr>
<td>Table 22.</td>
<td>Mean change in number of retail trade establishments, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>85</td>
</tr>
<tr>
<td>Table 23.</td>
<td>Mean change in total volume of retail trade, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>86</td>
</tr>
<tr>
<td>Table 24.</td>
<td>Mean change in number of non-operating school districts, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>87</td>
</tr>
<tr>
<td>Table 25.</td>
<td>Mean change in number of elementary school districts, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>88</td>
</tr>
<tr>
<td>Table 26.</td>
<td>Mean change in number of unified school districts, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960</td>
<td>89</td>
</tr>
<tr>
<td>Table 27.</td>
<td>Pearson product-moment correlation matrix, 374 counties of Iowa, Missouri, Nebraska, and South Dakota</td>
<td>93</td>
</tr>
<tr>
<td>Table 28.</td>
<td>Pearson product-moment correlation matrix, 99 Iowa counties</td>
<td>95</td>
</tr>
<tr>
<td>Table 29.</td>
<td>Pearson product-moment correlation matrix, 115 Missouri counties</td>
<td>97</td>
</tr>
<tr>
<td>Table 30.</td>
<td>Pearson product-moment correlation matrix, 93 Nebraska counties</td>
<td>98</td>
</tr>
<tr>
<td>Table 31.</td>
<td>Pearson product-moment correlation matrix, 67 South Dakota counties</td>
<td>100</td>
</tr>
<tr>
<td>Table 32.</td>
<td>Generalized analysis of variance for a completely randomized design with subsampling</td>
<td>103</td>
</tr>
<tr>
<td>Table 33.</td>
<td>Analysis of variance of area in square miles between states and economic areas in Iowa, Missouri, Nebraska, and South Dakota</td>
<td>106</td>
</tr>
</tbody>
</table>
Table 34. Analysis of variance of change in area population between states and economic areas in Iowa, Missouri, Nebraska, and South Dakota 107

Table 35. Analysis of variance of change in population density between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota 108

Table 36. Analysis of variance of change in area population under age 18 between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota 109

Table 37. Analysis of variance of changes in numbers of persons employed in agriculture between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota 110

Table 38. Analysis of variance of changes in median family income between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota 111

Table 39. Analysis of variance of change in median school years completed, population 25 years old and over between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota 112

Table 40. Analysis of variance of change in number of retail trade establishments between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota 113

Table 41. Analysis of variance of change in total volume of retail trade between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota 114

Table 42. Analysis of variance of change in number of non-operating school districts between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota 115
Table 43. Analysis of variance of changes in number of elementary school districts between states and economic areas in Iowa, Missouri, Nebraska, and South Dakota 116

Table 44. Analysis of variance of changes in number of unified school districts between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota 117
### LIST OF MAPS

<table>
<thead>
<tr>
<th>Map</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Functional Economic Areas, Iowa</td>
<td>152</td>
</tr>
<tr>
<td>2.</td>
<td>Adjusted Functional Economic Areas, Iowa</td>
<td>153</td>
</tr>
<tr>
<td>3.</td>
<td>Regional Government Centers, Iowa</td>
<td>154</td>
</tr>
<tr>
<td>4.</td>
<td>Economic Areas, Missouri</td>
<td>155</td>
</tr>
<tr>
<td>5.</td>
<td>Adjusted Economic Areas, Missouri</td>
<td>156</td>
</tr>
<tr>
<td>6.</td>
<td>Traffic Flow Communities, Missouri</td>
<td>157</td>
</tr>
<tr>
<td>7.</td>
<td>Adjusted Traffic Flow Communities, Missouri</td>
<td>158</td>
</tr>
<tr>
<td>8.</td>
<td>Growth Center Areas, Nebraska</td>
<td>159</td>
</tr>
<tr>
<td>9.</td>
<td>Adjusted Economic Areas, Nebraska</td>
<td>160</td>
</tr>
<tr>
<td>10.</td>
<td>Trade Centers, South Dakota</td>
<td>161</td>
</tr>
<tr>
<td>11.</td>
<td>Adjusted Trade Centers, South Dakota</td>
<td>162</td>
</tr>
</tbody>
</table>
CHAPTER I. STATEMENT OF THE PROBLEM

The evolution of local school district organization in the United States has been continuous and dynamic. Since the establishment of the first local school district, development in the various states has lacked general uniformity. This same diverse nature has characterized the development of local school districts within the fifty states. Though the ultimate responsibility for structuring education is recognized as a function of the states, great latitude in self-determination has historically been accorded local citizens.

Throughout the United States three distinct patterns of state-wide structuring are presently identifiable. One state has developed a single echelon system of education. The government of Hawaii has chosen to organize and operate all schools from the state level.

Sixteen states have elected to develop two echelon systems. In these states leadership functions and consultative services are provided by the state education agency. In some instances specialized programs are also developed and operated from the state level. All other functions and services are developed and provided by the local school district.

The remaining thirty-three states have chosen to develop three echelon systems which assign educational functions and services to the state education agency, to the county or intermediate unit, and to local districts. This pattern of
state-wide organization is presently operational in the four states encompassed by this study.

Since 1940 a dramatic change has taken place in the number of legally constituted local school districts in the United States. The earliest known national summary to report the number of local school districts, made in 1932, indicated a total of 127,244 districts in the 48 states (32, p. 8). The number varied from 24 in Maryland to 12,070 in Illinois. Since 1940 a substantial reduction in the number of school districts has been recorded each year. In October, 1966, only 27,200 local school districts were organized (33). Though total numbers have been materially reduced, within existing districts wide variations still persist. Major differences may be found in the geographic area, the pupil population base, the financial resources, and the extent and quality of educational programs offered in local school districts today.

Need for the Study

During this period of extensive reduction in the number of districts, major changes were taking place in the composition and distribution of the United States population, as well as the area population. Causal factors of these changes are difficult to isolate and identify. Certainly the development and implementation of technology in most facets of American enterprise has contributed to population changes.
In addition, major changes in social, economic, and political conditions have had some impact on population changes.

From a predominately rural nation, the United States has moved to a highly urbanized nation with approximately 70 percent of the total population residing in urban places in 1960. Population projections presently available suggest this movement is continuing and the urban population may approach 80 percent of the total national population by 1980.

In the process of the transition from a rural to an urban society significant changes have taken place in the internal and external concepts of a community. In the early periods of settlement and agricultural development of the area under study, the individual was largely self-sufficient. Most goods and services the individual could not provide were available in a small local village or community. Limited road networks and slow transportation necessitated the creation of communities with limited geographic boundaries.

In this early period of development, each of the four states identified the township as the basic unit for organizing schools. One of the four states, Iowa, enacted legislation 12 years after statehood permitting the further subdivision of townships for school organization (46).

Counties were established throughout the area to serve as governmental entities between the local citizens and the state government. The prime criteria in determining county
seat locations appeared to be one day's traveling time from
the most remote corner of the county.

The community center concept has historically suggested
the interrelationship of a village, town, or city and the
surrounding rural area. The interrelationship stems from an
identifiable commonality of social, cultural, political, eco-
nomic, and geographic considerations.

Recent research conducted in each of the four states sug-
gests that a substantially larger geographic area may now be
the basis for community considerations (3, 8, 11, 36, 79).
Areas with minimum radii of 50 miles have been delineated in
all four states. To date, these areas have been utilized pri-
marily for analyzing and projecting economic considerations.

Within each of these areas there appears to be a high
degree of cohesiveness. Factors which contribute to this
unity may be summarized as:

1. There are indications an established hierarchy of
   communities ranging from small villages to cities of
   50,000 or more exist in each area.
2. Each area possesses at least one major population
   center.
3. Common patterns of trade and shopping exist within
   each area.
4. The location of employment opportunities within the
   areas appear consistent.
5. There is a similarity in the extent and the distribution of essential service components within each area.

6. There are similarities in the composition of area populations when area size and industrial make-up are comparable.

Most writers suggest a community or a group of interrelated communities should form the geographic basis for identifying local district boundaries. When employing this criteria, population within a geographic area has usually been defined in terms of total numbers of people. Little concern has been given to internal composition.

There is a need to analyze the internal demographic composition of recently identified economic areas and to compare the composition between areas.

There is also a need to explore in depth the relationship that exists between demographic characteristics and changing patterns of local school district structure in identified economic areas. As community concepts alter and enlarge so must our considerations of the structural basis for providing necessary and desirable educational services and programs.

School district reorganization has been a continuously evolving phenomena of school structuring in the United States. Though the responsibility for providing state-wide structuring
is constitutionally delegated to state legislatures, they have historically chosen to accord broad discretionary powers to local school districts. As a consequence, we have seen created throughout the midwest a proliferation of small school districts tied closely to local communities.

Within the area under study four distinct types of school districts have been operational. They are:

Type A. Non-operating local school districts. These are districts that are legally constituted, possess governmental autonomy, but operate no educational programs within the district. This type of district is found most frequently in the rural areas of the midwest. Educational needs of students within such districts are met by adjacent organized and operating districts. Non-operating districts pay districts providing educational services on a tuition cost basis.

Type B. Elementary school districts. These are legally constituted districts that provide educational programs and services to students in grades K-6, K-8, 1-6, or 1-8 only. Provisions for the education of children beyond grade six or grade eight is met by adjacent districts on a tuition basis as is the case of Type A districts.

Type C. High school districts. These are legally constituted districts that provide educational programs to students in grades 9-12 or 10-12 only. Two forms of Type C districts are constituted within the area under study. One type is superimposed over a series of elementary districts and possesses taxing authority and governmental autonomy over all included elementary districts when planning and conducting the high school program. The other type is organized with a limited geographic area but serves a series of elementary districts on a tuition basis.

Type D. Unified districts. These are districts providing educational programs and services to students enrolled in grades kindergarten through 12th grade or where kindergarten pro-
grams are not offered, in grades one through twelve.

In recent years, major changes have taken place in school organization concepts. The most significant of these changes are the following:

1. State legislatures in 22 states have enacted mandatory school reorganization legislation within the past ten years (33).

2. The concept that a local district should be large enough to provide a comprehensive range of educational services to all children from kindergarten through twelfth grade has been established (33, 64).

3. The minimum number of pupils to be served by a local district ranges from 1,000 to 30,000 with the most frequently acceptable range being 5,000 to 10,000 students (30, 33, 64, 83).

When viewing these changes and present discernable trends in school district structuring in the United States, a study of the practicality of presently identified enlarged economic areas being utilized for local school district organization is most relevant.

This study has, therefore, examined changes that have taken place in the type and number of local school districts in a four state midwest area in relation to selected demographic variables employed in identifying enlarged communities for economic considerations.
The Problem

The purposes of this study were: First, to determine relationships that exist between selected demographic variables within the 54 presently identified economic areas, among the economic areas, and between the economic areas within the states of Iowa, Missouri, Nebraska, and South Dakota. Second, the study measured the variances that existed within economic areas, among economic areas, and between the four states when considering changes in numbers of school districts of Types A, B and D. Third, to analyze the utility of employing presently identified economic areas for planning future school district organization.

Hypotheses

In analyzing the problems identified above, the following hypotheses were tested. Stated in null form, they are:

1. There is no significant difference in changes that have occurred in the identified demographic variables within each of the 54 economic areas under study.

2. There is no significant difference in changes that have occurred in each of the identified demographic variables among the 54 economic areas under study.

3. There is no significant difference in changes that have occurred in each of the identified demographic variables among the four states under study.
Definitions

For purposes of this study, the following selected terms shall be operationally defined as follows:

Local school district: any area or territory comprising a legal entity, whose sole purpose is that of providing free school education, whose boundary lines are a matter of public record, and the area of which constitutes a complete taxing unit (39, p. 8).

Elementary school district: any local school district that conducts instructional programs in grades K-8 or any portion thereof.

Non-operating school district: any local school district that has no organized and operational instructional programs.

High school district: any local school district that organizes and conducts instructional programs in grades 9-12 or any portion thereof.

Unified district: any local school district that organizes and operationalizes instructional programs in at least grades K-12 or in grades 1-12.

Community: an area of any size in which the people have common interest or interests (3, p. 4).

Economic area: an area that is relatively closed or bounded with respect to the income-producing activities of its residents. It is also relatively closed or bounded with respect to a cluster of customer-oriented or "residen-
tiary" activities. Almost all the labor resident in the area is sold within it and almost all the goods consumed in the area are bought within it (36, p. 24).

Sources of Data

The data required to test the hypotheses formulated for this study was found in records and reports published by the U.S. Census Bureau (89-97). Data from these sources deals exclusively with demographic characteristics.

Data regarding the number of school districts by type was secured from unpublished records filed with State Departments of Public Instruction in Iowa, Missouri, Nebraska, and South Dakota.

Data relating to economic areas for the four states was gathered from the research and publications of Fox (36), Campbell (11), Ottoson (79), Antonides (3), and Hughes (81).

Delimitations of the Study

This study has been limited to a four state area: Iowa, Missouri, Nebraska, and South Dakota.

Demographic changes were measured in terms of nine variables. Research undertaken in each of the four states to identify economic areas has utilized one or more of the nine variables related to demographic considerations. These relate to area, population distribution, age composition and distribution, employment distribution, income levels, educa-
tional attainment, and economic considerations. Since all
variables identifiable under each of the above major areas
are dichotomous it negated the desirability or utility of em-
ploying more than one variable—to represent each area. The
demographic variables have, therefore, been limited to the
following:

1. Land area in square miles
2. Change in total area population
3. Change in population density per square mile
4. Change in population under age 18
5. Change in employed persons engaged in agriculture
6. Change in median family income
7. Change in median school grade completed, population
   25 years and over
8. Change in the number of retail trade establishments
9. Change in total retail sales

The study has been further limited to considering the
impact the nine identified demographic variables have had on
changes in the number of local school districts in Iowa,
Missouri, Nebraska, and South Dakota between 1940 and 1960.
These dates were utilized for two basic reasons. Major re-
duction in the number of school districts did not begin until
the mid-1940's (32), therefore, there was little reason for
considering changes occurring prior to 1940. In addition,
decennial reports of the U.S. Census Bureau are the only accu-
rate and comprehensive source of demographic data.
Organization of the Study

This study has been organized into five chapters. The first chapter includes the need for the study, the problem, hypotheses, definitions, sources of data, delimitations of the study, and organization of the study. The second chapter contains a review of the literature relating to area economic development and school district organization. The third chapter includes the statistical procedures to be employed in analyzing the data. The fourth chapter contains the findings including statistical relationships. The fifth chapter contains the summary, conclusions, and recommendations.

Summary

The need for adequate structural organization to provide optimum educational opportunities at a high level of efficiency and economy has long been recognized. The criteria employed in determining desirable local school districts have usually alluded to a "community" concept. The purpose of this study has been to examine changes that have taken place in the type and number of local school districts in a four state midwest area in relation to demographic variables employed in identifying enlarged communities for economic considerations.
CHAPTER II. REVIEW OF RELATED LITERATURE

The literature related to school district organization is voluminous. For purposes of this study only the literature relating specifically to area economic development, community identification, and size of administrative units has been reviewed.

Area Economic Development

In recent years increasing attention has been directed to research and study of enlarged geographic areas that might be utilized for economic considerations. Extensive analysis of area concepts has been conducted by various individuals associated with the Upper Midwest Research and Development Council. Borchert and Adams (8, p. 4) have made a comprehensive study of Montana, North Dakota, South Dakota, Minnesota, Northwest Wisconsin, and the Michigan Upper Peninsula. One of their most significant contributions was the definition of Trade Center types by business function for the entire area. From the lowest to the highest hierarchy they characterized the following types of Trade Centers in the Upper Midwest (8, p. 2):

- Hamlet
- Minimum Convenience
- Full Convenience
- Partial Shopping
- Complete Shopping
- Wholesale-Retail Centers

In terms of the six-state area they studied, the follow-
ing characteristics were noted for the entire region (8, p. 2). (See Table 1).

The impact on education of the above economic growth patterns and a substantial out-migration were explored by Keller and others (59). Their study suggested three major improvements needed to be instituted throughout the Upper Midwest Area in order to adapt to the changing economic structuring (59, p. 9). They suggested improved teaching standards, more effective school district organization, and sound school financing.

Borchert and Adams (8, p. iv) suggested five implications for community organization and development.

1. Shopping trade areas provide a framework for cooperative development of facilities and services which cannot economically be duplicated in every small community.

2. A number of medium size cities, which have been significant wholesale distribution centers for rural areas, are becoming increasingly important as retail and service centers while their wholesaling trade is growing slowly or declining. Hence, these centers need to devote increasing attention to developing attractive and diverse regional shopping and service facilities.

3. There is a growing need for cooperative, community-wide planning among retail merchants, services, professions, and governments if downtown districts are to be salvaged in small and medium-size cities.

4. A number of small, farm service centers are stable, viable business locations and merit continued maintenance. Others have been over-developed and must be cleared of obsolete structures.
Table 1. Characteristics of Upper Midwest Trade Center areas

<table>
<thead>
<tr>
<th>Type of Centers</th>
<th>No. of Centers</th>
<th>Median Pop.</th>
<th>Pop. Range</th>
<th>Mean No. Retail Functions</th>
<th>And with High Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamlet</td>
<td>1,820</td>
<td>160</td>
<td>30- 180</td>
<td>6.0</td>
<td>41%</td>
</tr>
<tr>
<td>Minimum-Convenience Centers</td>
<td>378</td>
<td>800</td>
<td>300- 3,700</td>
<td>14.4</td>
<td>94%</td>
</tr>
<tr>
<td>Full-Convenience Centers</td>
<td>111</td>
<td>1,600</td>
<td>800- 3,600</td>
<td>21.7</td>
<td>97%</td>
</tr>
<tr>
<td>Partial Shopping Centers</td>
<td>127</td>
<td>2,500</td>
<td>1,200- 8,700</td>
<td>27.1</td>
<td>97%</td>
</tr>
<tr>
<td>Complete Shopping Centers</td>
<td>79</td>
<td>9,500</td>
<td>3,700- 27,900</td>
<td>35.8</td>
<td>100%</td>
</tr>
<tr>
<td>Wholesale-Retail Centers</td>
<td>17</td>
<td>42,400</td>
<td>23,100-155,800</td>
<td>45.6</td>
<td>--</td>
</tr>
</tbody>
</table>
5. The most competitive centers provide not only the widest possible array of retail establishments, but also professional services, educational, recreational, and entertainment facilities, and pleasant surroundings.

Similar efforts at defining larger areas, most frequently for economic considerations, have been noted in the four states involved in this study.

Iowa Economic Areas

The first extensive effort in the identification of larger geographic areas for Iowa economic consideration was recorded in the work of Fox (35). He has delineated 12 "Functional Economic Areas" for the state. Only four are totally within Iowa. The remaining eight encompass area in adjoining states. These areas, overlapping in some instances, include approximately 75 percent of the land area of the state and over 90 percent of the state's population. The areas not identified with a Functional Economic Area (FEA) have, for the most part, limited population and no identifiable relationship with contiguous cohesive areas. Map 1 indicates the Iowa areas developed by Fox.

The FEA's were delineated by initially identifying the Standard Metropolitan Statistical Areas of Iowa as reported by the U.S. Census Bureau. Fox suggests that people tend to arrange themselves in concentric circles around the center of their labor market area; with distances from the center measured in terms of minutes. Based upon the assumption that the
maximum desirable travel time for employment purposes would be 60 minutes or approximately 50 miles, square configurations were superimposed upon the Iowa map since Iowa road networks are primarily north-south and east-west. Assuming further that a population center of at least 50,000 was necessary to develop the highest level hierarchy of functional significance, all such cities were identified. The 12 FEA's suggested for Iowa each possess population centers of approximately 50,000 or more and a surrounding geographic area that conforms to the time-distance concept of one hour travel time. Further, by utilizing the Borchert-Adams scale and definitions (8, p. 4), it is possible to define central place hierarchies within the Functional Economic Areas.

Fox's work suggests it is possible to establish in each Iowa FEA a commonality of travel patterns, retail and wholesale trade characteristics, educational levels, occupational distribution and governmental relationships. In viewing these generally defined characteristics, Fox suggests these are people-oriented rather than resource-oriented regions. (Termed nodal or heterogeneous by geographers.)

In discussing the utilization of the functional economic areas, Fox suggests (35, p. 21):

We believe that the functional economic area concept can be used to illuminate a number of problems. One of these is the nature of an optimum organization of residential activities within a labor market area and an optimal rate of introduction of new technology by the firms or plants in each such activity. A second is the analysis of the local demand for labor (current and projected) in
relation to changes in activity levels and in technology. Consumption theory may also be related to control place hierarchies within Functional Economic Areas.

Map 2 indicates the adjustment of Fox's Economic Areas to coincide with county boundaries.

On September 8, 1967, Governor Harold Hughes (81, p. 3) announced plans to issue an executive order defining 16 regional centers for Iowa. The move is predicated on the belief that Iowans are ready to move toward replacing counties with something more suited to modern transportation and communication.

Each of the 16 regional centers proposed would be the location of branch offices for field agents of the many state agencies who have workers outside the Iowa capital. It was suggested that a group of cities and counties in a region would be able to support schools, parks and other facilities that none could finance alone. The present development of area technical schools and colleges and the discussions presently under way to create regional jails and health centers was cited as evidence that county lines are giving way and citizens have come to recognize that programs and services cannot be duplicate in every town and in every county.

Map 3 indicates the regional areas recently ascribed by Iowa's governor.

Missouri Economic Areas

Denny (25) and Campbell (11) have conducted extensive projects in area identification in Missouri. Each has utilized
Denny (25) suggested that the selection of "Growth Centers" and the delineation of their potential-equal boundary lines is essentially an exercise in arithmetic, or more properly geometry. He has suggested the following specific procedures for identification.

1. Decide on the desirable minimum population base. (40,000 was used for the Missouri base.)

2. Decide on the maximum radius of service. (50 miles maximum in Missouri -- 32 miles average. This should equate with a travel time not to exceed one hour.)

3. From 1960 census data list in numerical rank all cities within the state and the marginal area by population.

4. Divide population into eight predetermined class intervals.

5. Begin inscribing concentric circles on the state map beginning with the largest population interval.

6. Bisect the overlapping areas until polygons are formed around all centers.

7. Adjust boundaries to account for natural barriers.

Following this procedure Denny created 31 Growth Center areas for Missouri. These are illustrated on Map 4. For utilization in state planning he adapted the initial area configuration to conform to existing county boundaries. This adjustment resulted in his identification of 24 Transitional Grouping of Counties around Growth Centers". This is shown in Map 5.
By comparison, Campbell's (11) Missouri studies have related to the identification of Traffic Flow Communities. The basis for his determination has been actual traffic counts made on major and secondary roads throughout the state of Missouri by the Highway Department. He has stratified the Traffic Flow Communities into three levels or hierarchies. The highest level areas evolve from highway traffic flow into the cities of St. Joseph, Kirksville, Hannibal, Columbia, Kansas City, Sedalia, Jefferson City, St. Louis, Joplin, Springfield and Poplar Bluff. The configuration of these is quite similar to the areas defined by Denny. Map 6 illustrates Campbell's highest level of communities. Map 7 is an adaptation agreed upon in conference with Dr. Campbell so that Traffic Flow Community boundaries would coincide with political boundaries.

His identification of two lower levels of community identification is an important one and infrequently developed in other states. The second order centers around 29 cities and the third order areas have as their core the 41 cities of Missouri with populations over 5,000.

Nebraska Economic Areas

Techniques developed by Denny have been utilized by Evans (99) in defining growth centers for Nebraska. Some adaptations of the Missouri criteria were necessary to compensate for sparsity of population in northwestern Nebraska.
Utilizing 40,000 as the minimum population base, except in the western area where 25,000 was accepted, 18 growth areas were delineated. The population varies from 448,000 in the Omaha area to a low of 25,000 in the Valentine area. Neither Denny or Evans have attempted to adjust area boundaries to political boundaries. Their area delineations are represented by Map 8.

Ottoson (79), who has worked extensively with the Great Plains Agricultural Council, a cooperative undertaking of 10 Plains states, has proposed 14 viable economic areas for Nebraska that coincide with existing county boundaries. He suggests the proposed county groups ... (79, p. 322)

are not by any means the best that could be devised. They are, in fact only a first approximation. For example, if present county boundaries were ignored, new boundaries could be based on natural topographical divisions, which would be more logical. The super-counties shown are presented partially for their shock value: they seem so huge the initial reaction is to think, 'this is going too far'. Yet with modern transportation and with population changes in the Plains, which give every indication of continuing, these combinations may not go far enough for a permanent long-run solution.

Map 9 presents Ottoson's 14 economic areas.

South Dakota Economic Areas

In South Dakota, Antonides (3) has identified 12 "Trade Area Communities". In arriving at the number he first determined the trade centers of the state. Fifteen cities were classified as trade centers. Listed in the decending order of their 1958 retail trade volume they were: Sioux Falls,

Some characteristics of each area which indicated community cohesiveness were:

1. Common communication media served the entire area. Daily newspapers and radio stations were present in most of the 15 cities.

2. Doctors, dentists, and medical services seemed to be concentrated in the 15 cities.

3. A number of smaller trade centers were dependent upon the 15 larger units. This varied from only four in the Vermillion area to 69 in the Aberdeen area.

4. Highway networks were such as to permit travel to the core city in one hours time.

5. Existing political structures were considered. It was suggested that present structuring necessitates cooperation among and between counties must involve whole counties not just parts of counties.

Seven specific criteria were employed in the determination of proposed economic area boundaries for South Dakota. They were:

1. The unit should be based upon normal trade areas.

2. The counties should be contiguous.

3. There should not be physical barriers.
4. The people should have similar interests as much as possible.

5. The unit should be large enough in area, economic base and population to solve the problems.

6. The unit should be large enough so that the same grouping of counties could be used for more than one purpose.

7. The unit should be of an optimum size for efficient working relationships, minimum costs, and maximum returns.

The areas initially identified and then adjusted to conform to political boundaries are illustrated in Maps 10 and 11.

Antonides' areas appear consistent with those suggested by Borchert and Adams and are very similar to the larger areas suggested for economic consideration in the other Plains States involved in this study.

Summary

In each of the four states involved in this study geographically enlarged areas have been described for economic considerations. Considerable similarity exists in the criteria employed by Antonides (3), Campbell (11), Fox (36), Hughes (81), and Ottoson (79) in defining these areas. When considering the definition stated previously for a "community", these areas possess potential for community identification.
24

The following criteria have been employed in varying degrees to identify enlarged economic areas in Iowa, Missouri, Nebraska and South Dakota.

1. A hierarchy of communities have been identified. These range from small hamlets or villages to at least one central city within each economic area.

2. A pattern of distribution of essential services has been established among the communities of varying size within each area.

3. Patterns of travel within areas have been established when considering employment, recreation, health and welfare activities, and acquisition of goods and services.

4. The location and distribution of industrial resources which provide employment opportunities within the area have been established.

5. Time-distance factors have been applied in each state.

6. Patterns of road networks and resulting travel patterns and habits have been considered.

School District Organization
For purposes of this study only literature relating specifically to community identification for school considerations and literature dealing with size of administrative units has been reviewed.
The Community

A number of authorities have attempted to describe the optimum school community. Great diversity is evident in these pronouncements.

The American Association of School Administrators (AASA) (2) pointed out that as early as 1911 an Illinois statute provided that any contiguous and compact area containing a community center could be formed into a union high school district without regard to transportation or existing school district boundary lines. This resulted in the rapid formation of high school districts composed of villages and surrounding open country, conforming in general, to natural patterns of association of people. This concept spread to other areas of the country and was the generally accepted guide until the depression of the 1930's began.

In the 1962 AASA report they suggest that, "A small town and its surrounding open country does not necessarily constitute an adequate setting for a school district" (2, p. 98).

Cushman (20), one of the first educators to describe an ideal school community, based his recommendations upon evidence that good communities generally produced good school systems and poor schools were most often found in poor communities. He concluded that the ideal school was coterminous with the ideal community. He described the ideal community as one with a live community spirit, cooperative participation between town and rural elements, secure economic services, and
the ability to adjust to changing times. He suggested such a community should contain 3,000 to 4,000 people in the town center and a similar total in the surrounding service area. Evidence presented by Cushman indicated economic services were improved in communities of 4,000 or more but community cohesiveness was found to decline after the city population reached 4,000. Participation of farm families in community activities was almost non-existent as community populations reached 10,000. Where population of town centers dropped below 1,000 to 1,500, the limited scope of economic services reflected negatively in the quality of the educational program.

Grieder, Pierce and Rosenstengel (41) and Estmond (28) suggested that a school community should serve an area population that was in close contact with their educational affairs. The former described the school community as a "natural sociological area". This assured a higher degree of control by the local district. The Committee for the White House Conference on Education (15) proposed that a district should be small enough so as not to lose the advantage of community contact and local control, nor the response to public will. This Committee concluded that it may be better to let small schools continue than to sacrifice community interest, pride and support.

By contrast, Swanson (87) believed that communities of 20,000 to 50,000 population possessed the optimum conditions
for promoting good schools. He found a strong positive relationship between population and school quality up to 20,000 population. There appeared to be a leveling off with a very gradual decrease in quality beginning to appear as district population went beyond 50,000.

One of the most thorough researchers in this field has been Howard Dawson. Though much of his work is presently outdated it is valuable to the researcher in terms of his methodology and the philosophical basis for school organization that was advocated during the 1930-1950 period. His 1934 publication (23) was the first major study of national significance regarding the organization of local school districts. In 1946 he (22, p. 10) stated that boundaries of elementary attendance centers should at least coincide with those of neighborhoods, that for high school purposes the boundaries should approximate those of natural communities, and that an administrative unit for rural schools should be village centered. He failed in this to recognize that a high school could serve more than one community.

In 1948 (21) he expanded his description by saying the structure of an administrative unit should be adjusted to the natural processes of community living and that for high school purposes it might be both desirable and practical to include two or more communities in order that enrollment might be large enough to justify a good program.

Blanke (5) indicated the term "community" possessed varied
meanings and consequently questioned its usefulness as a consideration of school organization. He suggested that community considerations seem to have little relationship to quality of education. Studies along this line had failed to prove conclusively that community cohesiveness influences student performance. There was little evidence to prove that schools with loyal patrons are good schools or schools violating natural community criteria are necessarily poor schools.

Reflecting the shift in emphasis, Hagman (43, p. 83) concluded in 1951 that a properly organized school district should contain at least one well defined community or a number of interrelated communities and that its schools should be placed in neighborhoods and community centers. Hagman's contention refutes the present day concepts in the development of educational parks and plazas.

The literature indicates that school communities may also be too large as well as too small. Mort and Reusser (72) felt that extremely large school districts often encounter apathy and general lack of interest and participation in school affairs. They described extremely large districts as those containing total populations of more than 100,000. They suggest that natural communities are identifiable within large cities. This contention is supported by Bell and Green (4) who described the possible sub-division of Chicago into 16 area districts, each serving about 20,000 pupils. The
writings of Mort and Reusser (72) and Bell and Green (4) have real relevance when considering educational planning for metropolitan areas.

There is increasing evidence in the literature of a general concern for excessive size developing in metropolitan centers. A number of the nation's largest urban complexes are presently exploring, or have initiated, various plans to cope with excessive size as well as their cultural, social and racial imbalances. New York, Chicago, Detroit, Saint Louis, and Atlanta are some of the cities that have initiated plans to decentralize administrative functions (33). In an excellent very recent publication, Mayer (63) discusses in some depth the extensive problems faced by the New York City Schools as a result of the massive bureaucracy that has been created to conduct the administrative functions of the system. He suggests that even though the New York City Board of Education has appointed sub-boards in an attempt to be more responsive to the citizenry, the program has been inherently unsuccessful. The very size of the administrative operation prevents ready communication between various components of the system and most recommendations submitted by sub-boards are rejected or never reach the central board of education for consideration.

One of the most prolific writers and researchers in the field of school district organization has been Fitzwater. His publications indicate an extremely broad background and
understanding of the problems and issues associated with all sizes and types of school organization. In addition, his writings suggest major philosophical adjustments over time to meet changing societal conditions. He (33) reports more favorably than Mayer (63) on the New York City Board of Education sub-division concept. He suggests the necessity for this type of development if urban school systems are to be truly responsive to the needs and desires of the constituency they are serving.

The efforts of the Pittsburg Board of Education, in coordination with the cities urban planners, to develop the "Great High Schools" is evidence of the concern for cutting across cultural, social and racial barriers in planning for metropolitan school organization.

These actions indicate the present trend in attempting to identify smaller communities within major metropolitan complexes. These moves are predicated on the belief that units of smaller population base will provide more democratic and personal benefits to parents, teachers and students and may aid in resolving some of the problems of the core cities.

The increasing emphasis on a broader concept of the community is evidenced in an excellent publication of the AASA (2, p. 100).

Two or more small villages may be included in the same new district, or even included in one having a small city, without harm to the natural patterns of association of people. In fact, if the new district contains
a very large village or small city along with a few
hamlets and small villages, it is more likely to
constitute a natural community.

Morphet, Johns and Reller (70, p. 221) advocated that
districts be organized to encompass existing communities
whose residents had been accustomed to cooperating in certain
areas. Similarly, Fitzwater (34) using the term "territorial
compatibility", stated:

... the territory included in school districts should
be that in which citizens may work together on their
educational problems. It would not contain geographic
barriers which would make communication among people
difficult. Whenever practical, determination of its
boundaries would take into account the natural patterns
of association of people.

Thus, the narrow concept of the natural community as a
desirable setting for the school district is no longer suffi-
cient. Limited enrollments in many rural areas, the diffuse
sociological characteristics of suburban and fringe areas,
and shifting patterns of decentralization in large cities
make it necessary to view an optimum setting for school dis-
tricts in broader prospective.

The concluding statement in a 1960 publication of the
Bureau of Educational Research, University of Oregon (9, p.
48), typifies the most widely accepted position of a community
today.

It is generally agreed that a school district should
be a natural sociological community, if other desirable
characteristics of a school district are met -- this
means that the local school district should be estab-
lished upon the basis of common characteristics of the
population by virtue of common educational interests,
common economic basis of the community, and common socio-cultural characteristics. Serious geographical obstacles which prevent the close association of people within communities should be avoided, and in the determination of what constitutes the natural community, consideration should be given to the problems inherent in the provision of an adequate and reasonable transportation program for pupils.

Administrative District Size

A variety of approaches have been employed in describing desirable district size. The two most frequent methods described in the literature have been to recommend criteria and to specify minimum numbers.

A number of lists of criteria have been developed. Alves (1) analyzed criteria employed in district organization in ten states in 1938. This is of limited value, except for historical purposes, today. Recent publications by Faber (29, 30), The Bureau of Educational Research, University of Oregon (9), and The Division of Surveys and Field Services, George Peabody College for Teachers (77, 78) present an excellent and comprehensive contemporary analysis of desirable criteria. Faber (30) states the criteria found most frequently in the literature are the following:

1.—Scope of program. The district should offer a comprehensive program of elementary and secondary education. Some authorities include nursery school, kindergarten, junior college and adult education as well.
2. Range of educational services. The district should provide a complete range of educational services, including: special classes for physically and mentally handicapped; remedial programs for under-achievers, special programs for academically gifted pupils; and health, guidance, and counseling services for all pupils.

3. The community. The district should include one well-defined community, or a group of interrelated communities which form a natural sociological area.

4. Administrative and instructional staff. The district should be large enough to employ specialized administrative and supervisory personnel and teachers with preparation in all areas taught.

5. Economic base. The district must be able to support financially the kind of educational program implied by the above criteria. Statements of economic criteria may refer to the total income available to the district or to its financial efficiency as measured by cost per pupil.

State Departments of Education in the four states have employed varied criteria. An analysis of these suggest they may be based more upon present educational practices in the states than upon recommended optimums emerging from contemporary research.

The Iowa Department of Public Instruction has, in recent
years employed two sets of criteria in approving new school formations. The first is based upon a policy statement of the State Board of Public Instruction (53) and suggests a district with a minimum enrollment of 100 students in the graduating class. The second (52), employed by consultative personnel, suggests the following:

1. The district should have an adequate pupil population to insure a comprehensive program of educational services pre-school through grades 12. Interpreted in terms of numbers, this would suggest a minimum of 1,800 students in each district.

2. The district should possess an adequate financial base to provide the comprehensive services suggested above. Valuations per pupil is not a reliable index since efficiency in services increases to a point as size increases within fixed valuation limits. The total assessed valuation of the district and the free bonding capacity should be the prime determinants.

3. The district should be able to utilize its administrative and supervisory staffs efficiently and effectively.

4. Minimum curricular offerings in the senior high school should be approximately three times the number of units required for graduation. If 16 units of
credit are required for graduation, a total of 48 units should be offered in the school.

5. The district should include a well-defined community or a group of interrelated communities.

6. The district should be associated with an intermediate service area of sufficient size to provide highly specialized and technical services. A minimum of 50,000 students should be enrolled in such an area to make it serviceable.

7. The geographic composition of the district and the location of attendance centers should be such that time required for transportation of children is within the following limits:

   K - 6 ............... 1 hr. 30 min. per day
   7 - 12 ............... 2 hrs. per day

Missouri has, since 1961, employed the following criteria (68):

It is desirable for a school district to be of sufficient size to provide every resident pupil access to:

1. At least twelve years of schooling.
2. Kindergarten and pre-school opportunities.
3. Curricular offerings in both the elementary and secondary schools which are sufficiently comprehensive to meet his needs. No pupil should be penalized by the fact of living in an administrative unit that does not make available to him the curricular offerings necessary to give him an adequate basic education.
4. The services of an adequate and qualified teaching staff. This includes both a reasonable pupil-teacher ratio and a sufficient number of teachers to insure curricular and cocurricular offerings to meet his needs.
5. Adequate library services. These services should include space in which to work, materials with which to work and a properly trained librarian to give guidance and direction in this area.

6. Varied teaching aids and materials necessary to the offering of a broad school program.

7. Safe, healthful and comfortable quarters while in attendance at school.

8. Competent administrative and supervisory services rendered by well-trained superintendents, principals and supervisors.

9. Safe, comfortable and reasonably quick transportation to and from school, if he should live beyond a reasonable walking distance.

The South Dakota Department of Public Instruction has since 1958 employed the following criteria in defining adequate First Class school districts, i.e., those districts offering at least 1-12 programs (86):

Requirements for A First Class Accredited School


2. See No. 2 regulations concerning the superintendents.

3. The school employs a high school principal who has the required high school Principal's Administrative Certificate and teacher's certificate.

4. The school employs seven full time high school teachers in addition to the superintendent or administrative head of the school. (The classes taught by the superintendent are part of the high school program.)

5. Each teacher in a four-year high school or three-year senior high school has a valid Secondary Certificate or one of equal or higher rank.

6. Each elementary teacher and each teacher in a recognized junior high school has a certificate based upon a two-year college course for elementary teachers or a certificate of higher rank. (A certificate based upon a Baccalaureate Degree is recommended.)

7. First class curriculum should offer the following minimum course offerings.
<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>English (Communications)</td>
<td>4</td>
</tr>
<tr>
<td>Science</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>Social Science</td>
<td>4</td>
</tr>
<tr>
<td>Foreign Languages</td>
<td>2</td>
</tr>
<tr>
<td>Fine Arts (Such as music and art)</td>
<td>2</td>
</tr>
<tr>
<td>Practical Arts (Such as business,</td>
<td>6</td>
</tr>
<tr>
<td>homemaking, industrial arts, and agriculture</td>
<td></td>
</tr>
<tr>
<td>Physical Education (At least 2</td>
<td></td>
</tr>
<tr>
<td>periods per week for 2 years)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>

8. Schools are now required to be in session at least 175 days or have a school term of at least 190 days in length. A school meeting either of these conditions will meet the requirements for accreditation. (September 1, 1961)

Note: This regulation is the same as the new law pertaining to the length of the school term which was passed by the 1963 State Legislature.

9. The school employs a guidance-counselor with a minimum of 15 semester hours in the field of guidance and counseling. (See provisions for certification of guidance personnel effective July 1, 1965.)

10. The school has an organized guidance program which provides counseling services with a minimum student-counselor ratio of one hour per day per 100 students or major fraction thereof in the secondary school.

11. The school maintains a balanced educational program which includes athletics, music, and speech activities. To avoid an unbalanced school program, the basketball schedule will not exceed 18 games per season. Each school may participate in one tournament in addition to the district, regional, and state tournaments. (The tournament games may be in addition to the 18 games listed above.) A school may participate in 20 basketball games per school year if they do not participate in any basketball tournaments except by the elimination tournaments leading to the state championship sponsored by the SDHISAA. (Amended December 9, 1960)

A unique situation exists in Nebraska regarding identification of criteria for desirable school districts. The Nebraska Legislature has been reluctant to either delegate
the responsibility for defining criteria to the State Board of Education or to assume it. One result of this has been the development of recommended criteria by various professional groups.

The Nebraska Association of School Administrators has recommended the following criteria be adopted as standards for the organization of school districts (74).

1. Each school district in Nebraska should be organized to provide a continuous and coordinated program of education extending from the kindergarten grade through at least grade 12; each school be a unified district.

2. The intermediate school unit should be developed as a supplementary service unit in Nebraska.

3. Each school district in Nebraska should include within its boundaries a sufficient number of pupils so that it can meet the individual needs of all pupils; it should have a minimum of 500 pupils.

4. If sparsity of population and geographic barriers make it impracticable for a school district to bring together at least 500 pupils, the factor of area is important. In such cases a district should contain at least 400 square miles.

5. Insofar as practicable, each district should have sufficient resources so that the educational services and facilities which the people desire can be provided without excessive costs.

6. The boundaries of each school district should be so arranged that few or no pupils need to cross school district boundaries lines in order to attend the school they should logically attend.

The Nebraska Department of Education did, in 1966, issue a publication entitled "Characteristics of a Good School System" (75). This serves as an unofficial guide for school criteria in Nebraska, but with little impact.

This publication suggests desirable criteria in the following broad categories:
A review of the literature suggests much less agreement in defining numerical size of desirable districts than is true in suggesting criteria. Few authorities have ventured recommendations on the size of total districts. Most efforts along this line have been directed to determining optimum size for either secondary or elementary attendance centers.

The literature, however, presents little support for the continued existence of small schools. Dawson's (23) early review suggested optimum administrative districts of from 9,800 to 12,000 pupils and a teaching staff of 280. A minimum justifiable district should have at least 1,600 students and 46 teachers. Cook (17) suggested that supervisors, librarians, nurses, and attendance supervisors could be utilized most efficiently in districts with 10,000 - 12,000 students.

There is a wealth of evidence to support the contention that larger districts provide more qualitative programs. A wide variation exists in describing qualitative factors, how-
ever.

Faber (29), in a study of 35 Iowa school districts, assessed quality in terms of 15 measures.

A consistent and high correlation coefficient of .763 was derived when measuring the relationship between total quality scores and enrollment. Every district in the first quartile in enrollment ranked above average in quality while every district in the fourth quartile ranked below average in quality. Conant (16), in discussing the comprehensive high school, suggested a minimum of 100 students in the graduating class is required to provide for general education, good electives for non-college bound students, and adequate college preparatory programs. Translated into a K-12 organization, his recommendations would require minimum administrative units of 1,500 - 2,000 students.

Purdy is one of the first to advocate the determination of school size based upon a comprehensive identification of educational needs to be met. In an excellent study recently completed for the Ohio Legislature (83), he recommended size consideration for two types of administrative units. He suggested administrative districts providing comprehensive programs and services should enroll a minimum of 10,000 students. The optimum size of 20,000 for such districts was recommended. An optimum of 10,000 was recommended for districts providing limited programs. The minimum for these districts was set at 5,000.
The Pennsylvania Legislature in 1965 established 2,000 as the minimum size for newly formed districts in the state. Recent publications from the Pennsylvania Department of Public Instruction indicate most districts formed since 1965 have approached 4,000 students.

In an extensive study of 552 reorganized school districts in eight states Fitzwater (34) found numerous educational changes had resulted from reorganization. He found reorganized districts added to their staffs nurses, psychologists, guidance personnel, physicians, speech correctionists, and dental hygienists. Program improvements were noted in the areas of art, music, and vocational education. In addition, teachers in the reorganized districts possessed a higher level of academic training. As a result of this analysis Fitzwater suggests 5,000 students as minimum size for a desirable administrative unit. This size has been generally endorsed and supported by the U.S. Office of Education.

Summary

As a means of analyzing and projecting economic data, the U.S. Census Bureau has identified Economic Areas through the United States. Economists and sociologist within the area under study have delineated economically viable areas. Though present research indicates a high degree of relationship between employment, trade, and services within these areas, little consideration has been given to any analysis of
educational organization within these recently identified economic areas.

The community as the basis of a school district has been alluded to in the literature since the early 1930's. The literature today implies a community concept similar to that advocated by Cushman (20). When relating school district organization to community identification, the concept of a town, village or city and the surrounding rural area still persists. Research and literature dealing with enlarged community concept for educational consideration is very limited.

Criteria

Little uniformity in describing desirable school size can be found in the literature. This review has, however, revealed a consistent condemnation of small schools. Research consistently supports the contentions that larger administrative districts offer more extensive curricular offerings, provide higher quality programs, employ teaching personnel with a higher level of academic training, operate at a higher level of efficiency, provide more extensive specialized services, secure a higher level of academic achievement from students, utilize administration and supervisory personnel more efficiently, and adapt more readily to education changes and innovation.

Though considerable variation exists in enumerating the
criteria for an adequate district, there is a core of consistency in most lists. The criteria most frequently identified include the following:

1. A school district should offer a comprehensive educational program grades K-12.
2. The district should offer a complete range of educational services.
3. The district should be of adequate size to permit the development of extensive programs at a high level of quality with efficiency and economy.
4. The district should include at least one well-defined community.
5. The district should possess an adequate economic base.
6. Where local administrative districts cannot economically provide comprehensive educational programs, Regional Education Service Areas (Intermediate Units) should be developed to provide specialized services and programs.

Research Studies

Only one research study concerned with the determination of school district boundaries utilizing demographic considerations was found.

Craver (18) utilized four techniques for identifying "secondary communities" that could be utilized in planning
local school districts. He defined secondary communities as (18, p. 4):

That trade center which, when taken together with the surrounding rural geographical area including dependent hamlets, villages, and open country, constitutes a unit which supplies on a day-to-day, week-to-week basis most of the basic needs and wants of man.

The location of boundaries for secondary communities involves establishing along highways and roads between communities under study and adjacent communities, the points from which most people go in opposite directions to satisfy most of their basic needs and wants. Lines drawn through these points circumscribe the community and establish its outer limits.

Graver utilized four techniques common to the social sciences in delineating boundary lines for secondary communities. They were:

1. Formula method:

\[
\text{Miles from B to Boundary} = \frac{\text{Miles from A to B}}{1 + \frac{\text{Population of A}}{\text{Population of B}}}
\]

2. Trade Center Interview Method: 9 to 16 maps were utilized and random interviews conducted to determine trade preferences. Mean points were computed and boundaries established.

3. Pupil Questionnaire Method: questionnaires were submitted to students in grades 7-12 to determine where parents go most frequently for defined goods
and services. Boundaries were established on the basis of frequency of occurrence.

4. Fringe area survey method: By interview with merchants and knowledgeable people approximate fringe areas were established. On the spot interviews were conducted with residents within 2-3 miles of the fringe area to determine true preferences and boundaries were ascribed accordingly.

Graver concludes that (18, p. 238):

It would appear that a feasible method for locating the boundary lines of such secondary communities is desirable if in a large-broad-area reorganization program the principle of the sociological community is to be considered seriously.

In terms of his study, the formula method proved best to utilize in gaining general boundary concepts but the fringe area survey method proved to be most acceptable from a cost, accuracy and time standpoint for final boundary determination.
CHAPTER III. METHODS AND PROCEDURES

This chapter describes the methods and procedures utilized to gather and analyze the data required for completion of the study. The chapter will be divided into six sections: 1) Description of the Population, 2) Description of the Demographic Variables, 3) Description of the Types of School District Variables, 4) Description of Economic Areas, 5) Description of the Data, and 6) Analysis of the Data.

Description of the Population

The population utilized in this study included the resident population of four states, Iowa, Missouri, Nebraska, and South Dakota. The population was that reported by the U.S. Bureau of Census in the years 1940 and 1960. The population has been stratified by state, economic area within state, and by county within economic area. For purpose of this study the economic areas utilized have been those delineated by Hughes (81), Campbell (10), Ottoson (79), and Antonides (3). The areas described for the four states consist of groups of existing counties, therefore, required no adjustment. A total of 54 economic areas have been utilized; 16 in Iowa, 11 in Missouri, 15 in Nebraska, and 12 in South Dakota.

The basic population was further stratified by counties within economic areas. The county unit of local government, considered the primary division of the state (93, p. xvi),
is utilized extensively by the U.S. Census Bureau for data collection. It is the smallest unit of government for which comprehensive data relating to demographic characteristics that have relevance to this study are uniformly available. Within the area under study a total of 373 county units were legally constituted in 1960. The distribution was 99 in Iowa, 114 in Missouri, 93 in Nebraska, and 67 in South Dakota. The same number of counties were in existence in 1940 in Iowa, Missouri and Nebraska. In South Dakota, one additional county was legally constituted in 1940. Armstrong County was dissolved as a separate political entity in the 1940-1960 period and the area became a part of Dewey County. To permit consistent analysis, the data for Dewey and Armstrong counties was combined for the 1940 period.

Description of Demographic Variables

Nine selected demographic variables have been utilized. The following general criteria have served as guidelines in the selection of the variables to be analyzed. 1) Only variables for which data was uniformly reported in 1940 and 1960 were utilized. 2) It was necessary that raw data be in terms of absolute numbers rather than measures of central tendency, if possible, since regrouping of data within stratified classifications was employed. 3) Demographic variables utilized were representative of geographic, social, and economic considerations employed in delineating economic areas
within the four states.

**Geographic area variable**

The geographic area was recorded in square miles of land area within each stratified unit. With the exception of very limited artificially created water bodies, land area has remained constant during the 1940-1960 period. Therefore, the same data was utilized for the two periods under study.

**Total population variable**

The area population has been represented by the total population residing within each of the three strata as reported by the U.S. Census Bureau in the 1940 and 1960 Decennial Census.

**Density variable**

Population density is intended to present a measure of population distribution. It was secured by dividing the total population of each stratified unit by its respective land area in square miles.

**Age variable**

The U.S. Census Bureau reports ages of the resident population in eight major categories: under 5 years, 5 to 14 years, 15 to 24 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years and 65 and over. Data has been regrouped by the U.S. Census Bureau to record the percent of the population under 18 years old. This figure was applied
to the total population of each strata in order to arrive at an absolute number for the population under age 18.

**Occupational variable**

As a measure of occupational distribution, the change in number of individuals employed in agricultural occupations was measured for the 1940-1960 period. Though numerous break-downs on occupational distribution were available in 1960, the same type reporting was not employed in 1940. Therefore, it is difficult to make occupational comparisons in other than broad general categories.

**Income variable**

The only absolute numerical measure of income reported on a county basis by the U.S. Census Bureau is Median Family Income in dollars. In addition, the percent of a county population with incomes under $3,000 and $10,000 and over is reported. Since absolute numbers were sought in the study, the former was utilized.

**Educational variable**

As a measure of educational level within each unit under study, the median school years completed for persons 25 years old and over was utilized.

**Economic variable-trade establishments**

From the U.S. Census of Business, conducted independent of the decennial census, two economic considerations were
utilized. The number of retail trade establishments was intended to reflect the growth or decline in the business structuring of each stratified unit being studied.

**Economic variable—retail sales**

The total retail sales of each unit was recorded to present a measure of the change in total business activity within each unit being studied.

Description of the Types of School District Variables

Within the four state area, four distinct types of school districts have been legally constituted. As defined in Chapter I, they consist of:

- **Type A.** Non-operating local school districts
- **Type B.** Elementary school districts
- **Type C.** High school districts
- **Type D.** Unified districts

Description of Economic Areas

A total of 54 areas have been identified in Iowa, Missouri, Nebraska, and South Dakota that appear to have a high degree of economic cohesiveness. In each instance they constitute a group of contiguous counties varying from 3 to 19. The grouping of counties within economic areas of the four states follows:
Iowa

Area I
Allamakee
Clayton
Howard
Winneshiek

Area II
Cerro Gordo
Floyd
Franklin
Hancock
Kossuth
Mitchell
Winnebago
Worth

Area III
Buena Vista
Clay
Dickinson
Emmet
O'Brien
Osceola
Palo Alto

Area IV
Cherokee
Ida
Lyon
Monona
Plymouth
Sioux
Woodbury

Area V
Calhoun
Hamilton
Humboldt
Pocahontas
Webster
Wright

Area VI
Black Hawk
Bremer
Buchanan
Butler
Chickasaw
Fayette
Grundy

Area VII
Cerro Gordo
Delaware
Dubuque
Jackson

Area VIII
Buena Vista
Clinton
Muscatine
Scott

Area IX
Cedar
Iowa
Johnson
Linn
Washington

Area X
Hardin
Marshall
Poweshiek
Tama

Area XI
Boone
Dallas
Jasper
Madison
Marion
Polk
Story
Warren

Area XII
Audubon
Carroll
Crawford
Greene
Guthrie
Sac

Area XIII
Cass
Fremont
Harrison
Mills
Montgomery
Page
Pottawattamie
Shelby

Area XIV
Adair
Adams
Clarke
Decatur
Ringgold
Taylor
Union

Area XV
Appanoose
Davis
Jefferson
Keokuk
Lucas
Mahaska
Monroe
Van Buren
Wapello
Wayne

Area XVI
Des Moines
Henry
Lee
Louisa
<table>
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<th>Area I</th>
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<th>St. Louis (City)</th>
<th>St. Louis (Co.)</th>
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<td>Barton</td>
<td>St. Louis (City)</td>
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<tr>
<td>Atchison</td>
<td>Bates</td>
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<td>St. Louis (Co.)</td>
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<td>Daviess</td>
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<td>Dekalk</td>
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### Nebraska

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South Dakota

Area I
Lincoln
McCook
Minnehaha
Turner
Union

Area II
Bon Homme
Charles Mix
Clay
Yankton

Area III
Aurora
Brule
Davison
Douglas
Hanson
Hutchinson

Area IV
Gregory
Mellette
Todd
Tripp

Area V
Bennett
Custer
Fall River
Haakon
Jackson
Pennington
Shannon
Washabaugh

Area VI
Buffalo
Hughes
Hyde
Jones
Lyman
Stanley
Sully

Area VII
Beadle
Hand
Jerauld
Sanborn

Area VIII
Brookings
Kingsbury
Lake
Miner
Moody

Area IX
Clark
Codington
Deuel
Grant
Hamlin
Hutchinson

Area X
Brown
Day
Edmunds
Faulk
McPherson

Area XI
Campbell
Carson
Dewey
Potter
Walworth
Ziebach

Area XII
Butte
Harding
Lawrence
Meade
Perkins
Description of the Data

Data on the following variables was available from the 16th Decennial Census, 1940, and the 18th Decennial Census, 1960.

1. Area in square miles
2. Change in total area population
3. Change in population density per square mile
4. Change in area population under age 18
5. Change in the number of persons employed in agriculture
6. Change in median family income
7. Change in median school grade completed, population 25 years old and over

Data for the remaining variables was taken from the U.S. Census of Business. This enumeration is made every five year period. The enumeration years do not coincide with those of the 16th and 18th Decennial Census. Therefore, the years closest to the 16th and 18th Decennial Census for which data was available were employed. Data from the U.S. Census of Business for 1939 and 1963 were utilized for reporting the following variables.

1. Change in the number of retail trade establishments
2. Change in the total retail sales, reported in dollars

Data for reporting the number of legally constituted local school districts by type was secured from records avail-
able at the State Departments of Public Instruction of Iowa, Missouri, Nebraska, and South Dakota.

Analysis of the Data

In reviewing the data collected before processing, one type of school district variable appeared insignificant. No school districts of Type C existed in Iowa and Missouri during the period under study. A very limited number existed in South Dakota and Nebraska and little change in total numbers was evidenced. Therefore, this type of school district variable was not utilized in later analysis. Further analysis of the data was undertaken in four steps after condensation of the original data to cards. They were to: 1) obtain averages for demographic variables within each economic area, 2) table the values for changes in school districts of Types A, B and D, 3) compute the Pearson product-moment coefficient of correlation for the 12 variables (nine demographic variables and three school size variables) to measure the degree of association between the variables, and 4) using the analysis of variance technique, measured the variability between and among states and economic areas.

Average for demographic variables

An economic area average for each demographic variable was computed. Since the 54 economic areas constituted the treatment units, the 373 counties are considered individuals divided unequally among the 54 treatment units. Therefore,
each of the demographic variables was summed through counties within economic areas to determine an average.

**Tabled values for school district changes**

The change in numbers of school districts by Types A, B and D was computed by summing and averaging for each economic area. The change in numbers of school districts by Types A, B and D became the criterion variable for the statistical analysis that followed.

**Analysis**

The criterion variable was compared with the comparison (x) variables in the correlation framework showing the relationships between each variable and every other variable. Matrices were reported for the total four-state area and for the relationship within each state.

Statistically significant correlation coefficients were determined by values of r tabled in Wert (101, p. 424).

Analysis of variance was utilized as the final statistical tool in order to measure the variances of highly correlated variables within states and economic areas.

Statistically significant variances were determined by values of F tabled in Wert (101, pp. 419-422).

**Summary**

The method of analysis of data consisted of determining mean figures for demographic variables within each economic area.
area, tabling mean changes in school districts by Types A, B and D, analyzing the relationships between demographic variables through use of coefficient of correlation, and the final use of Analysis of Variance techniques to determine the variances that existed among and between groups when measuring changes that have taken place in highly correlated variables.
CHAPTER IV. FINDINGS

One problem of this study was to determine the relationship that existed between the demographic variables identified for analysis in the study.

A second aspect of the problem was to determine the relationships that existed between demographic variables and the type of school district variables.

Finally, the variances which existed in selected variables between states and between the 54 economic areas were tested for significance.

The report of the findings has been arranged into four groupings. The first section presents the data by counties within states. The second section includes a regrouping of the basic data by economic areas within the four states. The third section includes the relationships that exist between all variables as measured by the Pearson product-moment correlation coefficients. These have been grouped as follows: relationship between all variables for the 374 data collection units, relationship between all variables for the 99 Iowa counties, relationship between all variables for the 115 Missouri counties, relationship between all variables for the 93 Nebraska counties, and relationship between all variables for the 67 South Dakota counties.

The fourth section presents the measures of variance that existed between selected variables within states and
within economic areas.

Variable Data by Counties Within States

Data on thirteen previously identified variables were obtained from reports of the Sixteenth and Eighteenth Decennial Census of the United States published by the U.S. Department of Commerce, the 1939 and 1963 Census of Business published by the U.S. Department of Commerce, and from unpublished reports available from the State Departments of Education of Iowa, Missouri, Nebraska, and South Dakota.

Area in square miles

Substantial variations exist when viewing the geographic area of counties within the four states under study. Table 2 presents data regarding the mean size of counties within the four states.

Table 2. Mean area in square miles, counties of Iowa, Missouri, Nebraska, and South Dakota, 1960

<table>
<thead>
<tr>
<th>State</th>
<th>Total land area</th>
<th>X size of counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>56,030</td>
<td>566</td>
</tr>
<tr>
<td>Missouri</td>
<td>69,226</td>
<td>602</td>
</tr>
<tr>
<td>Nebraska</td>
<td>76,612</td>
<td>824</td>
</tr>
<tr>
<td>South Dakota</td>
<td>76,368</td>
<td>1,140</td>
</tr>
</tbody>
</table>

Iowa counties ranged in size from 376 square miles (Dickinson County) to 979 square miles (Kossouth County).
The mean size computed for the 99 Iowa counties was 566 square miles.

Missouri, with a total land area of 69,226 square miles, was sub-divided into 115 legally constituted counties. The city of St. Louis is separated from all contiguous areas and is officially classified as a separate and distinct county unit. The geographic area of Missouri counties ranged from a low of 61 square miles in St. Louis City to a high of 1,183 square miles in Texas County. The mean size of the 115 Missouri counties was 602 square miles.

Nebraska, with a total land area of 76,612 square miles, was sub-divided into 93 legally constituted county units. Nebraska counties varied in size from a low of 236 square miles in Sarpy County to a high of 5,982 square miles in Cherry County. The mean size of Nebraska counties was 824 square miles.

The 76,368 square miles of land area in South Dakota was divided into 67 legally constituted county units. The size of these ranged from 403 square miles in Clay County, the smallest, to 3,466 square miles in Mead County, the largest. The mean size of the 67 South Dakota counties was 1,140 square miles.

**Change in area population**

The first of the change variables utilized in this study suggested substantial differences had occurred in the total
population change among the four states. The mean county population changes for the four states are presented in Table 3.

Table 3. Mean change in area population, counties of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>Total Change</th>
<th>X County Change</th>
<th>% of Change over 1940 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>219,269</td>
<td>2,215</td>
<td>8%</td>
</tr>
<tr>
<td>Missouri</td>
<td>526,836</td>
<td>4,581</td>
<td>14%</td>
</tr>
<tr>
<td>Nebraska</td>
<td>95,496</td>
<td>1,026</td>
<td>7%</td>
</tr>
<tr>
<td>South Dakota</td>
<td>39,919</td>
<td>595</td>
<td>6%</td>
</tr>
</tbody>
</table>

During the period 1940-1960, Iowa experienced a numerical population growth of 219,269. This represented an increase of approximately eight percent over the 1940 state population. However, an analysis of the changes within counties of the state suggests a varied pattern of development. During this period, 61 Iowa counties recorded population losses. The largest loss was recorded in Appanoose County where the population declined by 8,230. This represented a loss of over 33 percent of the 1940 reported population. Among the 38 counties reporting population gains, Polk County, the most densely populated county in 1940, recorded the largest single gain. The 70,480 increase was a 36 percent gain over the 1940 county
population. This also represented 32 percent of the total state population gain during this 20 year period.

Within the 115 Missouri counties, 87 recorded population losses. The largest numerical loss, 66,022, was recorded in the city of St. Louis. Though a substantial decline, it represented only eight percent of the 1940 St. Louis City population. Though the numerical losses in the rural counties were substantially lower than the St. Louis City loss, the percentage losses were very sizable in most counties. Howard County lost only 11,411 residents during the 20 year period, but this constituted 51 percent of the 1940 county population. Eighty-one percent of the entire Missouri population gain was accounted for in St. Louis County. From a population base of 274,230 in 1940, the population of this suburban area increased to 703,532 by 1960. This constituted a 157 percent gain.

Within the 93 counties of Nebraska a more pronounced rural decline and urban increase is identifiable. Seventy-three of the 93 Nebraska counties recorded population losses. By contrast, gains in three counties, Douglas, Sarpy, and Lancaster, accounted for approximately 95 percent of the total state increase during the 20 year period. These three counties encompass the metropolitan complexes of Omaha and Lincoln.

During the 1940-1960 period, South Dakota recorded the
smallest over-all population gain among the four states studied. The 39,919 increase represented a six percent over-all state increase.

Within the 67 counties of South Dakota, 48 declined in population. As was evidenced in Nebraska, over 90 percent of the total state increase was accounted for in three counties, Hughes, Pennington, and Minnehaha.

Table 3 suggests mean county population increases which varied from 595 per county in South Dakota to 4,581 in Missouri. However, an analysis of individual county data indicates a substantially different pattern. Though not included in this dissertation, data on all variables was tabled by counties within states and by economic areas within states. These tables are on file and may be secured from the Great Plains Project Office, Department of Public Instruction, Des Moines, Iowa.

Of the 374 counties under study, 269 experienced population losses. In some instances this loss was over half of the reported 1940 population. With few exceptions, all major gains were recorded in areas of already heavy population concentration.

Table 4 indicates the population changes that occurred within the largest urban places of each state.

When data included in Tables 3 and 4 are compared it is readily apparent the population increase of 918,126 recorded in the 11 urban centers of the four state area exceeded the
over-all four state increase of 881,520.

Table 4. Urban population changes, 1940-1960, major cities of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>County</th>
<th>City</th>
<th>Population Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Hawk</td>
<td>Waterloo, Iowa</td>
<td>42,536</td>
</tr>
<tr>
<td>Linn</td>
<td>Cedar Rapids, Iowa</td>
<td>47,757</td>
</tr>
<tr>
<td>Polk</td>
<td>Des Moines, Iowa</td>
<td>70,480</td>
</tr>
<tr>
<td>Scott</td>
<td>Davenport, Iowa</td>
<td>34,319</td>
</tr>
<tr>
<td>Jackson</td>
<td>Kansas City, Missouri</td>
<td>145,865</td>
</tr>
<tr>
<td>St. Louis County</td>
<td>Rural around St. Louis City</td>
<td>429,302</td>
</tr>
<tr>
<td>St. Louis City</td>
<td>Missouri</td>
<td>- 66,022</td>
</tr>
<tr>
<td>Douglas</td>
<td>Omaha, Nebraska</td>
<td>95,928</td>
</tr>
<tr>
<td>Lancaster</td>
<td>Lincoln, Nebraska</td>
<td>54,687</td>
</tr>
<tr>
<td>Minnehaha</td>
<td>Sioux Falls, South Dakota</td>
<td>28,878</td>
</tr>
<tr>
<td>Pennington</td>
<td>Rapid City, South Dakota</td>
<td>34,396</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>918,126</strong></td>
</tr>
</tbody>
</table>

Change in population density per square mile

Table 5 presents the mean change in population density per square mile within counties of the four state area.

Since the density distribution was secured by dividing total area population by the area in square miles for the 1940 period and the 1960 period, the results reflect directly changes recorded in variable two also.

In Iowa, the change in density distribution ranged from a loss of 158 individuals per square mile to a gain of 1,186
Table 5. Mean change in density per square mile, 1940-1960, counties of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>State</th>
<th>Total Density Change</th>
<th>( \bar{X} ) Change per County per square mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>3,570</td>
<td>36.0</td>
</tr>
<tr>
<td>Missouri</td>
<td>984</td>
<td>8.5</td>
</tr>
<tr>
<td>Nebraska</td>
<td>3,260</td>
<td>34.9</td>
</tr>
<tr>
<td>South Dakota</td>
<td>131</td>
<td>1.9</td>
</tr>
</tbody>
</table>

per square mile in Polk County. In Missouri, the range was from a loss of 10,823 per square mile in St. Louis City to a gain of 8,638 per square mile in St. Louis County. The Nebraska change in density ranged from a loss of 92 per square mile in Nemaha County to a gain of 2,925 per square mile in Douglas County. With the exception of Douglas and Lancaster Counties, the changing distribution of population within Nebraska counties was more uniform than changes recorded in any of the remaining three states.

Among South Dakota counties the changes in density distribution ranged from a decline of 34 per square miles in Turner County to an increase of 354 in Minnehaha County. Though the declines in density computed for all South Dakota counties appeared small when considering the limited total base populations of most counties, they actually represented substantial over-all numerical decreases within most counties.
Change in area population under age 18

Table 6 presents the mean changes in county populations under age 18 in the four state area.

Table 6. Mean change in area population under age 18, 1940-1960, counties of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>State</th>
<th>Total Change</th>
<th>( \bar{x} ) change per county</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>128,334</td>
<td>1,295</td>
</tr>
<tr>
<td>Missouri</td>
<td>241,451</td>
<td>2,099</td>
</tr>
<tr>
<td>Nebraska</td>
<td>43,931</td>
<td>472</td>
</tr>
<tr>
<td>South Dakota</td>
<td>21,263</td>
<td>317</td>
</tr>
</tbody>
</table>

Each state recorded an increase in this age grouping. The pattern of increase appears consistent with total population increases recorded within each state.

Within Iowa, 48 of the 99 counties experienced declines in their population under age 18. As in previous variables, Appanoose County recorded the greatest decline, 3,799, or 43 percent of the 1940 county population under age 18. The greatest gains in this age category were recorded in Polk County, 33,696; Linn County, 22,110; Black Hawk County, 21,163; and Scott County, 18,420.

Of the 115 Missouri counties, 88 experienced losses in this age group. Carroll County recorded the largest over-all
loss with a 51 percent decline in this age group. As was true in variable two, the largest increases were recorded in Clay, Jackson, and St. Louis Counties. These increases were 267 percent, 60 percent, and 204 percent respectively.

Seventy-four of the 93 Nebraska counties experienced declines in the age group under age 18. With one notable exception, the pattern of decline in rural areas and increase in urban areas was consistent with changes noted in variable two. Hall County, in the central part of the state, experienced a growth of 56 percent in the under 18 age group. This was a result of urban increases within the city of Grand Island during the 1940-1960 period.

Though substantial, the declines in this age group have not been as severe in South Dakota as in the other three states. Forty-five of the 67 South Dakota counties lost population in the 18 and under age group but the percent of decline was, in most cases, less than in the other states under study.

The bulk of the 21,263 increase in South Dakota was accounted for by increases in Minnehaha and Pennington Counties, each recording gains in excess of 14,000 young people.

**Change in number of persons employed in agriculture**

Since the largest single occupational group in three of the four states was agricultural employees, this classification was selected for purposes of analyzing changing occupa-
Table 7 indicates the over-all decline within each of the four states. The mean change varies from a decline of 384 per county in South Dakota to 1,359 per county in Missouri.

Missouri, with the largest number of agricultural employees, has also experienced the greatest decrease, 51 percent. By contrast, South Dakota, with the fewest number employed in agriculture, has experienced a decline of 26 percent, the least of the four states studied.

Except for St. Louis City, Missouri, Sherman County, Nebraska, and Douglas County, South Dakota, the remaining 371 counties studied all experienced declines in the number of persons employed in agriculture.
Change in median family income

Table 8 presents data relative to changes in median family income within counties of Iowa, Missouri, Nebraska, and South Dakota. Without exceptions, all counties recorded increases in median family income. Changes in median family income appear to be associated with two factors. Counties where median family income was highest in 1940 have experienced the largest increase and counties with larger urban centers consistently recorded larger increases during the 20 year period than did predominately rural counties. There is some indication that counties which experienced substantial population declines have equaled or exceeded the mean county increase in median family income.

Table 8. Mean change in median family income, 1940-1960, counties of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>State</th>
<th>Total Increase</th>
<th>( \bar{X} ) county increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>$154,399</td>
<td>$1,559</td>
</tr>
<tr>
<td>Missouri</td>
<td>193,839</td>
<td>1,685</td>
</tr>
<tr>
<td>Nebraska</td>
<td>132,202</td>
<td>1,324</td>
</tr>
<tr>
<td>South Dakota</td>
<td>78,742</td>
<td>1,175</td>
</tr>
</tbody>
</table>

Change in median years school completed for persons 25 years old and over

Table 9 indicates substantial differences in changing educational attainment among the four states. The median
educational attainment for Iowa and Nebraska residents over age 25 increased approximately 2 years, 1.95 years for Iowans and 2.07 years for Nebraskans. Mean increases within South Dakota counties was 1.43 years and Missouri counties recorded only a 1.06 year mean increase.

Table 9. Mean change in median years school completed, population 25 years old and over, 1940-1960, counties of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>State</th>
<th>Total Change</th>
<th>X county change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>193.5</td>
<td>1.95 years</td>
</tr>
<tr>
<td>Missouri</td>
<td>122.8</td>
<td>1.06 years</td>
</tr>
<tr>
<td>Nebraska</td>
<td>192.7</td>
<td>2.07 years</td>
</tr>
<tr>
<td>South Dakota</td>
<td>95.8</td>
<td>1.43 years</td>
</tr>
</tbody>
</table>

Within Iowa counties the mean change ranged from an increase of .5 years in Carroll County to 3.2 years in Hamilton County.

Within Missouri counties, the mean change ranged from an increase of .3 years in Platte County to a 3.3 year increase in Boone County.

Nebraska and South Dakota counties recorded similar ranges. Within Nebraska counties the educational change varied from a .6 year increase in Nancy County to a 3.7 years increase in Sarpy County. The South Dakota range was from
.7 year increase in Todd, Roberts, and Douglas Counties to 3.4 years increase in Day County.

Change in number of retail trade establishments

Substantial differences existed among the four states when considering changes that occurred in the number of retail trade establishments between 1939 and 1963. Table 10 presents these changes.

Table 10. Mean change in number of retail trade establishments, 1939-1963, counties of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>State</th>
<th>Total Change</th>
<th>X county change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>- 8,091</td>
<td>- 81.7</td>
</tr>
<tr>
<td>Missouri</td>
<td>- 10,894</td>
<td>- 94.7</td>
</tr>
<tr>
<td>Nebraska</td>
<td>- 3,096</td>
<td>- 33.3</td>
</tr>
<tr>
<td>South Dakota</td>
<td>- 2,652</td>
<td>- 39.5</td>
</tr>
</tbody>
</table>

Iowa and Missouri, the states with the largest number of retail establishments in 1939, recorded decreases of 81.7 percent and 94.7 percent respectively. Nebraska and South Dakota, both with less than 20,000 retail trade establishments in 1939, experienced losses of only 33.3 percent and 39.5 percent respectively.

Only 46 of the 374 counties under study recorded gains in the number of retail trade establishments. There appears
to be no core of commonality among counties recording increases. By contrast, however, counties with major urban centers in all four states were the counties in which the largest number of retail trade establishments were recorded. With few exceptions, these, and counties contiguous to urban counties, recorded the greatest losses during the 1939-1963 period. This pattern is clearly identifiable in Polk and Woodbury Counties in Iowa, Jackson County and St. Louis City, Missouri, Douglas County, Nebraska, and Pennington County, South Dakota.

Change in volume of retail trade within counties

Table 11 indicates mean retail trade increases within counties of the four states. The mean increases range from $10,540,612 in South Dakota counties to a high of $42,023,278 in Missouri counties.

Table 11. Mean change in total volume of retail trade, counties of Iowa, Missouri, Nebraska, and South Dakota, 1939-1963 (reported in thousands of dollars)

<table>
<thead>
<tr>
<th>State</th>
<th>Total change in volume</th>
<th>( \bar{X} ) county change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>$ 3,073,314</td>
<td>$ 31,043</td>
</tr>
<tr>
<td>Missouri</td>
<td>$ 4,832,677</td>
<td>$ 42,023</td>
</tr>
<tr>
<td>Nebraska</td>
<td>$ 1,698,114</td>
<td>$ 18,259</td>
</tr>
<tr>
<td>South Dakota</td>
<td>$ 706,221</td>
<td>$ 10,540</td>
</tr>
</tbody>
</table>
Great variations existed within counties of each state. Decatur County, Iowa, recorded an increase of only $6,507,000 as compared to a Polk County increase of $324,425,000. Morgan County, Missouri, recorded a decrease of $1,620,000 as compared to an increase of $931,639,000 in St. Louis County. Among Nebraska counties, McPherson recorded a decline of $87,000 in retail trade and Douglas County an increase of $448,098,000. Retail sales increases in South Dakota counties varied from a low of $84,000 in Washabaugh County to a high of $111,850,000 in Minnehaha County.

Change in number of non-operating school districts

Very different patterns are evident in changes that have taken place in the number of legally constituted non-operating school districts. An analysis of changes in numbers of non-operating districts is presented in Table 12.

Table 12. Mean change in the number of non-operating school districts, counties of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>Number of districts</th>
<th>Total change</th>
<th>X change per county</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1940</td>
<td>1960</td>
<td></td>
</tr>
<tr>
<td>Iowa</td>
<td>425</td>
<td>746</td>
<td>321</td>
</tr>
<tr>
<td>Missouri</td>
<td>554</td>
<td>409</td>
<td>-145</td>
</tr>
<tr>
<td>Nebraska</td>
<td>1,013</td>
<td>506</td>
<td>-507</td>
</tr>
<tr>
<td>South Dakota</td>
<td>351</td>
<td>1,057</td>
<td>706</td>
</tr>
</tbody>
</table>
In 1940, 2,343 non-operating districts were reported in the four state area. By 1960 this number had increased to 2,718. While the number of this type district was reduced by 145 in Missouri and by 507 in Nebraska, it flourished in Iowa and South Dakota. Iowa reported a gain of 321 non-operating districts and the number increased by 706 in South Dakota. There appears to be no consistent pattern in either the decreases recorded in Missouri and Nebraska nor in the increases recorded in Iowa and South Dakota.

Change in the number of elementary districts

The most extensive form of school organization in the midwest has been the elementary school district. Data on changes in this type district are presented in Table 13. In 1940, 18,660 districts of this type were organized in the four states. By 1960 this number had been reduced to 4,260.

Table 13. Mean change in the number of elementary school districts within counties of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>Number of districts</th>
<th>Total change</th>
<th>X change per county</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1940</td>
<td>1960</td>
<td>change</td>
</tr>
<tr>
<td>Iowa</td>
<td>3,455</td>
<td>353</td>
<td>-3,102</td>
</tr>
<tr>
<td>Missouri</td>
<td>7,263</td>
<td>982</td>
<td>-6,281</td>
</tr>
<tr>
<td>Nebraska</td>
<td>5,306</td>
<td>2,674</td>
<td>-2,632</td>
</tr>
<tr>
<td>South Dakota</td>
<td>2,636</td>
<td>2,751</td>
<td>115</td>
</tr>
</tbody>
</table>
All of this reduction was recorded in Iowa, Missouri, and Nebraska. The greatest decrease occurred in Missouri where the number was reduced from 7,263 to 982. In South Dakota the number of elementary districts increased from 2,636 to 2,751 during the 20 year period. The reduction of elementary districts in Iowa counties varied from 1 to 78. All 99 counties recorded some decrease. All Missouri counties also recorded decreases which ranged from 21 to 104. All but nine of Nebraska's counties decreased the number of elementary districts. These reductions varied from 3 to 78. By contrast, only 19 South Dakota counties reduced elementary districts. One county, Charles Mix, actually increased by 67 the number of elementary districts.

**Change in number of high school districts**

Change in the number of districts maintaining high schools only was initially identified as one of the four school type variables for analysis in this study. After collection of initial data, the number of districts in this classification was so limited the variable was dropped.

Within the states of Iowa and Missouri no school districts were organized exclusively for high school education. In Nebraska 32 districts conducted only high school programs in 1940, but this number had been reduced to 23 by 1960. In South Dakota five districts of this type were operational in 1940 and only one remained in 1960.
Since this was not a consistently organized type of school district within the four states and the numbers that were organized were insufficient for a reliable analysis, this variable was not utilized in later analyses.

Change in number of unified districts

Within all four states, reductions were recorded in the number of unified school districts. Table 14 indicates reductions of 409 in Iowa, 300 in Missouri, 298 in Nebraska, and 45 in South Dakota.

Table 14. Mean change in number of unified school districts, counties of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>No. of districts</th>
<th>Change</th>
<th>X change per county</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1940</td>
<td>1960</td>
<td></td>
</tr>
<tr>
<td>Iowa</td>
<td>970</td>
<td>561</td>
<td>-409</td>
</tr>
<tr>
<td>Missouri</td>
<td>846</td>
<td>546</td>
<td>-300</td>
</tr>
<tr>
<td>Nebraska</td>
<td>696</td>
<td>398</td>
<td>-298</td>
</tr>
<tr>
<td>South Dakota</td>
<td>295</td>
<td>250</td>
<td>-45</td>
</tr>
</tbody>
</table>

The mean county reduction in the number of unified school districts varied from .7 in South Dakota to 4.1 districts in Iowa.

All but 1 of Iowa's 99 counties reported reductions ranging from 1 to 35 districts. Ninety-seven of the 115 Missouri counties recorded reductions varying from 1 to 11
districts. All but 14 of Nebraska's 93 counties recorded declines ranging from 1 to 14.

Only 34 of the 67 South Dakota counties recorded reductions in the number of unified districts. These reductions ranged from only 1 to 6. By contrast, 8 South Dakota counties actually increased the number of unified districts. The greatest increases were recorded in Charles Mix and Beadle Counties. During the 1940-1960 period the number of unified districts in both counties increased by six.

Variable Data by Economic Areas Within States

The second phase of the data analysis involved the regrouping of initial county data into totals for economic areas. The economic areas employed were those delineated by Antonides (3), Campbell (11), Hughes (81), and Ottoson (79). Fifty-four economic areas were utilized: 16 in Iowa, 11 in Missouri, 15 in Nebraska, and 12 in South Dakota.

Area in square miles

There appears to be little consistency among any of the states in identifying similarly sized economic areas. Table 15 presents data on the mean size and range in economic area size.

The size of identified economic areas utilized in this study ranged from a 981 square mile unit in Nebraska to one encompassing 13,042 square miles, also in Nebraska. Iowa, the smallest of the four states studied, had identified the
largest number of economic areas. The 16 Regional Government Centers utilized in Iowa possessed a mean size of 3,539 square miles. The size of Iowa areas varied from 1,587 square miles in Area 8 to 4,933 square miles in Area 15. The generally uniform distribution of Iowa's population and the existence of 16 strategically dispersed population centers probably accounts for the greater uniformity in size.

Table 15. Mean area in square miles, economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>State</th>
<th>No. econ. areas</th>
<th>Total area</th>
<th>Mean area</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>16</td>
<td>56,030</td>
<td>3,539</td>
<td>1,587 - 4,933</td>
</tr>
<tr>
<td>Missouri</td>
<td>11</td>
<td>69,226</td>
<td>6,838</td>
<td>2,052 - 13,428</td>
</tr>
<tr>
<td>Nebraska</td>
<td>15</td>
<td>76,612</td>
<td>5,108</td>
<td>981 - 13,042</td>
</tr>
<tr>
<td>South Dakota</td>
<td>12</td>
<td>76,368</td>
<td>6,364</td>
<td>2,584 - 13,038</td>
</tr>
</tbody>
</table>

The mean size of the 11 Missouri economic areas was 6,838 square miles. The smallest area had been formed with 2,052 square miles. The largest area included 13,428 square miles.

The 15 Nebraska areas ranged in size from 981 square miles in Area 11 to 13,042 square miles in Area 3. The mean size of all Nebraska economic areas was 5,108 square miles.

The mean size of the 12 South Dakota areas was 6,364 square miles with a size range from 2,584 square miles in Area 2 to 13,038 square miles in Area 5.
Change in economic area population

Little consistency was evident when viewing total population changes that had occurred within economic areas during the 20 year period, 1940 to 1960. Table 16 presents data on the changes in total population and economic area.

Table 16. Mean change in total population, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>Total population change</th>
<th>Economic area change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>219,269</td>
<td>13,079</td>
</tr>
<tr>
<td>Missouri</td>
<td>526,836</td>
<td>47,894</td>
</tr>
<tr>
<td>Nebraska</td>
<td>95,496</td>
<td>6,364</td>
</tr>
<tr>
<td>South Dakota</td>
<td>39,919</td>
<td>3,326</td>
</tr>
</tbody>
</table>

In Iowa the mean increase in economic area population between 1940 and 1960 was 13,079. By contrast, the mean increase in Missouri was 47,894. The Nebraska and South Dakota mean increases were 6,364 and 3,326 respectively.

When analyzing more closely the great differences in economic area population change, one is lead to question the viability of some of the identified areas. Five of the 16 Iowa areas actually lost population during the 1940-1960 period. Six of the 11 Missouri areas experienced declines, some being rather substantial. Twelve of the 15 Nebraska areas
declined and a similar decline was recorded in nine of the 12 South Dakota areas.

**Change in density per square mile**

The mean density distribution was reported as positive in all states and varied from an 11 person per square mile increase in economic areas of South Dakota to an increase of 223 per square mile in economic areas of Iowa. Table 17 presents data relative to density distribution within economic areas of all states.

Table 17. Mean change in population density per square mile, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>X change per economic area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>223</td>
</tr>
<tr>
<td>Missouri</td>
<td>89</td>
</tr>
<tr>
<td>Nebraska</td>
<td>217</td>
</tr>
<tr>
<td>South Dakota</td>
<td>11</td>
</tr>
</tbody>
</table>

Though the mean distribution was positive, an analysis of individual economic areas indicated 35 of the 54 areas actually declined in over-all density.

**Change in area population under age 18**

The mean change in economic area population under age 18 is reported in Table 18.
Table 18. Mean change in area population under age 18, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>Total change</th>
<th>$\bar{X}$ economic area change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>128,335</td>
<td>8,021</td>
</tr>
<tr>
<td>Missouri</td>
<td>241,451</td>
<td>21,946</td>
</tr>
<tr>
<td>Nebraska</td>
<td>43,931</td>
<td>2,929</td>
</tr>
<tr>
<td>South Dakota</td>
<td>21,263</td>
<td>1,772</td>
</tr>
</tbody>
</table>

Though the mean economic area change is recorded as positive in all four states, a very diverse pattern is present among the economic areas of each state. In Iowa, only three areas reported population declines in the under 18 age group. In Missouri, however, 8 of the 11 areas experienced declines in this age category. The total state increase in Missouri was concentrated in two counties, Jackson and St. Louis. Similar observations can be made in Nebraska and South Dakota. Twelve of the 15 Nebraska areas experienced declines in the under 18 age group. Most Nebraska gains in this age category were recorded in Douglas and Lancaster Counties. Half of the 12 South Dakota areas declined in this age grouping. The largest increases in South Dakota were recorded in Minnehaha and Pennington Counties.
Change in number of persons employed in agriculture

All 54 economic areas employed in the study experienced declines in agricultural workers. Mean changes are reported in Table 19.

Table 19. Mean change in number of persons employed in agriculture, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>Total change</th>
<th>$\bar{x}$ economic area change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>-98,516</td>
<td>-6,157</td>
</tr>
<tr>
<td>Missouri</td>
<td>-156,278</td>
<td>-14,207</td>
</tr>
<tr>
<td>Nebraska</td>
<td>-50,653</td>
<td>-3,377</td>
</tr>
<tr>
<td>South Dakota</td>
<td>-25,746</td>
<td>-2,149</td>
</tr>
</tbody>
</table>

The mean declines varied from a low of 2,149 in South Dakota to a high of 14,207 in Missouri. Within the economic areas of each state a variable pattern of decline is apparent but it is similar to the pattern described for declines within counties earlier in this chapter.

Change in median family income

Table 20 presents data on the mean change in family income within economic areas of each state.

The mean increase in median family income within Iowa economic areas was $1,598 but varied from $983 to $2,495. In Missouri, the mean increase was $1,585 and the range was from
$1,238 to $2,140. The mean increase for Nebraska economic areas was $1,370 and individual area increases ranged from $668 to $2,258. The mean increase recorded for South Dakota economic areas was $1,141. Individual South Dakota economic area increases ranged from $805 to $1,929.

Table 20. Mean change in median family income, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>X economic area change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>$1,598</td>
</tr>
<tr>
<td>Missouri</td>
<td>1,585</td>
</tr>
<tr>
<td>Nebraska</td>
<td>1,370</td>
</tr>
<tr>
<td>South Dakota</td>
<td>1,141</td>
</tr>
</tbody>
</table>

Within the four states, the economic areas with the largest urban centers consistently recorded the highest increases in median family income.

Change in years school completed, population 25 years old and over

The median years school completed, when computed on an economic area basis, varied from 1.0 years increase in Missouri to 2.0 years increase in Iowa and Nebraska. The South Dakota increase fell between the extremes at 1.5 years.

Table 21 presents data regarding the mean change in educational attainment.
Table 21. Mean change in median years school completed, population 25 years old and over, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>( \bar{X} ) economic area change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>2.0</td>
</tr>
<tr>
<td>Missouri</td>
<td>1.0</td>
</tr>
<tr>
<td>Nebraska</td>
<td>2.0</td>
</tr>
<tr>
<td>South Dakota</td>
<td>1.5</td>
</tr>
</tbody>
</table>

There appeared to be no uniform pattern of change within economic areas of any state. As was true in observing Missouri county changes, the economic areas of Missouri have recorded the lowest over-all increase in educational attainment during the same period.

Change in retail trade establishments

Table 22 presents an analysis of the mean economic area changes in the number of retail trade establishments.

Table 22. Mean change in number of retail trade establishments, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>Total change</th>
<th>( \bar{X} ) economic area change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>-8,091</td>
<td>-506</td>
</tr>
<tr>
<td>Missouri</td>
<td>-10,894</td>
<td>-990</td>
</tr>
<tr>
<td>Nebraska</td>
<td>-3,096</td>
<td>-106</td>
</tr>
<tr>
<td>South Dakota</td>
<td>-2,652</td>
<td>-221</td>
</tr>
</tbody>
</table>
Each state recorded substantial decreases in the number of such establishments. The mean decreases vary from only 221 in South Dakota's economic areas to 990 in Missouri's economic areas. All 54 areas under study recorded declines. As was true in the county analysis, economic areas with the largest population centers also recorded the greatest numerical declines in the number of retail trade establishments.

Change in volume of retail trade

Great differences existed between states and economic areas when considering changes in the volume of retail trade during the 1940-1960 period.

Table 23 presents data regarding changes in the volume of retail trade within the economic areas.

Table 23. Mean change in total volume of retail trade, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960 (reported in thousands of dollars)

<table>
<thead>
<tr>
<th>State</th>
<th>Total change</th>
<th>X economic area change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>$ 3,073,314</td>
<td>$ 192,082</td>
</tr>
<tr>
<td>Missouri</td>
<td>4,832,677</td>
<td>439,334</td>
</tr>
<tr>
<td>Nebraska</td>
<td>1,698,114</td>
<td>113,208</td>
</tr>
<tr>
<td>South Dakota</td>
<td>706,221</td>
<td>58,852</td>
</tr>
</tbody>
</table>

All economic areas experienced substantial growth in the volume of retail trade. However, the extent of growth appears
to be closely associated with changes in total area population. Economic areas that recorded the largest numerical population gains were also the areas recording the largest increase in retail trade. Though a number of economic areas declined in over-all population, the volume of retail trade increased in all areas.

Change in number of non-operating school districts

Within the economic areas of Iowa and South Dakota substantial increases were recorded in the number of non-operating school districts. Changes in the number of non-operating districts are reported in Table 24.

Table 24. Mean change in number of non-operating school districts, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>Total change</th>
<th>$\bar{X}$ economic area change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>321</td>
<td>20</td>
</tr>
<tr>
<td>Missouri</td>
<td>-145</td>
<td>-13</td>
</tr>
<tr>
<td>Nebraska</td>
<td>-507</td>
<td>-34</td>
</tr>
<tr>
<td>South Dakota</td>
<td>706</td>
<td>59</td>
</tr>
</tbody>
</table>

The mean economic area increase in Iowa was 20. South Dakota areas recorded a mean increase of 59 non-operating districts. By contrast, Missouri and Nebraska recorded mean decreases of 13 and 34 respectively. The Iowa area recording the greatest increase, 109 districts, was an area also report-
ing a substantial population decline. In South Dakota the opposite appeared to be the case. Economic Areas 1, 9, and 10 reported gains of 120, 118, and 127 non-operating districts. These are also economic areas of greatest population concentration in South Dakota.

**Change in number of elementary school districts**

All economic areas of the four states recorded sizable reductions in the number of operating elementary school districts. These changes are reported in Table 25.

Table 25. Mean change in number of elementary school districts, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>Total change</th>
<th>÷ economic area change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>- 3,102</td>
<td>- 194</td>
</tr>
<tr>
<td>Missouri</td>
<td>- 6,281</td>
<td>- 571</td>
</tr>
<tr>
<td>Nebraska</td>
<td>- 2,632</td>
<td>- 175</td>
</tr>
<tr>
<td>South Dakota</td>
<td>115</td>
<td>9</td>
</tr>
</tbody>
</table>

An analysis of individual economic areas suggests a consistent pattern of reduction in all states except South Dakota. Of the 12 South Dakota economic areas, eight recorded gains which varied from two districts in Area 4 to 79 districts in Area 2.
Change in number of unified districts

During the 20 year period, 1940-1960, the total number of unified school districts was reduced from 2,807 to 1,755. The state break-down on these changes is reported in Table 26.

Table 26. Mean change in number of unified school districts, economic areas of Iowa, Missouri, Nebraska, and South Dakota, 1940-1960

<table>
<thead>
<tr>
<th>State</th>
<th>Total change</th>
<th>$\bar{x}$ economic area change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa</td>
<td>-409</td>
<td>-26</td>
</tr>
<tr>
<td>Missouri</td>
<td>-300</td>
<td>-27</td>
</tr>
<tr>
<td>Nebraska</td>
<td>-298</td>
<td>-19</td>
</tr>
<tr>
<td>South Dakota</td>
<td>-45</td>
<td>-4</td>
</tr>
</tbody>
</table>

The mean economic area decrease in number of unified school districts ranged from only four per area in South Dakota to 27 in Missouri. Within economic areas of specific states, equally as great a range was recorded. In Iowa, the range in decrease was from 11 in Economic Area 16 to 40 in Economic Area 8. In Missouri, Areas 2 and 6 decreased unified districts by 10 while the number in Area 1 decreased by 54. Economic Area 2 in Nebraska decreased the number of unified districts by only two while the number declined by 45 in Area 7. Half of the 12 South Dakota areas experienced reductions in unified districts and these ranged from a reduction of two in Area 6 to 13 in Area 10.
Relationship Between Variables

The initial phase in analyzing the data was to compute Pearson product-moment coefficients of correlation utilizing all data collected on the 374 county units. The purpose of this analysis was to determine the relationship that existed between all variables. Utilizing the formula from Wert (101)

\[ r_{xy} = \frac{\sum xy}{\sqrt{(\sum x^2)(\sum y^2)}} \]

correlation coefficients were computed and tabled in a 12 x 12 matrix reported in Table 27.

Variables utilized in computing correlation coefficients were:

Variable 1. area per square mile
Variable 2. change in total area population
Variable 3. change in population density per square mile
Variable 4. change in area population under age 18
Variable 5. change in number of persons employed in agriculture
Variable 6. change in median family income
Variable 7. change in median years school completed, population 25 years old and over
Variable 8. change in number of retail trade establishments
Variable 9. change in total volume of retail trade
Variable 10. change in number of non-operating school districts
Variable 11. change in number of elementary school districts
Variable 12. change in number of unified school districts

Relationship between variables

The computed correlation coefficients for all data utilized in the study are reported in Table 27. An operational decision was made to consider only those coefficients that exceeded $-0.50$ as measures expressing strong relationship between variables. Wert (101) indicates that in educational and psychological research coefficients of $0.30$ to $0.40$ are normally considered sufficiently high to indicate relationship between variables. In order to be assured that coefficients expressed a strong relationship between variables, the level of $-0.50$ was arbitrarily established.

Utilizing this operational limitation, only six strong positive relationships are suggested in Table 27.

1. With a coefficient of $0.76$, there are indications that as total area population changes, the population density per square mile tends to change in the same direction.

2. With a coefficient of $0.97$, as total population changes, there is a very strong tendency for the population under age 18 to alter correspondingly. It suggests these variables move directly together.

3. With a coefficient of $0.74$, as total area population changes, there are indications the total volume of
retail sales will tend to change correspondingly.

4. With a coefficient of .61, there are indications that as population density per square mile changes, there is a tendency for area population under age 18 to change in the same direction.

5. With a coefficient of .74, as population density per square mile alters, the number of retail trade establishments tend to change similarly.

6. With a coefficient of .86, a relatively high positive relationship exists between changes in area population under age 18 and changes in the volume of retail trade.

A seventh relationship was indicated, though not as pronounced as the previous six. There appears to be a positive relationship between changes in the number of persons employed in agriculture and changes in the number of elementary school districts. Though the coefficient of correlation is less than the previous six, a .57 coefficient is sufficiently high to be considered of some import.

When considering all correlation coefficients computed utilizing the data from the 374 counties within the four states, only the seven previously stated appear sufficiently large to indicate strong positive relationships. No strong negative relationships were apparent. Most coefficients were in the range that would suggest little or no relationship between variables.
Table 27. Pearson product-moment correlation matrix, 374 counties of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-0.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>-0.03</td>
<td>0.97</td>
<td>0.61</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.15</td>
<td>-0.24</td>
<td>-0.21</td>
<td>-0.22</td>
<td>1.00</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.03</td>
<td>0.36</td>
<td>0.20</td>
<td>0.38</td>
<td>0.35</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.02</td>
<td>0.20</td>
<td>0.17</td>
<td>0.19</td>
<td>0.16</td>
<td>0.17</td>
<td>1.00</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.07</td>
<td>0.20</td>
<td>0.74</td>
<td>-0.01</td>
<td>-0.05</td>
<td>-0.08</td>
<td>0.05</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>-0.08</td>
<td>0.74</td>
<td>0.21</td>
<td>0.86</td>
<td>0.25</td>
<td>0.40</td>
<td>0.13</td>
<td>-0.48</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>-0.14</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
<td>0.04</td>
<td>-0.15</td>
<td>-0.11</td>
<td>-0.01</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>0.17</td>
<td>-0.07</td>
<td>-0.09</td>
<td>-0.05</td>
<td>0.57</td>
<td>-0.24</td>
<td>-0.21</td>
<td>-0.05</td>
<td>-0.08</td>
<td>0.34</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0.05</td>
<td>0.06</td>
<td>0.01</td>
<td>0.06</td>
<td>0.17</td>
<td>-0.11</td>
<td>-0.11</td>
<td>0.01</td>
<td>0.01</td>
<td>0.15</td>
<td>0.12</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Since the correlation coefficients presented in Table 27 indicate limited relationship between variables, four additional matrices were computed utilizing data from each of the four states separately. Matrices indicating the relationship between variables within individual states are presented in Table 28 for Iowa, Table 29 for Missouri, Table 30 for Nebraska, and Table 31 for South Dakota.

Iowa correlation analysis

The Iowa data analysis indicates there was a very strong positive relationship between change in the total population and four variables; change in population density (.99), change in area population under age 18 (.99), change in total volume of retail trade (.94), and to a lesser degree, change in median family income (.62).

Correlation coefficients indicate a very strong positive relationship between change in population density and the following: change in the area population under age 18 (.98), change in total volume of retail trade (.93), and to a lesser degree, change in median family income (.62).

A strong positive relationship was also evidence between change in the area population under age 18 and change in the volume of retail trade (.95), and to a lesser degree with changes in median family income (.61).

A fairly strong positive relationship, .62, was indicated between change in median family income and change in the
Table 28. Pearson product-moment correlation matrix, 99 Iowa counties

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
<th>8</th>
<th>9</th>
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<tbody>
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<td>2</td>
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</tr>
<tr>
<td>3</td>
<td>.08</td>
<td>.99</td>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>.15</td>
<td>.99</td>
<td>.98</td>
<td>1.00</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>-.65</td>
<td>-.30</td>
<td>-.26</td>
<td>-.32</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>.07</td>
<td>.62</td>
<td>.62</td>
<td>.61</td>
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</tr>
<tr>
<td>7</td>
<td>-.01</td>
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<td>.14</td>
<td>.15</td>
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<td>.29</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>-.32</td>
<td>-.38</td>
<td>-.34</td>
<td>-.41</td>
<td>.50</td>
<td>-.31</td>
<td>-.13</td>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>.23</td>
<td>.94</td>
<td>.93</td>
<td>.95</td>
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<td>.02</td>
<td>.16</td>
<td>-.59</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>.09</td>
<td>-.07</td>
<td>-.08</td>
<td>-.02</td>
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</table>
volume of retail trade in Iowa.

**Missouri correlation analysis**

There appears to be less relationship among variables in Missouri than was evidenced in Iowa.

Within Missouri counties coefficients presented in Table 29 indicate a strong positive relationship between change in total area population and the following: change in density per square mile (.75), change in area population under age 18 (.97), and change in the volume of retail trade (.72).

A coefficient of .80 suggests a strong positive relationship between change in density distribution and changes in the number of retail trade establishments.

The only other indication of a strong positive relationship exists between change in area population under age 18 and change in the volume of retail trade (.85).

A coefficient of -.61 suggests a sizable negative relationship between area in square miles and changes in the number of elementary school districts within Missouri. Contrary to what would normally be expected, this suggests that as geographic areas of Missouri decrease, there is a tendency for elementary school districts to increase. The opposite of this would also be suggested.

**Nebraska correlation analysis**

Extremely high positive coefficients suggest that as the area population of Nebraska changes, population density (.95),
Table 29. Pearson product-moment correlation matrix, 115 Missouri counties

<table>
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Table 30. Pearson product-moment correlation matrix, 93 Nebraska counties

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</table>
area population under age 18 (.99), and the volume of retail trade (.96) tend to change also, and in the same direction.

Similarly, high positive coefficients suggest that as density per square mile changes, the population under age 18 (.97) and the volume of retail sales (.93) tend to change in the same direction.

Lastly, as the area population under age 18 changes, the total volume of retail trade tends to change (.97).

A very strong negative relationship, −.81, was evidenced when comparing changes in the number of retail trade establishments and changing volume of retail trade in Nebraska. This would suggest that as the volume of retail trade increased, there is a tendency for the number of retail trade establishments to decline. The opposite might also be stated.

South Dakota correlation analysis

The South Dakota analysis is almost identical to that of Nebraska. Very high positive coefficients indicate that as area population changes in South Dakota population density (.86), area population under age 18 (.99), and the volume of retail trade (.92) tend to change also.

A coefficient of .87 indicates a strong positive relationship between the density per square mile and the volume of retail sales.

Lastly, as the area population under age 18 changes,
Table 31. Pearson product-moment correlation matrix, 67 South Dakota counties

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there is a strong positive relationship, .92, which suggests change in the volume of retail sales tends to move in the same direction.

**Summary of correlation analysis**

When considering the four state correlation analysis, as well as the individual state analyses, several generalizations can be made.

First, consistently high and strong positive relationships exist between variables two, three, four, and nine. This would suggest that as total area population changes, population density, area population under age 18, and the volume of retail sales tend to change in the same direction. The coefficients are sufficiently high to suggest that these variables move directly together.

Secondly, no positive relationships of substantial magnitude existed when comparing demographic variables with school size variables. Within several states there was some evidence of negative relationships, but these were not sufficiently large to be considered relevant. This would suggest that changes that have taken place in the four state area in identified demographic variables have little or no relationship to changes that have taken place in the number of non-operating school districts, elementary school districts, and unified districts.

Thirdly, the pattern of variable relationship appears
quite similar in Missouri, Nebraska, and South Dakota. In Iowa, high positive correlation coefficients suggest a relationship between more variables than is evidenced in the other states.

Analysis of Variance

To test the hypotheses initially generated for this study, Analysis of Variance was employed as the final statistical tool. Utilizing a completely randomized design with unequal cell observations, F values were computed. The design of this experiment was classified as a nested design with unequal N. The linear additive model employed was:

\[ Y_{ijk} = \mu + \tau_i + \epsilon_{ij} + \eta_{ijk}; \quad i = 1, \ldots, t \\
\quad \quad \quad \quad \quad \quad j = 1, \ldots, n_i \\
\quad \quad \quad \quad \quad \quad k = 1, \ldots, n_{ij} \]

where \( \mu \) is the mean effect, \( \tau_i \) is the effect of states, \( \epsilon_{ij} \) is the economic area effect, and \( \eta_{ijk} \) is the county effect or error term. The term \( i = 1, \ldots, t \) indicates states, \( j = 1, \ldots, n_i \) indicates economic areas nested within states, and \( k = 1, \ldots, n_{ij} \) indicates counties nested within economic areas within states.

Table 32 contains the Analysis of Variance model employed for this design.

To test the hypothesis that there were no significant differences between economic areas (\( H: \tau_{1j} = 0 (j = 1, \ldots, n_i) \)
Table 32. Generalized analysis of variance for a completely randomized design with subsampling (unequal numbers: Model I)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>Expected Mean Square</th>
</tr>
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<td>Mean</td>
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<td>$M_{yy}$</td>
<td>$M$</td>
<td>$\ldots \ldots$</td>
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<tr>
<td>States</td>
<td>$t-1$</td>
<td>$T_{yy}$</td>
<td>$T$</td>
<td>$\sigma^2 + c_2 \sigma^2 + \frac{t}{\sum_{i=1}^{t} \sum_{j=1}^{n_{ij}} (n_{ij} - 1)^2} / (t-1)$</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>$\sum_{i=1}^{t} (n_i - 1)$</td>
<td>$E_{yy}$</td>
<td>$E$</td>
<td>$\sigma^2 + c_1 \sigma^2$</td>
</tr>
<tr>
<td>Sampling Error</td>
<td>$\sum_{i=1}^{t} \sum_{j=1}^{n_j} (n_{ij} - 1)$</td>
<td>$S_{yy}$</td>
<td>$S$</td>
<td>$\sigma^2$</td>
</tr>
<tr>
<td>Total</td>
<td>$N$</td>
<td>$y^2$</td>
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</table>
the formula below was employed. The following uniform numerical subscripts were employed in formuli development and derivation: 1, states; 2, economic areas; 3, counties.

\[
\frac{F}{\text{Mean Square}_2} = \frac{\text{Mean Square}_3}
\]

Since no exact test of \( H: \gamma_1 = 0 \) (i = 1, ..., t) is available, the Cochran-Satterthwaite approximate test procedure was employed. Using estimates of the components of variance, mean squares were synthesized which had the same expected values. These synthetic mean squares were then used to form a ratio which was approximately distributed as F. This was accomplished by making a linear combination of the Mean Squares for economic areas and counties. This combination resulted in the following test ratio:

\[
\tilde{F} = \frac{\sigma_n^2 + c_2 \sigma^2 + \sum_{i=1}^{t} \left( \sum_{j=1}^{n_i} \frac{n_{ij}}{n_i} \right)^2 \gamma_1^2}{(t-1)}
\]

\[
\frac{c_2}{c_1} \text{MS}_2 + \left(1 - \frac{c_2}{c_1}\right) \text{MS}_3 \quad \text{or} \quad \sigma^2 + c_2 \sigma^2
\]

The resulting linear combination made necessary additional computation to arrive at the correct degrees of freedom for the denominator. The correct degrees of freedom were determined from the following formula:
Denominator DF = \[
\frac{\left[ \frac{c_2}{c_1} (MS_2) + \left( \frac{c_1-c_2}{c_1} \right) MS_3 \right]^2}{\left[ \frac{c_2}{c_1} (MS) \right]^2 + \left[ \left( \frac{c_1-c_2}{c_1} \right) MS_3 \right]^2}
\]

This was then employed to test the hypothesis that there were no significant differences between states.

Tables 33 through 44 present the analysis of variance for each of the 12 variables utilized in the correlation analyses.

Variable 1. There are no differences in area in square miles between economic areas. The null hypothesis is rejected. The computed F value for economic area differences was 3.51 which is greater than 1.35 needed for significance at the five percent level. This supports the earlier contention that there were substantial differences in the geographic area of economic areas within all four states.

There are no differences in area in square miles between states. The null hypothesis is rejected. The computed F value for state differences was 26.31 which is substantially greater than 1.52 needed for significance at the one percent level. In fact, there were highly significant differences in the geographic area of the states.
Table 33. Analysis of variance of area in square miles between states and economic areas in Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
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<td>5,515,754</td>
<td>26.31**</td>
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<td>583,640</td>
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<td>County (Error)</td>
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<tr>
<td>Total</td>
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<td>98,907,648</td>
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</table>

** The computed F value for state differences was 26.31 which is greater than 1.52 needed for highly significant variations at the one percent level.

* The computed F value for economic area differences was 3.51 which is greater than 1.35 needed for significance at the five percent level.
Table 34. Analysis of variance of change in area population between states and economic areas in Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
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<td>3</td>
<td>943,272,448</td>
<td>314,424,064</td>
<td>0.47</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>17,307,242,496</td>
<td>346,144,768</td>
<td>0.49</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>226,862,497,791</td>
<td>708,945,152</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>245,113,094,143</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 35. Analysis of variance of change in population density between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>3</td>
<td>82,909</td>
<td>27,636</td>
<td>0.05</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>4,392,508</td>
<td>87,850</td>
<td>0.13</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>210,042,256</td>
<td>656,382</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>214,517,680</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 36. Analysis of variance of change in area population under age 18 between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>3</td>
<td>194,903,552</td>
<td>64,967,840</td>
<td>0.53</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>4,430,295,040</td>
<td>88,605,888</td>
<td>0.70</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>40,427,335,680</td>
<td>126,335,424</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>45,052,534,784</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 37. Analysis of variance of changes in numbers of persons employed in agriculture between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>3</td>
<td>54,602,752</td>
<td>18,200,912</td>
<td>104.55**</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>22,804,736</td>
<td>456,094</td>
<td>3.23*</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>45,220,608</td>
<td>141,314</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>122,628,096</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** The computed F value for state differences was 104.55 which is greater than 1.52 needed for highly significant differences at the one percent level.

* The computed F value for economic area differences was 3.23 which is greater than 1.35 needed for significance at the five percent level.
Table 38. Analysis of variance of changes in median family income between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>3</td>
<td>13,919,488</td>
<td>4,639,829</td>
<td>12.59**</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>63,593,984</td>
<td>1,271,879</td>
<td>4.82**</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>84,365,824</td>
<td>263,643</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>161,879,296</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** The computed F value for state differences was 12.59 which is greater than 1.52 needed for highly significant differences at the one percent level.

** The computed F value for economic area differences was 4.82 which is greater than 4.22 needed for highly significant differences at the one percent level.
Table 39. Analysis of variance of change in median school years completed, population 25 years old and over between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>3</td>
<td>6,756.5625</td>
<td>2,252.1875</td>
<td>54.96**</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>5,466.3750</td>
<td>109.3275</td>
<td>3.31*</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>10,572.1250</td>
<td>33.0379</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>22,795.0625</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** The computed F value for state differences was 54.96 which is greater than 1.52 needed for highly significant differences at the one percent level.

* The computed F value for economic area differences was 3.31 which is greater than 1.35 needed for significance at the five percent level.
Table 40. Analysis of variance of change in number of retail trade establishments between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>3</td>
<td>265,667</td>
<td>88,555</td>
<td>0.71</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>1,345,566</td>
<td>26,911</td>
<td>0.20</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>43,351,952</td>
<td>135,474</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>44,963,200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 41. Analysis of variance of change in total volume of retail trade between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>3</td>
<td>52,709,621,760</td>
<td>17,569,873,920</td>
<td>2.66</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>260,376,428,543</td>
<td>5,207,527,424</td>
<td>0.77</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>2,169,601,261,567</td>
<td>6,780,002,304</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>2,482,688,229,375</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 42. Analysis of variance of change in number of non-operating school districts between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>3</td>
<td>11,050.9453</td>
<td>3,683.6484</td>
<td>48.27**</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>10,117.2383</td>
<td>202.3448</td>
<td>3.28*</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>19,734.8125</td>
<td>61.6713</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>40,902.9961</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** The computed F value for state differences was 48.27 which is greater than 1.52 needed for highly significant differences at the one percent level.

* The computed F value for economic area differences was 3.28 which is greater than 1.35 needed for significance at the five percent level.
Table 43. Analysis of variance of changes in number of elementary school districts between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>3</td>
<td>136,297.2500</td>
<td>45,432.4141</td>
<td>143.32**</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>38,463.8750</td>
<td>769.2773</td>
<td>2.91*</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>84,622.5625</td>
<td>264.4453</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>259,383.6875</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** The computed F value for state differences was 143.32 which is greater than 1.52 needed for highly significant differences at the one percent level.

* The computed F value for economic area differences was 2.91 which is greater than 1.35 needed for significance at the five percent level.
Table 44. Analysis of variance of changes in number of unified school districts between states and economic areas of Iowa, Missouri, Nebraska, and South Dakota

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Degrees of Freedom</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>3</td>
<td>498.3196</td>
<td>166.1065</td>
<td>19.50**</td>
</tr>
<tr>
<td>Economic Areas</td>
<td>50</td>
<td>980.7820</td>
<td>19.6156</td>
<td>2.71*</td>
</tr>
<tr>
<td>County (Error)</td>
<td>320</td>
<td>2,313.7969</td>
<td>7.2306</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>373</td>
<td>3,792.8984</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** The computed F value for state differences was 19.50 which is greater than 1.52 needed for highly significant differences at the one percent level.

* The computed F value for economic area differences was 2.71 which is greater than 1.35 needed for significance at the five percent level.
Variable 2. There are no differences in change in area population between economic areas. The null hypothesis is retained.

There are no differences in change in area population between states. The null hypothesis is retained.

Variable 3. There are no differences in change in population density between economic areas. The null hypothesis is retained.

There are no differences in change in population density between states. The null hypothesis is retained.

Variable 4. There are no differences in change in area population under age 18 between economic areas. The null hypothesis is retained.

There are no differences in change in area population under age 18 between states. The null hypothesis is retained.

Variable 5. There are no differences in change in number of persons employed in agriculture between economic areas. The null hypothesis is rejected. The computed $F$ value for economic area differences was 3.23 which is greater than 1.35 needed for significance at the five percent level.

There are no differences in change in number of persons employed in agriculture between states. The null hypothesis is rejected. The computed $F$ value for state differences
was 104.55 which is substantially greater than 1.52 needed for significance at the one percent level.

Variable 6. There are no differences in change in median family income between economic areas. The null hypothesis is rejected. The computed F value for economic area differences was 4.82 which is greater than 4.22 needed for significance at the one percent level.

There are no differences in change in median family income between states. The null hypothesis is rejected. The computed F value for state differences was 12.59 which is greater than 1.52 needed for significance at the one percent level.

Variable 7. There are no differences in changes in median school years completed, population 25 years old and over, between economic areas. The null hypothesis is rejected. The computed F value for economic area differences was 3.31 which is greater than 1.35 needed for significance at the five percent level.

There are no differences in changes in median school years completed, population 25 years old and over, between states. The null hypothesis is rejected. The computed F value for state differences was 54.96 which is substantially greater than 1.52 needed for significance at the one percent level.

Variable 8. There are no differences in changes in the number of retail trade establishments between economic
areas. The null hypothesis is retained.

There are no differences in changes in the number of retail trade establishments between states. The null hypothesis is retained.

**Variable 9.** There are no differences in changes in total volume of retail trade between economic areas. The null hypothesis is retained.

There are no differences in changes in total volume of retail trade between states. The null hypothesis is retained.

**Variable 10.** There are no differences in change in number of non-operating school districts between economic areas. The null hypothesis is rejected. The computed F value for economic area differences was 3.28 which is greater than 1.35 needed for significance at the five percent level.

There are no differences in change in number of non-operating school districts between states. The null hypothesis is rejected. The computed F value for state differences was 48.27 which is much greater than 1.52 needed for significance at the one percent level.

**Variable 11.** There are no differences in change in number of elementary school districts between economic areas. The null hypothesis is rejected. The computed F value for economic area differences was 2.91 which was greater than 1.35 needed for significance at the five per-
cent level.

There are no differences in change in number of elementary school districts between states. The null hypothesis is rejected. The computed F value for state differences was 143.32 which is substantially greater than 1.52 needed for significance at the one percent level.

Variable 12. There are no differences in change in number of unified school districts between economic areas. The null hypothesis is rejected. The computed F value for economic area differences was 2.71 which is greater than 1.35 needed for significance at the five percent level.

There are no differences in change in number of unified school districts between states. The null hypothesis is rejected. The computed F value for state differences was 19.50 which is greater than 1.52 needed for significance at the one percent level.
CHAPTER V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The general problem of this study was to assess the impact that changes in selected demographic variables had on the changing structure of local school districts within counties and economic areas of Iowa, Missouri, Nebraska, and South Dakota during the 1940 to 1960 period. In arriving at this assessment, the relationship that existed between demographic variables was measured by Pearson product-moment correlation coefficients. The same statistical measure was employed to measure the relationship between demographic variables and school type variables. Analysis of variance was employed as the final statistical tool to measure the variances that existed when considering variable change that had occurred among economic areas and among states.

The most salient findings are presented below.

Demographic Variable Data

The following summary of the findings relative to the nine demographic variables is presented for county, as well as economic area data.

Area in square miles

The geographic area of all counties within Iowa, Missouri, and Nebraska had remained constant during the 1940-1960 period. In South Dakota, however, Armstrong County had
been legally dissolved and the area merged with Dewey County. The smallest county organized in the four states was St. Louis City, Missouri, with 61 square miles. The largest was Cherry County, Nebraska, with 5,982 square miles. The mean size of counties in Iowa and Missouri was comparable, 566 square miles in Iowa, and 602 square miles in Missouri. The range in size was also comparable in Iowa and Missouri.

Much greater variations existed in the size of Nebraska and South Dakota counties. The mean size of Nebraska and South Dakota counties was substantially larger, 824 square miles in Nebraska and 1,140 square miles in South Dakota. The smaller counties were concentrated in the eastern portions of both states where population concentrations were highest. In the western areas of both states where the population density declines, in some areas to less than 1.0 per square mile, counties tend to be much larger geographically.

Though very similar criteria had been employed in the identification of economic areas of all states, little consistency was apparent in their geographic delineation within individual states. The 16 Iowa areas were the most uniform in size. They ranged from 1,587 square miles to 4,933 square miles. The greatest variance in size was recorded for Nebraska areas, from 981 square miles to 13,042 square miles. One factor that accounts for some extremely small Nebraska areas is the location of the principal population center of
the areas. In his delineation, Ottoson (79) suggested that areas of contiguous states related to Nebraska cities for economic consideration. Therefore, border economic areas of all states could probably be enlarged by enscribing areas of adjacent states. This consideration was not utilized in data collection or analysis for this study.

Change in area population

Over-all population gains were recorded in all four states. The rate of growth was substantially different, however. The Missouri population increased 14 percent, Iowa's 8 percent, Nebraska's 7 percent, and South Dakota's 6 percent.

Of more importance was the consistent pattern of internal state change. Of the 374 counties studied, 269 lost population. Some counties in all four states had recorded losses in excess of 50 percent of their 1940 population. The highest rate of loss was generally recorded in counties with predominately rural populations. The eleven largest urban centers in the four-state area recorded population gains which exceeded the total four-state increase. Though not studied in depth, there was evidence, especially in the Missouri data, that central city population declined and suburban population increased substantially.

A similar pattern of inconsistent growth was evidenced in economic areas. Over half of the economic areas identified, 31 of 54, recorded population losses. Without excep-
tion the economic areas recording the highest growth rates were those possessing the largest central cities. Those recording the highest declines were the areas organized around the smallest urban places.

**Change in population density**

Change in density distribution reflected the change in area population. A consistent pattern of increase was recorded in most counties with large urban populations. Changes in population density ranged from a loss of 10,823 per square mile in St. Louis City to a gain of 8,638 per square mile in St. Louis County. With few exceptions, counties with the sparsest population in 1940 recorded the highest percent of decline.

Within the economic areas of the four states, mean increases in density ranged from 11 per square mile in South Dakota to 223 per square mile in Iowa. As was evidenced in the analysis of area population changes, 34 of the 54 economic areas actually declined in over-all density.

**Change in population under age 18**

The mean county change in population under age 18 varied from a low of 317 per county increase in South Dakota to a mean increase of 2,099 per county in Missouri. Because of extremely large gains in a limited number of urban places in each state, the mean increases tended to distort
the actual pattern of change. An analysis of individual counties indicated 255 of the 374 counties studied recorded declines. As was true of total area population change, counties with predominately rural populations recorded the highest rate of decline.

Over half of the economic areas of Missouri, Nebraska, and South Dakota recorded declines in their population under age 18. Most of the increases in these states were recorded in Jackson and St. Louis Counties, Missouri, Douglas and Lancaster Counties, Nebraska, and Minnehaha and Pennington Counties, South Dakota. In Iowa only 3 of the 16 identified areas recorded declines and these were the economic areas with the smallest central cities.

Change in number of persons employed in agriculture

The mean county decline in the number of persons employed in agriculture varied from 384 in South Dakota counties to 1,359 in Missouri counties. When the percent of decline was computed a similar rate was recorded. Missouri counties experienced declines of approximately 51 percent, Iowa and Nebraska counties had 31 percent reductions, and South Dakota counties had 26 percent declines.

Even greater variations were recorded among the states when numerical changes in agricultural employees within economic areas were considered. Missouri economic areas recorded uniformly high declines. Though the numerical
decline was great in Missouri, the rate of reduction by percentage change was similar in South Dakota. The range in economic area declines varied from 2,149 in South Dakota to 14,207 in Missouri economic areas. The mean decline in Nebraska areas was 3,377 and in Iowa economic areas the mean decline was 6,157.

**Change in median family income**

Median family income increased in all 374 counties and within all 54 economic areas. Among counties, the reported increases ranged from only $93 per family in Jerauld County, South Dakota, to $3,988 per family in Douglas County, Nebraska. The mean county increases varied from a low of $1,175 in South Dakota counties to a high of $1,685 in Missouri counties. The mean county increase in Iowa was $1,559 and in Nebraska the increase was computed as $1,324.

There appeared to be more uniformity in increases in mean family income when computed on an economic area basis. The Iowa and Missouri economic area mean increases were $1,598 and $1,585 respectively. The Nebraska and South Dakota mean increases were $1,370 and $1,141.

**Change in years school completed, population 25 years old and over**

Substantial differences were evidenced in changes in educational attainment among counties, economic areas, and states. The mean increase in the level of educational attain-
ment for the Missouri population 25 years old and over was only 1.06 years. The mean increases in Iowa, Nebraska, and South Dakota were 1.95, 2.07, and 1.43 years respectively.

The same pattern of change was evidenced in economic areas of the four states. The economic area change ranged from 1.0 year increase in Missouri areas to 2.0 years increase in Iowa and Nebraska areas.

Change in number of retail trade establishments

All states have experienced a massive decline in the number of retail trade establishments. During the 1940-1960 period 338 of the 374 counties organized in the four states recorded losses in the number of retail trade establishments. Mean county losses varied from 33.3 establishments in Nebraska counties to 94.7 establishments in Missouri counties. The mean reduction in Iowa counties, 81.7 per county, approached the mean Missouri reduction and South Dakota's decline of 39.5 per county approximated the Nebraska change.

A similar pattern was evidenced in changes in the number of retail trade establishments within economic areas. The mean economic area reductions were computed as: Missouri, 990; Iowa, 506; South Dakota, 221; and Nebraska, 106.

Change in volume of retail trade

Only 3 of the 374 counties studied recorded declines in retail sales during the 1940-1960 period. The mean county increases ranged from $10,540,000 per county in South Dakota
to $42,023,000 in Missouri counties.

When data were regrouped for economic area analysis, more extensive ranges in retail trade increases were noted. The mean increase in the volume of retail trade for economic areas of South Dakota was only $58,852,000. By contrast, the mean increase for Missouri economic areas was computed as $439,334,000.

School Type Variables

Changes in the number of school districts of four types was also measured. Within the four states, school districts have normally been classified as: non-operating, elementary, high school, and unified. (The latter term also implies consolidation, community, union, etc., as long as students in grades 1-12 are enrolled.)

Change in non-operating school districts

Major differences were identified among the states in changes that occurred from 1940-1960 in the number of non-operating school districts. Iowa and South Dakota recorded substantial increases, 321 and 706 respectively, while Missouri and Nebraska were reducing their numbers by 145 and 507 respectively. The mean county increases in Iowa and South Dakota were 3.2 and 10.5. The mean decreases in Missouri and Nebraska were 1.3 and 5.4. There was no evidence of a consistent pattern of increase or decrease in any state.

The identical pattern was evidenced when data were re-
grouped by economic areas. The mean increase in economic areas of Iowa and South Dakota were 20 and 59, and the mean decreases in Missouri and Nebraska areas were 13 and 34.

**Change in number of elementary school districts**

All states but South Dakota recorded sizable reductions in the number of elementary school districts. The number declined by 3,102 in Iowa, 6,281 in Missouri, and by 2,632 in Nebraska. By contrast, the number increased by 115 in South Dakota.

The same pattern of change was evidenced within the economic areas of all states. The decreases in Iowa, Missouri, and Nebraska, as well as the increases in South Dakota, did not appear to be associated with any single factor employed in this study.

**Changes in high school districts**

This variable was dropped after observation of the initial data. Iowa and Missouri had no districts of this type organized during the 1940-1960 period. The number in South Dakota and Nebraska was so limited it precluded any analysis of change.

**Change in unified school districts**

Each of the four states recorded reductions in the number of high school districts. Iowa, with a reduction of 409, lead all states. Missouri and Nebraska reduced their
numbers by 300 and 298 respectively. The South Dakota decrease was only 45 districts. The mean county reductions in Iowa, Missouri, and Nebraska varied little, from 2.6 to 4.1. The mean South Dakota county reduction was only 0.7 districts.

When data were regrouped by economic areas the same pattern and magnitude in reductions was evidenced.

**Relationship between Variables**

Utilizing Pearson product-moment correlation coefficients, a limited number of strong relationships was indicated among the variables. ($\pm 0.50$ was operationally established as indication of strong relationships.)

Analysis of data from all 374 county units, suggested the following relationships.

1. As area population changes, the population density, the change in population under age 18, and the change in the volume of retail trade all tend to move in the same direction.

2. As population density changes, there is a tendency for area population under age 18 and change in the number of retail trade establishments to move in the same direction.

3. There appeared to be a positive relationship, though not extremely strong, between the number of persons employed in agriculture and changes in the number of elementary school districts.

In addition to the above, correlation coefficients were
computed and reported in matrices indicating the relationship between variables in each of the four states.

**Iowa variable relationships**

There appeared to be more relationships among variables in Iowa than in the other three states.

1. There appeared to be a negative relationship between geographic area and change in the number of persons employed in agriculture.

2. As area population changes, change in population density, change in area population under age 18, change in the volume of retail trade, and change in median family income tend to move in the same direction.

3. As the number of persons employed in agriculture changes, there is a tendency for the median family income to move in the opposite direction.

4. As the number of persons employed in agriculture changes, there is a tendency for the number of retail trade establishments to change in the same direction.

5. There is a tendency for change in the number of retail trade establishments and change in the total volume of retail sales to move in opposite directions.

6. There appears to be no evidence of any relationships existing between demographic variables and change in school type variables.
Missouri variable relationships

1. As area population changes in Missouri counties, a negative coefficient suggests there is a tendency for change in the number of elementary school districts to move in the opposite direction.

2. As area population changes, the population density, change in area population under age 18, and change in volume of retail trade tend to move in the same direction.

3. As population density changes, changes in the number of retail trade establishments tend to move in the same direction.

4. The only demographic variable that appeared related to change in type of school variables was geographic area. This was expressed as a moderately negative relationship.

Nebraska variable relationships

1. High positive coefficients suggest that as area population changes population density, area population under age 18, change in median family income, and change in total volume of retail trade all tend to move in the same direction.

2. High negative coefficients suggest that as the number of retail trade establishments change, changes in area population, change in population density, and change in area population under age 18 tend to move in the opposite direction.
3. As the number of retail trade establishments alter, change in the total volume of retail sales tends to move in the opposite direction.

4. There appeared to be no relationship between demographic variables and changes in type of school district variables.

South Dakota variable relationships

1. Positive coefficients well above .50 suggest that as area population changes, the population density, the area population under age 18, and the volume of retail trade tend to change in the same direction.

2. As the number of retail trade establishments change, there is a tendency for the area population, area population under age 18, and the volume of retail sales to move in the opposite direction.

3. There were no apparent relationships between demographic variables and school type variables.

Analysis of Variance

In testing for significant differences between states and between economic areas a number of variables appeared to be highly significant.

There were significant differences between states and between economic areas when considering area in square miles, change in the number of persons employed in agriculture, change in median family income, change in median school years
completed, and changes in non-operating school districts, changes in elementary school districts, and changes in unified school districts.

There were no significant differences between states and between economic areas when other variables were considered.

Conclusions

Contrary to a widely held belief, there is no evidence in this study to indicate that changing demographic conditions have had an impact on the changing organization of school districts in Iowa, Missouri, Nebraska, and South Dakota. When the nine demographic variables were placed in a 12 x 12 correlation matrix, no substantial positive relationships existed between the demographic variables and the school type variables. If anything, a sizeable negative coefficient suggests that as geographic area decreases, the number of elementary school districts tended to increase. This was especially true in Missouri. This finding suggests that the concern expressed for reorganization of school districts because of demographic changes has been more lip service than operationalized practice.

Great changes had taken place in the organization of school districts in all four states during the 1940-1960 period. Highly significant differences were indicated in changes that had occurred in non-operating districts, ele-
mentary districts, and unified districts between all states. In addition, significant differences were indicated between economic areas when changes in all three type districts were considered. However, there was no apparent relationship between demographic changes and school district changes.

There is little evidence to indicate criteria for local school district organization presently employed by State Departments of Education in Iowa, Missouri, Nebraska, and South Dakota have displayed a serious concern for demographic changes. The criteria allude to communities and groups of interrelated communities. However, they advocate minimum sizes which fail to recognize the changing composition and distribution of population in delineation of a community.

The study supports conclusively the reported trends in rural decline and urban growth. Detailed analysis of the data suggests that decline may be much more acute than is frequently realized. Of equal concern is the pattern of decline and growth evidenced from the data. Areas of sparse population have, with few exceptions, been the areas which recorded the greatest declines. Though there was no significant difference in population changes between economic areas and states, great inconsistencies between counties exist. This would certainly suggest that urban gains have tended to offset rural losses within economic areas utilized in this study.

Though the total number of school districts had dimin-
ished materially in all four states studied, there was no positive relationship established between demographic changes identified in this study and changes in school organization. There were, however, significant differences in changes that had occurred in the number of school districts of all types between states and between economic areas. It would appear that these differences have resulted more from legislative action and from the exigencies of the times rather than from a concerted effort to adapt school organization to rapidly altering population patterns.

Sociologists and economists in all four states have identified enlarged geographic areas and these are presently being employed for economic planning and development. Within all states these areas possess elements of community cohesiveness. Within most areas there was evidence of an increasing concentration of people, increasing retail trade, and in-migration of the age group under age 18. In most instances these increases were reflected in growth of the principle population center of the area. From this central population hub an increasing number of services are being provided to contiguous areas. Yet, an analysis of changes in school organization refutes this sociological movement completely. There was evidence to indicate that small rural schools have decreased materially in all states but South Dakota. But, in light of the data analyzed, there is little evidence to suggest that schools have reorganized around
presently identifiable community centers. In fact, in some areas of Nebraska and South Dakota sizable increases have been recorded in the number of non-operating and elementary school districts. Two primary reasons have been advanced for this movement. One is a firm desire to retain local autonomy, even though no school is operational. The second reason suggested is that such districts provide an excellent tax refuge.

**Limitations**

The scope and design of this study was limited in some aspects by the availability of data. Comprehensive and accurate population enumerations are made at 10 year intervals. This necessitated utilizing population data and school type data that was seven years old. It did not consider changes that have occurred since 1960 in either demographic variables or types of school district organization.

The availability of comparable data over a prolonged period of time also limited the number of demographic variables that were employed in the study. Since all demographic variables were to represent areas of concern utilized in delineating economic areas this imposed further limitations.

Lastly, the design of the study imposed some limitations in making inferences from the analysis. Since an Analysis of Variance design with unequal cell sizes was employed,
approximations of F values had to be made when testing for the significance of differences between states. This procedure imposes the restriction that inferences must be made with caution.

Recommendations

If the concept of a "community" is to be realistically employed in the determination of school district boundaries, educational planners must begin looking beyond the boundaries of villages and towns in Iowa, Missouri, Nebraska, and South Dakota. It is generally agreed that a school district should be a natural sociological community. When we view the massive movement of people from rural areas to urban places, the consistent pattern of decline in small towns and villages, and the increasing concentration of social, economic, governmental, and cultural services in relatively few large cities in the four states, the present operational philosophy, local school districts being organized around a community or a group of interrelated communities, must be rejected.

If local school district organization is to be compatible with other facets of community development, the individuals and groups responsible for organizing schools must look beyond the residentary activities and interests of the local community. The increased vistas of social, economic, governmental, and cultural environments must be identified and
employed in the delineation of geographic areas for local school districts.

Recommendations for Research

Since there appeared to be little relationship between the demographic variables identified for this study and the changing organization of school districts, additional research in the identification of demographic variables that evidence some relationship would be extremely valuable.

The design of this study necessitated some assumptions that prohibit extensive inferences from the data. The mass of data accumulated for this study was analyzed in an effort to seek answers to the specific problems identified for this study. There are indications, however, that the data could profitably be subjected to other types of analyses in an effort to make more comprehensive inferences. Analysis of Co-Variance could be employed to access the degree and direction in which variables affected the significance levels determined in the Analysis of Variance. In addition a new program utilizing means has been developed by the Bureau of Standards. This program could be employed in more depth analysis of the data.

Lastly, the literature is replete with admonitions that school districts should encompass a community, group of interrelated communities, natural sociological community, and so forth. Unfortunately the literature seldom attempts
to define what truly constitutes a school community. Certainly a valuable contribution would be additional research attempting to describe the social, economic, governmental, and cultural parameters of desirable local school districts in light of current and anticipated societal changes.
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Map 1. Functional Economic Areas, Iowa (35)
Map 2. Adjusted Functional Economic Areas, Iowa (35)
Map 4. Economic Areas, Missouri (25)
Map 5. Adjusted Economic Areas, Missouri (25)
Map 6. Traffic Flow Communities, Missouri (11)
Map 7. Adjusted Traffic Flow Communities, Missouri (11)
Map 8. Growth Center Areas, Nebraska (79)
Map 9. Adjusted Economic Areas, Nebraska (79)
Map 10. Trade Centers, South Dakota (3)
Map II. Adjusted Trade Centers, South Dakota (3)