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SOCIAL INDICATORS AND SOCIAL WELFARE:

COLUMBUS, OHIO, 1960

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

Paul Esmond King, B.A., M.A.

* * * * *

The Ohio State University
1972

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Studies in Urban Geography. Professors Emilio Casetti, Reginald G. Golledge and Leslie J. King
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS.</td>
<td>ii</td>
</tr>
<tr>
<td>VITA.</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES.</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF FIGURES.</td>
<td>vii</td>
</tr>
<tr>
<td>INTRODUCTION.</td>
<td>1</td>
</tr>
<tr>
<td>Chapter</td>
<td></td>
</tr>
<tr>
<td>I. SOCIAL INDICATORS AND SOCIAL SYSTEMS ACCOUNTING.</td>
<td>3</td>
</tr>
<tr>
<td>Historical Background</td>
<td></td>
</tr>
<tr>
<td>Social Indicators</td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td></td>
</tr>
<tr>
<td>II. TERRITORIAL SOCIAL INDICATORS</td>
<td>33</td>
</tr>
<tr>
<td>Inter State Scale</td>
<td></td>
</tr>
<tr>
<td>Urban Indicators</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td></td>
</tr>
<tr>
<td>III. RESEARCH QUESTIONS AND RESEARCH DESIGN.</td>
<td>45</td>
</tr>
<tr>
<td>Data</td>
<td></td>
</tr>
<tr>
<td>Analytic Procedure</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td></td>
</tr>
<tr>
<td>IV. EMPIRICAL INVESTIGATION OF URBAN INDICATORS.</td>
<td>61</td>
</tr>
<tr>
<td>Urban Indicators and their Spatial Patterns</td>
<td></td>
</tr>
<tr>
<td>Relationships Among Categories of Social Welfare</td>
<td></td>
</tr>
<tr>
<td>Chapter</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Relationships Among the Urban Indicators</td>
<td></td>
</tr>
<tr>
<td>Urban Neighborhoods Based on Social Welfare</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td></td>
</tr>
<tr>
<td>V. SUMMARY AND CONCLUSIONS</td>
<td>98</td>
</tr>
<tr>
<td>APPENDIX</td>
<td>106</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>111</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>1.</td>
<td>Data Input for the Component Model.</td>
</tr>
<tr>
<td>2.</td>
<td>Summary of Primary Pattern Matrix.</td>
</tr>
<tr>
<td>3.</td>
<td>Highest Loadings on Six Urban Indicators.</td>
</tr>
<tr>
<td>4.</td>
<td>Component Correlation Matrix.</td>
</tr>
<tr>
<td>Figure</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>1. Research Design</td>
<td>46</td>
</tr>
<tr>
<td>2. Census Tracts in Columbus, Ohio, 1960</td>
<td>48</td>
</tr>
<tr>
<td>3. General Social Welfare</td>
<td>66</td>
</tr>
<tr>
<td>4. Crime</td>
<td>69</td>
</tr>
<tr>
<td>5. Socio-Economic Status</td>
<td>72</td>
</tr>
<tr>
<td>6. Residential/Non Residential</td>
<td>74</td>
</tr>
<tr>
<td>7. Public Buildings/Academic Ghetto</td>
<td>75</td>
</tr>
<tr>
<td>8. Accessibility and Action Space</td>
<td>77</td>
</tr>
<tr>
<td>9. Visual Summary of Component Loadings</td>
<td>80</td>
</tr>
<tr>
<td>10. Highest Correlations Between the Urban Indicators</td>
<td>84</td>
</tr>
<tr>
<td>11. Error Curve from HGROUP Algorithm</td>
<td>85</td>
</tr>
<tr>
<td>12. Neighborhood Typology of Social Welfare</td>
<td>86</td>
</tr>
<tr>
<td>13. Seven Classes of Tracts</td>
<td>92</td>
</tr>
<tr>
<td>14. Six Classes of Tracts</td>
<td>93</td>
</tr>
<tr>
<td>15. Five Classes of Tracts</td>
<td>94</td>
</tr>
<tr>
<td>16. Four Classes of Tracts</td>
<td>95</td>
</tr>
<tr>
<td>17. Three Classes of Tracts</td>
<td>96</td>
</tr>
<tr>
<td>18. Two Classes of Tracts</td>
<td>97</td>
</tr>
<tr>
<td>19. Social Area Analysis Neighborhoods</td>
<td>103</td>
</tr>
</tbody>
</table>
INTRODUCTION

While it may be cautiously admitted that government officials and policy makers have their fingers on the economic pulse of the United States, this claim cannot be made about the social condition of the same patient. Although economic indicators have become an integral part of policy planning at all levels of government, it has become increasingly apparent that meaningful social indicators are lacking if not nonexistent.

Over the last decade a growing concern over social unrest and its causes has led to the emergence of a social indicator movement aiming to rectify this deficiency in social statistics. Claiming both politicians and social scientists among its ranks, the movement has produced a large volume of literature, much of it general and rhetorical. Only a handful of authors provide conceptual bases and pragmatic guidelines for monitoring social welfare, and fewer still have undertaken empirical investigations in this area. More recently, a splinter group has turned its attention to the social problems of American cities, calling for urban
indicators, but again only a minimal amount of empirical work has been attempted.

This study reviews the major works relating to social and urban indicators and to systems of social accounts. It emphasizes the conceptual and methodological difficulties associated with measuring the social health of a nation, and of population sub-groups and geographical sub-areas within that nation. It then proceeds to an inductive and exploratory investigation of social welfare in a representative city, Columbus, Ohio. Stressing the difficulties of specifying variables which truly represent different aspects of the quality of life, a limited number of urban indicators are constructed. The spatial patterns exhibited by values on these indicators are investigated, as are the relationships between the indices themselves. Also, urban neighborhoods are derived which show internal homogeneity with respect to social well-being. Finally both the indicators and their spatial distributions are evaluated with respect to their implications for public policy and as far as they shed light on some of the social processes posited to be in operation within urban areas.
CHAPTER I

SOCIAL INDICATORS AND SOCIAL SYSTEMS ACCOUNTING

In this chapter the events leading to the formation of the social indicator movement are presented briefly. This is followed by a review of the major conceptual and empirical works in the field. The chapter ends with an assessment of a number of methodological problems.

Historical Background

The idea of measuring social well-being in the United States started during the Depression of the thirties. However, it became a less pressing issue in the forties and did not re-surface until the late fifties, reaching maturity during the "New Frontier" of the Kennedy administration.¹

In 1929 President Hoover formed a Research Committee on Social Trends under the leadership of the sociologist W. F. Ogburn and five social reports on the nation

were issued for the years 1928 through 1932. Due to the deteriorating economic situation the formal reports were discontinued, although Ogburn continued to produce two additional volumes. The upheavals of the Great Depression, however, had a more positive effect on the development of economic indicators where interest was centered on finding indices which changed consistently with fluctuations in the economy. Mitchell and Burns, for example, attempted to monitor business cycles with time series data, while subsequent work by Moore discriminated between "leading", "lagging" and "diffusive" indicators of economic growth.

Public concern over social issues re-emerged in the late fifties when President Eisenhower established a Commission on National Goals. The commission's report in 1960 specified eighty-one goals in eleven major

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categories: the individual, equality, democratic process, education, science, democratic economy, economic growth, technological change, agriculture, living conditions and health and welfare. Although economic considerations were dominant, social goals were clearly evident.

The Social Indicator Movement

Conforming to the generally held principle that once a nation has acquired economic sufficiency it can then turn its attention to more social and aesthetic (and implicitly less urgent) activities and concerns, there arose in the early sixties what Springer has termed the Social Indicator Movement.

Comprised of government officials and social scientists it was concerned with stimulating as much interest in, and concern over, social problems as had been mustered to combat the economic problems of the previous decades. Militancy on the part of minority groups and


increased visibility of poverty and relative deprivation brought about a realization that economic prosperity for a nation as a whole does not necessarily lead to a better quality of life for any particular individual or group of individuals. Also, when the government began to deploy its resources for the "War on Poverty" it became increasingly evident that little was known about the basic problems, let alone how best to solve them. As a result, advisory committees began calling for the collection of more behavioral data, suggesting that the government should lead the way in this regard. In addition, the possibility of extending benefit cost analyses to a wide range of public investment policies was discussed. This culminated in the expansion of the Program-Planning-Budgeting-System (P.P.B.S.), used in the Department of Defense, to all domestic programs in 1965. This was a first step towards evaluating the social costs of government programs.

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10This is discussed in T. McVeigh, op. cit., p. 8. also by D. Bell (1969), "The Idea of a Social Report." Public Interest, #15 (Spring).
Social Indicators

At about the same time, a need was seen to collect more data on social problems in an organized fashion by constructing indices which would answer the questions "where are we now?" with respect to the quality of life, "where do we want to be at some future time?", and "how do we want to go from this present to that future?" However, there was disagreement over the form and the immediate utility of such indicators and social accounting procedures. Perle noted that:

Underlying the dialogue . . . are two groups of persons: 1. those who are extremely optimistic about the immediate utility of indicators for a wide class of societal issues both in the public and the private sectors; and 2. those who are cautiously optimistic about their eventual use for societal issues, subsequent to an intensive period of fundamental social science research.

He then proceeded to identify these two factions:

The first group is composed of public and bureaucratic officials, as well as of academics who are closely related to the political system; the second group is primarily composed of academics who are interested in understanding the structure and functioning of social systems, but are not intimately related to the political system in a professional sense. This categorization reflects an expected

---

distinction between social science activists and research oriented scholars.\textsuperscript{13}

These "research oriented scholars" have been attacking the problem of relative deprivation with renewed enthusiasm and have turned to such topics as social unrest, the questioning of traditional values of American society by the young and by minority groups, and the rapidly increasing social costs of industrial and economic success.\textsuperscript{14} In calling for social indicators and systems of social accounts to aid in this research, they have emphasized the descriptive and informational aspects of such measures claiming they should be:

measurements aimed at broadening the agenda of our concern by providing information on human conditions past, present and future,\textsuperscript{15}

or defining them as:

quantitative data that serve as indexes to socially important conditions of society,\textsuperscript{16}

Or simply as measures which:

\textsuperscript{13}Ibid.

\textsuperscript{14}See N. M. Kamrany and A. N. Christakis, op. cit.


describe with some precision and detail the condition of society in terms of particular activities and social groups.  

Other writers include the condition that indicators be normative measures which can be used to evaluate progress toward achieving societal goals. Sheldon and Moore claim that:

social indicators would give a reading on both the current state of some segment of the social universe and on past and future trends, whether progressive or regressive, according to some normative criteria.

This interpretation is echoed by Kamrany and Christakis in their description of a social indicator as:

a relative notion to be measured and/or quantified against some defined standard or unit that represents the "quality of a good life."  

The most comprehensive statement in this vein is presented, however, by Olson when he takes a social indicator to be:

a statistic of direct normative interest which facilitates concise, comprehensive and balanced judgements about the conditions of major aspects of a society. It is in all cases a direct measure of


19N. M. Kamrany and A. N. Christakis, op. cit., p. 208.
welfare and is subject to the interpretation that if it changes in the "right" direction, while other things remain equal, things have gotten better or people are better off.20

On the other hand, the approach of politicians and "social activists" is more pragmatic asking how more information about the quality of life can be obtained, and how programs aimed at alternative societal futures can be evaluated. One of the prime movers for social accounts, Bell, points out the deficiencies in using economic indicators to monitor the well-being of society and argues strongly against the "economic philistinism" of the P.P.B.S. system of evaluating social programs.21 He stresses that social costs are not separated from other costs in the current battery of economic indicators, and argues for indicators to supersede the P.P.B.S. system and to evaluate social gains and losses in a more direct fashion.22

A similar assessment is made by Bauer whose prime interest is in establishing indices which can be used to evaluate the secondary effects of technical innovations


21 D. Bell, op. cit.

22 Ibid., p. 10.
and to measure social costs of public programs.\textsuperscript{23} He argues that:

for many of the important topics on which social critics blithely pass judgments, and on which policies are made, there is no yardstick by which to know if things are getting better or worse.\textsuperscript{24}

He proceeds to state that such yardsticks could be used to choose between alternative future scenarios, and lead to more effective social planning. He sees social indicators as:

statistics, statistical series and all forms of evidence that enable us to assess where we stand and are going with respect to our values and goals and to evaluate specific programs and determine their impact.\textsuperscript{25}

A slightly different view is expressed by Biderman.\textsuperscript{26} While agreeing that existing statistics are inadequate for social monitoring, and pointing out how figures are frequently misused for certification of public policy, he suggests that new normative measures may be obtained by expanding upon existing indicators, and cannot foresee "the possibility of introducing any master plan of

\textsuperscript{23}R. A. Bauer, \textit{op. cit.}

\textsuperscript{24}Ibid., p. 20.

\textsuperscript{25}Ibid., p. 1.

\textsuperscript{26}A. D. Biderman, \textit{op. cit.}
social accounting as a unified package" within the near future.27

Thus, despite differences in emphasis, there are at least some common threads running through the conceptual definitions listed above. Indicators are seen as time series data which can be compared with some predetermined standard or criterion, either to assess societal change per se, or to evaluate the success of public policy aimed at bringing about such change. However, these statements pose more questions than they answer and although conceptual definitions abound, the number of empirical investigations is very small. The major impediment to the establishment of a practical set of social indicators is the lack of a theory to suggest how different elements of the social system are causally related and to suggest what elements should be monitored. Nevertheless, several authors have attempted to rectify this situation, and their suggestions are discussed below.

Conceptual and Theoretical Bases

Some writers argue that the conceptual and theoretical base for economic planning may be carried over into

27Ibid., p. 145.
considerations of social well being. Olson, for example, claims that "existing economic indicators, and particularly the national income accounts, do in fact provide a paradigm that can be used to help guide the development of better social statistics." He goes on to suggest that the Gross Social Product of the nation be computed, but notes that before this is possible, the system which contributes to this product must be fully understood and specified. The similarities between some of the methodological proposals made by the social indicator movement and the techniques employed in economic planning are quite apparent. In fact in 1967 the Full Opportunity and Social Accounting Bill was introduced which in part provided for an annual social report, the creation of a Council of Social Advisors, and the establishment of a Joint Committee on the Social Report in the Congress.


In contrast to the above, some attempts have been made to provide social indicators with a paradigm of their own. Gross presents what he calls a "structure performance model of society" as a basis for social systems accounting. However, even here the influence of economic theory is evident since he is extending ideas he originally developed to describe the management of organizations. He identifies seven structural variables: people, non human resources, subsystems, external relations, internal relations, values and guidance. The functioning of the system is described as follows:

The performance of any social system consists of activities to satisfy the interests of various "interesteds" by producing various kinds, qualities and quantities of output, investing in the system's capacity for future output using inputs efficiently, acquiring inputs, and doing all this in a manner that conforms with various codes of behavior and varying conceptions of technical and administrative (or guidance) rationality.

Gross does not expand, however, on how such a model could be used to identify causality within the social system, or how indicators could measure the structure and performance variables.

Rather than approach the thorny question of


31 Ibid., p. 184.
developing a grand model for society, Kamrany and Christakis limit themselves to developing a conceptual framework for social indicators.\textsuperscript{32} They argue that a system of social accounts needs "completeness, geographical delineation, an effective level of disaggregation and relevance to some cohesive rational process of policy planning."\textsuperscript{33} They advocate indicators for different spatial entities, in effect a spatial hierarchy, where local measures are directed toward local problems and national measures to national problems. They go on to say that the main problem in setting up a system of social indicators is to "identify the major dimensions of a national system, determine and identify the role of social indicators in the entire process and develop and implement a particular system of social indicators for that process."\textsuperscript{34} The major dimensions that they identify are "the setting of national objectives, national goals, national priorities, operational targets, implementation strategies and a system of monitoring and review on a continuing basis."\textsuperscript{35} They proceed to say that "the structure of social indicators . . . requires

\begin{itemize}
  \item \textsuperscript{32}N. M. Kamrany and A. N. Christakis, \textit{op. cit.}
  \item \textsuperscript{33}\textit{Ibid.}, p. 208.
  \item \textsuperscript{34}\textit{Ibid.}, p. 211.
  \item \textsuperscript{35}\textit{Ibid.}
\end{itemize}
that . . . the overall behavioral and environmental conditions be translated into three kinds of indicators, namely 1. absolute indicators; 2. relative indicators; and 3. autonomous indicators. "36 Absolute indicators are those where normative standards have been determined by substantial agreement among experts, whereas relative indicators are measures where "time series data and cross comparison data are available [but] for which no optimum value is obtainable."37 Autonomous indicators refer to specific areal units and social groups which do not have national significance. This approach appears to be far more practical in the short run than Gross' structure performance model.

Nevertheless, in reality, neither of the above models is operational, and a number of authors have proceeded to construct sets of social indicators for the nation using conventional wisdom rather than a conceptual framework to determine which problem areas are to be included.

**Empirical Approaches to Social Indicators**

The H.E.W. publication Toward a Social Report avoids conceptual questions and is simply "an attempt,

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36 Ibid.

37 Ibid.
on the part of social scientists to look at several important areas and digest what is known about progress toward generally accepted goals.\textsuperscript{38} The areas considered are:

1. Health and illness.
2. Social mobility.
3. The physical environment.
4. Income and poverty.
5. Public order and safety.
6. Learning, science and the arts.
7. Participation and alienation.

The report proceeds to evaluate, in a somewhat superficial manner, whether the conditions in these areas are getting better or worse at the national level. Prepared by the economist Olson, it again suggests building social indicators in the image of their economic counterparts.

A second empirical example is provided by Sheldon and Moore, who ask simply what is changing in four general areas of social interest: the demographic base, the major structural components of society and the distributive and aggregative features of the social system.\textsuperscript{39} They lament the lack of consistent time series data on social issues and call for widespread sample surveys to be replicated at regular intervals. The

\textsuperscript{38} Toward a Social Report, op. cit.

\textsuperscript{39} E. B. Sheldon and W. E. Moore, op. cit.
specific topics covered show some similarity to those discussed in Toward a Social Report. They are:

1. Population.
2. Production of goods and services.
3. Employment.
4. Knowledge and technology.
5. Political life.
6. Family life.
7. Religious change.
8. Leisure.
10. Schooling and education.
11. Social mobility.

A much shorter list of topics is addressed by the authors in Gross' Social Intelligence for America's Future. Here, the discussion revolves around the "intelligence gap" that exists in public policy planning, and the deficiencies in present social information are analyzed for the following problem areas:

1. Income assets.
2. Basic services.
3. Social mobility and education.
4. Political position.
5. Status and satisfaction.

An alternative approach to social monitoring is provided by a study underway at the Institute for Survey Research under the direction of Andrews et al. 41


Instead of measuring social conditions objectively, they are attempting to collect people's subjective evaluations of social welfare. The study sets out "1. to develop a valid and statistically efficient research instrument to measure a wide range of perceived life qualities, and 2. to obtain some initial reading on these life qualities for a representative sample of Americans." The authors propose to monitor perceptions in the following categories using survey data:

1. Concern over the social setting.
2. Health concerns.
3. Economic concerns.
4. Relationship of man to his society.
5. Aspects of the personality.
6. Physical environment.

The four studies reviewed above are examples of the pragmatic approach to social monitoring at a national scale. They concentrate on operationalizing batteries of indicators while keeping theoretical considerations to a minimum.

Consenus and Disagreement

Although not immediately evident from the studies discussed above, there is some consensus as to which problem areas are prime candidates for social monitoring. Smith has undertaken a content analysis of ten

\[42\text{Ibid.}, \text{p. i.}\]
major works and arrives at the following list on which there is considerable agreement:

1. Income, wealth and employment.
2. The environment.
3. Physical and mental health.
4. The level, duration and quality of education.
5. The amount of social disorganization.
6. Alienation and participation.
7. Recreation.\(^43\)

He excludes some other topics such as economic growth, the development of science and technology, and religious participation on the basis that they do not affect the quality of life directly.

However, as Perle notes,\(^44\) a similar consensus does not exist over the uses to which social indicators should be put. A variety of suggestions has been forwarded, and McVeigh has summarized them into twelve major categories:

1. Measure the extent of social ills and social well-being in a society.

2. Measure the gap between the current extent of social ills and the state of well-being declared to be the goal.

3. Provide structural information on the past and present.


\(^44\)Perle, op. cit., p. 136.
4. Assess where more and better information is required.

5. Measure the social costs and net returns on investments in social programs.

6. Measure the costs and benefits of each of the alternatives by which goals might be achieved.

7. Establish criteria of evaluation.

8. Formulate goals.

9. Make informed decisions about national priorities.

10. Improve understanding of what the future is likely to be.

11. Indicate control mechanisms.

12. Contribute to the analysis of social changes.\(^45\)

Thus, the social indicator movement is comprised of a heterogeneous group of individuals linked by a common concern over the quantification of societal issues, but expressing divergent views on how the social statistics should be used. These differences of opinion, however, constitute only one difficulty facing social indicator research. Several other methodological and conceptual problems exist, and they are assessed below.

\(^{45}\) T. McVeigh, op. cit., p. 11.
Assessment

It is clear from virtually all the articles and books reviewed that the major impediment to the establishment of a practical set of social indicators, in the short run, is the lack of adequate data. However, this is only the apparent cause, the fundamental reasons being:

1. The lack of theory.
2. Problems of measurement and aggregation.
3. The need for flexibility in the face of changing social conditions.
4. Disagreement over societal goals and the applicability of social indicators.

These will be examined in turn.

1. Lack of Theory

In the long run, the major impediment to understanding the complexities of the social system is the lack of theory to suggest exactly how different elements are causally related. Such a theory would indicate which critical aspects of society should be monitored in order to yield the greatest amount of information. As substitutes, writers such as Gross, and Kamrany and Christakis have attempted to provide general systems models and conceptual frameworks on which to base indicators, but none of these contributions is immediately operational. In addition, it is apparent that these suggestions have borrowed the theoretical basis of
economics, or at least have attempted to mirror the economic indicator movement. This does serious damage to social indicators, since the functioning of the social system is by no means isomorphic with the functioning of the economic system. The end result may be value laden economic indicators in the short run; but before a true set of social accounts can be constructed, if in fact such a comprehensive system is desirable, a fully specified model and theory of society must be presented and verified.

Moreover, as is noted by Wilcox and Brooks, a difficulty arising out of these macro-model conceptualizations is how to translate abstract concepts into empirical, operational variables. An example of this is the concept of fluidity, or societal complexity, used by Eberts as a measure of the quality of life in a community. Thus, Wilcox and Brooks suggest a more inductive approach, constructing specific measurable indices for particular communities which then can be generalized

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to make statements about social change. They provide a conceptual model and example where simple population indices are used to lead to statements about the social effects of major demographic changes at the community level.

2. Problems of Measurement and Aggregation

Measurement

In commenting on this general operational problem, Bauer asks the following question: "is it better to have a crude measure of a variable you are really interested in, or a precise measure of a variable which is only an approximation of what you are interested in?"48 This raises one of the major empirical problems of indicator research, that is the difficulty associated with measuring some aspects of social welfare directly. For example, what value can be assigned to an increase in the number of doctors per head which truly reflects the impact this has on the quality of life? Furthermore, translation of everything into dollar equivalents does not measure utility, or personal contentment, or alienation, all of which are critical components of social welfare. The general conclusion in the literature is that surrogates for these general concepts will have to

48 R. A. Bauer, op. cit., p. 37.
be measured, for example, taking voter turn out as a measure of participation and crime rates and drug abuse as surrogates for social disorganization and alienation. The definition of surrogates is thwart with difficulty, since the relationship between the empirical variable and the abstract concept must be clearly understood and specified.

An alternative solution to this problem is provided by the perceptual approach, an example being the study by Andrews et al. However, both objective measurement and the perceptual approach are faced with problems which relate in general to the distinctions between ecological and survey data. The former virtually ignores the variations in utilities which different segments of society have for different resources and conditions; it is also subject to fallacious arguments if conclusions about individuals are attempted. In the latter approach, that is using survey data, it is very difficult to set goals with which results are to be compared. It may be possible to measure whether people's satisfactions have increased or decreased, but it is not clear how some optimum level of satisfaction can be determined in order to evaluate the continuance of a particular social program. Also, it is obvious that different

49 Andrews et al., op. cit.
people will have different aspirations. There is a danger that if perceptions alone are used, groups with low aspirations may appear to be as satisfied, if not more satisfied, with a low level of social well-being, than groups which have much higher levels of social welfare when measured objectively. Thus the differences between the "haves" and the "have nots" may be underestimated. Andrews et al. conclude that aspiration levels themselves might prove to be useful social indicators.

In summary, it would appear that eventually a combination of both objective and perceptual data will be needed to accurately measure the condition and progress of society. Kamrany and Christakis come close to this in discussing their typology of social indicators. Their absolute measures most probably represent objective information, while some of their relative indicators may well fall into the perceptual domain where no consensus as to an optimal value is available.

Aggregation

One further problem directly related to data collection for social indicators is the question of aggregation, and it is here that the implications for geographers are most significant. There are both spatial
and non spatial aggregation problems. To the sociologist the problem is to have information available for different sub-groups of the population; to the geographer it is a question of having data disaggregated by areal units so that spatial variation at different scales can be observed. It appears that it is in the area of the distribution of social-well-being and the question of spatial justice that the geographer can make a useful contribution to social indicator research.

There is some concurrence with this view, even by non-geographers. Kamrany and Christakis, for example, note that "recognition of the types of geographic areas, sub-areas, and their growth patterns bears important implications upon public decision making . . . one could not overstate the importance of geography and the need for its inclusion in a measure of well-being." They proceed to argue for a hierarchy of additive measures from the city block up to the national level.

3. Flexibility and Changing Social Conditions

Despite the limited concern over spatial variation in social welfare, discussed above, one of the main themes in the literature is that social indicators are to be collected as time series so that social change can

\[\text{\footnotesize \textsuperscript{50}}\textsuperscript{Kamrany and Christakis, op. cit., p. 206.}\]
be monitored. In order for this to be possible data must be consistent and comparable over time. However as social conditions change, subsets of indicators will become either more important or alternatively obsolete. That is as social conditions change, indicators will have to shift in emphasis. Since the indicators themselves are meant to show how changes are occurring, this suggests one of two things: either a standard battery will be established and used forthwith even though it become redundant, or indicators will be altered only after significant shifts in social concerns have taken place. In the first case data will be comparable over time, but not necessarily relevant; while in the second, time series comparisons will be possible only over the short run, but indicators will always lag behind the social conditions they are trying to measure. Once a set of measurements becomes institutionalized, such as those used in the decennial census, then change becomes even more difficult to bring about and virtually condemns indicators to be lagging indices, telling what has happened. Once again only Kamrany and Christakis have made specific allowance in their conceptual model for a review on a continuing basis.
4. Disagreement over Social Goals and Social Indicators

Explicit in many proposals for systems of social monitoring is the idea that societal progress can be measured in relation to certain goals or normative standards. However Perle notes that "writers expressing this point of view usually avoid suggesting how normative criteria are to be developed or by whom and for whom. Given the diversity of changing goals in our society, it is not at all clear that meaningful normative criteria can be developed for complex social systems."\(^{51}\) Despite Perle's pessimistic view, Gross proposes that goals be established at a level where the impact of social problems is most intense. He argues for local goal setting under central direction to avoid what he calls the "elitist centralism" inherent in Academia on the one hand, and federal bureaucracy on the other. However both academics and government have been active in this area. The A.A.G., for example, is currently undertaking a project on the Spatial Analysis of Progress Toward National Urban Goals in Major Metropolitan Areas.\(^{52}\) Also, over the past few years several

\[^{51}\text{Perle, op. cit., p. 138.}\]

\[^{52}\text{A.A.G. (1972), project on Spatial Analysis of Progress Toward National Urban Goals in Metropolitan Areas. Association of American Geographers, Washington, D.C.}\]
commissions have been established to determine how the social sciences in general can be utilized to improve knowledge about the quality of life in the United States; to augment information about the functioning of a society and to assist government in setting up and evaluating social programs. Finally, in 1969, President Nixon established a National Goals Research Staff to prepare an annual social report and to set goals and indicators for the nation's bicentennial and for the year 2000.

Summary

This chapter introduced the historical background, definitions and major conceptual and empirical works of the social indicator movement. It was seen that

a. the main thrust of interest and concern did not occur until 1960,

b. there has been considerable disagreement over the definition and use of indicators,

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c. there is only a limited conceptual framework on which to base research,

d. nevertheless, a number of empirical studies have been undertaken.

Finally, several methodological and conceptual problems relating to theory, measurement, flexibility and societal goal setting were examined.

Although the tone of this review is somewhat pessimistic, there is one very positive aspect of social indicators that has yet to be mentioned. The very fact that so much discussion has proceeded on the subject has served to increase the visibility of social problems at all levels of society and has attracted the attention of politicians and academics alike. It has stimulated a concern for introducing the human element into governmental planning and has led to attempts to improve upon the pure economic decision process that, until now, has been used to evaluate public social policy at the rational level. Despite conceptual difficulties, some projects have been undertaken at a sub-national scale, working on the premise that "the best place to begin is to begin."\textsuperscript{54} These studies, due to their spatial implications will be discussed in detail in the following

\textsuperscript{54}M. J. Flax (1972), \textit{A Study in Comparative Urban Indicators: Conditions in 18 Metropolitan Areas}. The Urban Institute, Washington, D.C.
chapter where the notion of urban indicators will also be introduced.
CHAPTER II

TERRITORIAL SOCIAL INDICATORS

The theme of this chapter is best introduced by the following quote from Smith, in which he points out that:

to the Geographer, one of the major deficiencies of the social indicator movement is its shortage of spatial perspective. Despite some interest in "urban indicators," local social reporting and a few excellent empirical studies, the emphasis is on the development of aggregate national statistics measuring social trends over time. Yet, there are extreme spatial variations in many of the conditions which contribute to social well-being, and this is an important component of the social state of the nation. The development of territorial social indicators can do much to bring these facts to general attention.¹

Thus, the remainder of this chapter is devoted to the limited number of conceptual and empirical studies which investigate spatial, as opposed to temporal, trends in social welfare at the state and urban levels.

Inter State Scale

Only two known studies of interregional variation of social welfare exist, one by Wilson\(^2\) and one by Smith,\(^3\) and the two works are remarkably similar. Wilson collects eighty-five variables covering nine of the eleven domestic goal areas established by the President’s Commission on National Goals in 1960. Using factor analysis he extracts nine dimensions which he entitles health and welfare, living conditions, agriculture, technological change, economic growth, education, democratic process, equality, and status of the individual. States are ranked according to their scores on separate factors.

Smith limits himself to data relating to the seven major problem areas of income wealth and employment, the living environment, health, education, social disorganization, alienation and participation. Applying principal components analysis he reduces forty-seven variables to six unrotated components. His labels are as follows: general socio economic well being, social pathology, health, racial segregation, public assistance/


\(^3\)D. Smith, op. cit.
unionization, and social disruption. He concentrates on the first two components claiming they are "normative measures of major dimensions of social well-being."\(^4\) A linkage analysis using scores on the first two components yields four groups which show a high degree of contiguity when mapped. A second regionalization scheme is also attempted, component scores are standardized with means of zero and standard deviations equal to the eigenvalues of the appropriate components. These transformed scores are summed over the two components for each state. When mapped in three classes the indices provide "a three region division of the United States with respect to inter state variations in social well-being," with a "northern region of high social well-being," a "southern region of low social well-being," and a "region of transition," results which Smith himself observes "contain no dramatic revelations" and which "have been known intuitively for years."\(^5\)

After summing the ranks on six of Wilson's indicators and re-ranking the states, Smith finds a high rank order correlation between Wilson's aggregated results and his own dimension of general socio economic well-being, but an insignificant relationship with his social

\(^4\)Ibid., p. 28.
\(^5\)Ibid., p. 33.
pathology index. However, Smith concludes that the "agreement between the two studies . . . is impressive."6

Urban Indicators

Recently there has been a surge of interest in urban indicators which monitor the quality of life in cities, and which permit comparisons between metropolitan regions. This is reflected both in research on urban indicators per se and in a number of recent volumes addressing the quality of the urban environment and quality of urban life in general.7 In fact, several authors from the mainstream of the social indicator movement, notably Gross and Bell, are calling for urban indicators.8

6 Ibid., p. 32.
Data Requirements for Urban Indicators

Several authors discuss the data requirements of urban monitoring. Dueker,* for example, is concerned with the relationship between social indicators and urban information systems which have been discussed by city planners and others for some time. Also Schneidermeyer suggests a Metropolitan Social Inventory to cover the areas of health, material provision, opportunity, recreation, safety, and status. The lack of perceptual and aspirational data is noted by Stagner, while Heer describes the inadequacy of information used to answer questions relating to specific population subgroups, particularly the urban poor.13


11 M. J. Schneidermeyer, op. cit.


Conceptual Bases for Urban Indicators

In addition to crying out for more data, several authors attempt to provide conceptual frameworks for urban indicators. Gross extends his general system's framework for national indicators to the urban level, and argues for "cognitive mapping of characteristics of the population, housing, underemployment, unemployment, income, health, and family and institutional life."^14 A similar coverage is suggested by Moynihan who also advocates monitoring the non-human environment as well as people, families, organizations and institutions.^15 Gross continues by arguing for "creative localism" with citizen participation in goal setting, and regular local censuses and reports. He is fervent in his support of anthropocentric planning and introduces the term "anthropolis." He maintains that individuals and groups should be the central elements in any conceptualization and that satisfactions, frustrations and conflict should be included in any framework. His "model for anthropolis" stresses interrelationships through time and space between individuals, families and social groups and

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^14 B. M. Gross (1968), op. cit.

their "natural, man made and man changed environment." He points out that an urban area must be viewed in the context of national growth and change, and concludes with a warning that "the process of getting better information, making forecasts, analyzing alternative futures, and establishing goal patterns are necessarily competitive ones, with any procedures of formalized planning leading at best to a partial structuring of the competitive process and at worst to monopoly power for a dominant coalition."

Alternative systemic approaches are provided by Krendel, and also by Ruff who proposes a mathematical model for developing a social management system allocating resources to needs according to a set of maximizing programs. On the other hand, Perloff falls back on cost-benefit analysis to set forth a decision making model for evaluating the quality of the urban environment. He defines the following elements of his model:

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17 Ibid.
20 H. Perloff, op. cit.
the natural environment, the spatial environment, transportation and utility space, community and neighborhood environment, and micro environments. He sees large natural resource and space use envelopes linked to smaller community, neighborhood and micro environments by the transportation and utilities network. Each of these elements is to be monitored with an appropriate battery of social indicators which will measure conditions against an exogenously defined standard. Beyond noting the difficulty of setting such standards, Perloff does not pursue the problem. He expands the definition of "resources" as "needed elements of the natural environment that are in relatively short supply" to that of "new environmental resources" including such notions as convenience and amenity. He notes, however, that these new resources are more prone to generate externality effects than the older commodity resources, but believes that good social indicators can provide a useful reporting and evaluation framework even in the presence of these externalities. His cost-benefit framework identifies the public and private costs of maintaining present environmental conditions and then of improving upon them; however, when it comes to evaluating benefits he is forced to write that:

the whole system is built on a recognition of the fact that the quality of the
environment is judged by the values of society, different levels of achievement are possible, that each of these has cost features attached—both in achieving the given levels and in falling short of them—and that benefits are also to be derived from improvements in the environment. Unfortunately these benefits are very much harder to define. In some cases they can be fairly firm, particularly when the cost benefit amounts to an avoidance of the cost of abuse or shortfall. But in other cases they are much more general.21

A final conceptual approach to urban indicators that deserves mention is Boyce's classification of indices into standards, criteria and forecasts, all of which are considered as performance characteristics of society. These are presented as statements consisting of "(a) a definition which identifies some characteristics of a system as a function of its primitive qualities and attributes; and (b) a specification of the relationship of the characteristic to a desired, observed, or forecast performance value."22 The desired values are standards and criteria while the observed values, past and present, are indicators. After searching six major transportation and land use studies for such performance characteristics, Boyce finds that the

21Ibid., p. 24.

emphasis has been on physical characteristics, rather than relationship statements.

Thus, a number of conceptual models have been forwarded. However, beyond suggesting which characteristics of urban society should be monitored, they do not assist in the immediate establishment of a workable set of indicators. Nevertheless, empirical studies have been undertaken, and they are discussed below.

**Empirical Studies on Urban Indicators**

Two projects make explicit comparisons between cities on a range of indicators. The first, by Flax, focuses on the differences between eighteen metropolitan areas with respect to fourteen sets of social characteristics. Distinguishing between measurable variables and concepts he wishes to consider, Flax identifies the following aspects of social welfare that are to be compared between the eighteen cities: poverty, unemployment, racial equality, mental health, health, traffic safety, air pollution, income levels, housing, social disintegration, community concern, public order, education and citizen participation. The author discusses

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23 M. J. Flax (1972), *A Study in Comparative Urban Indicators: Conditions in 18 Metropolitan Areas*. The Urban Institute, Washington, D.C.
rates of change in each social indicator over a five year period, and presents comparisons between central cities and suburban communities.

The second study, by Smith, is much larger in scope, covering the one hundred and nine S.M.S.A.s with populations greater than 250,000. Using principal components analysis again, he reduces his data set to two dimensions, affluence and crime. He suggests the affluence dimension is closely related to the general socio-economic well-being component of his inter state analysis, while the crime dimension is a "more restricted and specific version of the social pathology component." After mapping scores on these two metropolitan indicators he concludes that "by most individual criteria, as well as by the general indicators, ... social well-being in American cities generally improves away from the South."26

Although not dealing with social welfare explicitly, the vast literature on Social Area Analysis and Factorial Ecology does provide a starting point for the investigation of intra-urban indicators. It yields

\[24\] D. Smith, op. cit.
\[25\] Ibid., p. 32.
\[26\] Ibid., p. 33.
descriptive information on the distribution of a large number of socio-economic characteristics, and suggests that patterns of ecological structure can be obtained from a limited number of basic dimensions. As will be seen in the next chapter, the empirical study undertaken here uses the methodology of Factorial Ecology, but applies it to a different set of variables, and stresses the social welfare implications of the components that are extracted.

Summary

This chapter has reviewed the major works in which the prime emphasis is on spatial variations in social welfare. Four studies were discussed, two at the inter-state and two at the inter-urban level. Although confounded by similar problems to those encountered at the national level, they do provide a more accurate picture of the spatial diversity of well-being in the United States. Following this trend, the next chapter presents an investigation of social welfare undertaken at the intra-urban level in Columbus, Ohio.
CHAPTER III

RESEARCH QUESTIONS AND
RESEARCH DESIGN

The objectives of this empirical investigation of social welfare in Columbus, Ohio, are limited in scope. Due to the lack of theory, the study focuses on research questions rather than clearly defined hypotheses. The aims and objectives are as follows:

1. From available data construct a limited number of social indicators for areas within the city.

2. Determine the spatial patterning of the various indicators of well-being across the urban area.

3. Investigate the relationships between the categories of social welfare for which data are collected.

4. Evaluate the degree and direction of the relationships between the different social indicators.

5. Construct regions or urban neighborhoods based on different levels of social well-being.

The analytic procedure to be followed is summarized in Figure 1.

Data

Following Smith's list of problem areas mentioned previously in connection with social monitoring, data
Fig. 1.—Research Design*

*Flow diagram modified after Rummel, p. 158.
is collected on the following aspects of social welfare for the seventy-six census tracts inside the city limits of Columbus, Ohio, in 1960. (See figure 2)

1. Income and poverty (standard of living).
2. Public order and safety.
3. Health.
4. Living environment.
5. Education.
6. Recreation and leisure.

To this list are added three more areas of significance to social well-being at the intra urban level,

7. Accessibility and action space.
8. Transportation availability.
9. Location with respect to the C.B.D.

A complete list of the variables associated with each area, and their sources, is provided in table 1.

Inadequate data has already been cited as one of the major impediments to the immediate creation of a workable set of national indicators; its effect is no less significant in this study. Thus, coverage is restricted to the tracts within the city of Columbus since several key variables are not enumerated for the remaining areas within the S.M.S.A. Furthermore, some of the information is collected from city departments whose jurisdiction does not cover the whole of Franklin County. In limiting the spatial coverage the diversity among tracts is somewhat reduced since the highest status suburbs and rural urban fringe areas are excluded.
Fig. 2.—Census Tracts in Columbus, Ohio, 1960
TABLE 1
DATA INPUT FOR THE COMPONENT MODEL

STANDARD OF LIVING.\textsuperscript{a}

Income and poverty.
- % families with income below the poverty line of $3,000.
- % families with income above $25,000.
- Median family income.
- % married couples without their own household.

Occupation and employment.
- % males unemployed.
- % females unemployed.
- % males in blue collar occupations.
- % females in blue collar occupations.

PUBLIC ORDER AND SAFETY.\textsuperscript{b}

Crimes per thousand of the population.
- Murder.
- Manslaughter.
- Forcible rape.
- Robbery.
- Aggravated assault.
- Burglary.
- Larceny.
- Auto theft.
- Other assaults.
- Forgery.
- Embezzlement/Fraud.
- Sex offenses.
- All other offenses.

HEALTH.\textsuperscript{c}

Number of cases per thousand of the population.
- Syphilis.
- Gonorrhea.
**TABLE 1—Continued**

**LIVING ENVIRONMENT.**

*Physical environment.*

Air pollution—dust fall in tons per square mile.

*Housing condition and value.*

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>% housing units deteriorating</td>
<td></td>
</tr>
<tr>
<td>% housing units dilapidated</td>
<td></td>
</tr>
<tr>
<td>% owner occupied units valued &lt; $5,000</td>
<td></td>
</tr>
<tr>
<td>% owner occupied units valued &gt; $25,000</td>
<td></td>
</tr>
<tr>
<td>Median housing value</td>
<td></td>
</tr>
<tr>
<td>% rented properties with rents &lt; $20</td>
<td></td>
</tr>
<tr>
<td>% rented properties with rents &gt; $150</td>
<td></td>
</tr>
<tr>
<td>Median rental value</td>
<td></td>
</tr>
</tbody>
</table>

*Living density.*

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td># dwelling units per net residential acre</td>
<td></td>
</tr>
<tr>
<td># persons per net residential acre</td>
<td></td>
</tr>
<tr>
<td>% occupied units with &gt; 1.01 persons per room</td>
<td></td>
</tr>
</tbody>
</table>

**Neighborhood land use characteristics as percentages of total acreage in a tract.**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>Communications, transportation and utilities.</td>
<td></td>
</tr>
<tr>
<td>Public buildings</td>
<td></td>
</tr>
<tr>
<td>Public open space</td>
<td></td>
</tr>
<tr>
<td>Private open space</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
</tr>
<tr>
<td>Mining</td>
<td></td>
</tr>
<tr>
<td>Vacant land</td>
<td></td>
</tr>
<tr>
<td>Freeways</td>
<td></td>
</tr>
<tr>
<td>Streets</td>
<td></td>
</tr>
</tbody>
</table>

**EDUCATION.*

*Level and duration of schooling.*

<table>
<thead>
<tr>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>% population over 25 with no schooling</td>
<td></td>
</tr>
<tr>
<td>% population with elementary education only</td>
<td></td>
</tr>
<tr>
<td>% population with up to and including high school.</td>
<td></td>
</tr>
<tr>
<td>% population with up to and including college</td>
<td></td>
</tr>
<tr>
<td>Median number of school years</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 1—Continued

#### RECREATION AND LEISURE.\(^f\)

- # of social and recreation trips per head.

#### ACCESSIBILITY AND ACTION SPACE.\(^f\)

- Mean length of work trips (city block distance).
- Mean length of shopping trips (city block distance).
- Mean length of social and recreation trips (city block distance).
- Work trip potential index per head.
- Shopping trip potential index per head.
- Social and recreation trip potential index per head.

#### TRANSPORT AVAILABILITY.\(^a\)

- % households with 0 autos available.
- % households with 1 auto available.
- % households with 2 autos available.
- % households with 3+ autos available.

#### LOCATION.\(^g\)

- Distance from the C.B.D.

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\(^b\)Annual Report, 1960, Police Department, Department of Public Safety, City of Columbus.

\(^c\)Annual Report, 1960, Department of Health, City of Columbus.

\(^d\)Division of Air Pollution Control, Dust Count for Columbus, 1960. Department of Public Safety, Columbus, Ohio.
Project T-501, Land Use Inventory, Comprehensive Regional Plan of Columbus and Franklin County, 1964.

Calculated by the author from Franklin County Traffic Survey, 1964, conducted by the Ohio Department of Highways, Division of Planning and Programming, Bureau of Planning Survey.

Calculated by the author between census tract midpoints and the peak land value intersection.
However, since Columbus has practiced an aggressive annexation policy, some areas with distinct suburban characteristics are enclosed within the city limits, contributing some degree of variation to the study area.

A second limitation is the lack of time series data on all but census information and crime figures. Many of the variables used here are obtained from isolated surveys which have not been replicated on a regular basis. Thus a trade-off is made between including a wide range of variables covering as many aspects of social welfare as possible, and the spatial and temporal scope of the investigation.

Given these restrictions the following variables are included. **Standard of living** is measured simply by income, occupation and employment figures. Poverty is estimated by the percentage of families with incomes below $3,000 in 1960,\(^1\) while the percentage with incomes above $25,000 in the same year is taken as a measure of affluence. Median income provides a measure of central tendency between the two extremes. These figures however are only estimates of the more general concepts since there is no accurate way to control for family

size. The percentage of married couples without their own household is included as a further index of economic sufficiency, working on the assumption that all or most married couples would set up their own household if they could afford it. Unemployment variables relate directly to income and poverty, while the percentages in blue collar occupations are included to convey some information about income expectation and social status.

The level of public order and safety is measured by crime rates in two general areas, offenses against persons and offenses involving property. The first includes murder, manslaughter, rape, robbery, aggravated assault and sex offenses while the second involves burglary, larceny, auto theft, forgery, embezzlement and fraud. On its face value the level of crime in a neighborhood is a direct aspect of the quality of life, frequently compounded with problems of low incomes and poverty; however, it is also a surrogate for the more elusive concept of social disorganization.

Two indices of general levels of health are collected: the numbers of cases of syphilis and gonorrhea. By no means comprehensive, these figures give an estimate of health conditions in different parts of the city. However, since these measures reflect only the
reported cases, they are expected to underestimate the true incidence of venereal disease over the study area.

Four different aspects of the living environment are included. Data on air pollution is collected to represent the physical environment. Dust fall figures are interpolated from figures obtained at twenty monitoring stations situated throughout the city, taking the prevailing wind direction into account. Dust fall is spatially correlated with the incidence of more harmful pollutants, such as oxides of nitrogen and sulphur, which were not measured in a consistent manner in 1960.\(^2\)

The housing environment is measured directly in terms of the proportions of dwelling units that are deteriorating or dilapidated, and indirectly by property values and gross rents. Living density is expressed in three variables measuring density per room, and the numbers of persons and housing units per net residential acre. Finally, neighborhood land use characteristics are included with noxious facilities (industry, freeways, communications, transportation, public utilities), potentially unpleasant land uses (commercial and public buildings) and some uses expected to generate positive externalities (open space and water).

\(^2\)This is verified by correspondence with the Air Pollution Control Board, Columbus, Ohio.
Education is monitored in terms of the level and duration of schooling since, as Smith puts it, "the importance of education to social well-being operates in a number of different ways, including the improvement of earning capacity and all that goes with it, the bestowal of status and social mobility, and making known and available to individuals wider ranges of alternatives for the manner in which they arrange their lives." ³

Accessibility is not covered in other studies, but represents an aspect of social welfare that is of considerable importance at the intra urban level. ⁴ Six variables are included which attempt to cover accessibility to work, shopping and recreational facilities, and the size of the average action space of people living within a tract. The mean length of trips is calculated using city block distance since, for the most part, Columbus streets conform to a grid pattern; while a trip potential index is calculated to measure both


⁴Harvey, for example, argues that the two most important variables influencing real income are the "price of accessibility" and the "cost of proximity" in "Social Processes and the Redistribution of Real Income in an Urban System." in M. Chisholm, ed., Regional Forecasting, Proceedings of the 22nd Colston Symposium. Butterworth Scientific Publications, London, 1972.
access and action space for the three types of trip listed above. The index is computed as follows.

\[ I_{kij} = \sum_j \frac{T_{kij}}{D_{ij}^2} \cdot \frac{1}{P_i} \]

where \( I_{kij} \) is the index value for the \( k \)th type of trips originating in tract \( i \), \( T_{kij} \) is the number of trips of type \( k \) between census tracts \( i \) and \( j \), \( D_{ij} \) is the distance between census tracts \( i \) and \( j \), and \( P_i \) is the population of census tract \( i \). This is a conventional flow potential index which measures the centrality or accessibility of a tract within the city, standardized by the population of the origin tract. As such it measures the degree to which people, on average, are constrained by distance in their trip behavior and gives some indication of the relative extent of the action space associated with different tracts.\(^5\)

Under the heading of transportation availability, the number of automobiles per household is included, indicating both economic well-being and the ability to take advantage of dispersed urban facilities. Only one

\(^5\)The larger the value of the index, the shorter will be the average trips made from a tract, leading to the conclusion that the people living there are closer on average to work, shops and recreation facilities than people in tracts with lower index values. This suggests the index also provides an estimate of the average action space associated with an area.
variable is available to reflect the leisure activities of an area, and this is the number of social and recreational trips per head. Finally, distance from the C.B.D. is included as a measure of relative location within the city and is measured as the straight line distance between the mid point of a tract and the peak land value intersection.

Analytic Procedure

The Factor Model

Factor analysis is used to investigate the inter-relationships between the variables measuring social welfare. In this context the model identifies groups of correlated measures which together represent major components of well-being in the city. Furthermore, the technique generates scores for the observations on each underlying dimension, which provides a basis for comparing and classifying census tracts. Since no direct hypotheses are being tested, nor is there a concern for separating general from unique contributions to data variability, the factor model selected is the principal components solution. This avoids the thorny issue of

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estimating communalities by requiring that they assume values of unity.

An oblique rotation scheme is chosen in this study on both conceptual and experimental grounds. Cattell, for example, argues that the orthogonal model "is altogether too restricted to permit a fit to naturally occurring causes, which are, more often than not, correlated or 'oblique'." On empirical terms, oblique rotations generate the best definition of clusters of variables and the best separation of those clusters, even though the dimensions are not orthogonal. This results from clear definition of simple structure where each variable has a high loading on only one factor and has loadings of near zero on all other factors in the solution.

**Grouping Procedure**

Observations are grouped according to their scores on the various components. The HGROUP algorithm is


7A direct quartimin rotation is performed following the technique developed by R. I. Jennrich and P. F. Sampson (1966), "Rotation for Simple Loadings." Psychometrika, 31, 3.


9D. J. Veldman (1967), *FORTRAN Programming for the*
employed to classify the tracts, operationalizing Ward's approach to finding optimal groupings.\textsuperscript{10} The technique initially defines each census tract as a group and proceeds to aggregate them in a stepwise process, such that the minimum increase in the within group variance is incorporated at each level. The larger the increase in this variance after any particular step, the larger is the error included in the grouping at that level. By plotting the increase in within group variance against the number of groups, a marked change in slope at a particular point frequently suggests the optimal number of classes.

\textit{Summary}

In this chapter the objectives of the empirical investigation were stated, and the research design was outlined. This was followed by the presentation of those aspects of social welfare for which data were collected, and by an explanation of the analytic procedure used. The results of this empirical analysis are discussed in the following chapter.

CHAPTER IV

EMPIRICAL INVESTIGATION OF
URBAN INDICATORS

In presenting the results of the principal component analysis and grouping procedure, each of the study objectives listed in the previous chapter is addressed in turn. First, the oblique components are interpreted and their spatial patterns illustrated. Second, the independence of the sets of input data is investigated. Next, the relationships between the indicators are discussed, and finally a set of urban neighborhoods is presented which is based on social welfare.

Urban Indicators and Their Spatial Patterns

On the basis of a scree test, a discontinuity in the eigenvalues, and interpretability, the first six


3Rummel, op. cit., p. 362.
orthogonal components, which together explain 65 percent of the total variance, are rotated to oblique simple structure. These correlated dimensions of social welfare within the city are interpreted as urban indicators. (The primary pattern factor matrix is presented in the Appendix, but summaries are provided in tables 2 and 3.)

The first rotated dimension has relatively high loadings on a large number of variables, and a sum of squares of 8.87. (Tables 2 and 3) It is a general social welfare component differentiating tracts on a large number of characteristics related to social well-being. When grouped and mapped the component scores reveal a marked gradient from the central city outwards, reflecting basic differences between the inner city and surrounding areas. (Figure 3) Central tracts are characterized by high positive scores, indicating concentrations of families below the poverty line and individuals without schooling. The incidence of venereal diseases is high, suggesting general poor health conditions, and there is marked overcrowding with significant percentages of both deteriorating and dilapidated dwelling

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4 All computations are performed using the B.M.D. X72 Factor Analysis Program and the facilities of the I.R.C.C. of the Ohio State University.
<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eigenvalues</td>
<td>22.31</td>
<td>6.15</td>
<td>4.18</td>
<td>3.64</td>
<td>3.29</td>
<td>2.25</td>
</tr>
<tr>
<td>before rotation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative</td>
<td>34.86</td>
<td>44.46</td>
<td>50.99</td>
<td>56.68</td>
<td>61.82</td>
<td>65.34</td>
</tr>
<tr>
<td>proportion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of explained</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>variance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of squares</td>
<td>8.87</td>
<td>8.29</td>
<td>7.12</td>
<td>3.87</td>
<td>3.70</td>
<td>4.09</td>
</tr>
<tr>
<td>after rotation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 3
HIGHEST LOADINGS ON SIX URBAN INDICATORS*

#### I. GENERAL SOCIAL WELFARE

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>% no schooling</td>
<td>0.82</td>
</tr>
<tr>
<td>Aggravated assault</td>
<td>0.80</td>
</tr>
<tr>
<td>Murders per head</td>
<td>0.78</td>
</tr>
<tr>
<td>% value &lt; $5,000</td>
<td>0.72</td>
</tr>
<tr>
<td>Gonorrhea/thousand</td>
<td>0.70</td>
</tr>
<tr>
<td>% females blue collar</td>
<td>0.65</td>
</tr>
<tr>
<td>% houses deteriorating</td>
<td>0.61</td>
</tr>
<tr>
<td>% houses dilapidated</td>
<td>0.60</td>
</tr>
<tr>
<td>% married no house</td>
<td>0.58</td>
</tr>
<tr>
<td>% males unemployed</td>
<td>0.52</td>
</tr>
<tr>
<td>% females unemployed</td>
<td>0.48</td>
</tr>
<tr>
<td>% &gt; 1.01 persons/room</td>
<td>0.48</td>
</tr>
<tr>
<td>% elementary</td>
<td>0.47</td>
</tr>
<tr>
<td>Syphilis/thousand</td>
<td>0.45</td>
</tr>
<tr>
<td>% C/T/U land use</td>
<td>0.48</td>
</tr>
<tr>
<td>% income&lt;$3,000</td>
<td>0.35</td>
</tr>
<tr>
<td>Distance from C.B.D.</td>
<td>-0.35</td>
</tr>
<tr>
<td>Median school years</td>
<td>-0.50</td>
</tr>
<tr>
<td>Mean length soc. and rec. trips</td>
<td>-0.57</td>
</tr>
</tbody>
</table>

#### II. CRIME

<table>
<thead>
<tr>
<th>Type of Crime</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embezzlement per head</td>
<td>0.95</td>
</tr>
<tr>
<td>Larceny per head</td>
<td>0.91</td>
</tr>
<tr>
<td>Auto theft per head</td>
<td>0.83</td>
</tr>
<tr>
<td>Misc. offenses per head</td>
<td>0.82</td>
</tr>
<tr>
<td># persons/residential acre</td>
<td>0.82</td>
</tr>
<tr>
<td># d.u./residential acre</td>
<td>0.69</td>
</tr>
<tr>
<td>Burglaries per head</td>
<td>0.69</td>
</tr>
<tr>
<td>% commercial</td>
<td>0.62</td>
</tr>
<tr>
<td>Forgery per head</td>
<td>0.61</td>
</tr>
<tr>
<td>Robberies per head</td>
<td>0.55</td>
</tr>
<tr>
<td>Assaults per head</td>
<td>0.53</td>
</tr>
<tr>
<td>% 0 autos</td>
<td>0.42</td>
</tr>
<tr>
<td>% 1 auto</td>
<td>-0.47</td>
</tr>
</tbody>
</table>

*Summarized from the factor pattern matrix which is presented in the Appendix.*
### TABLE 3—Continued

#### III. SOCIO-ECONOMIC STATUS

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>% income&gt;$25,000</td>
<td>.99</td>
</tr>
<tr>
<td>% value&gt;$25,000</td>
<td>.98</td>
</tr>
<tr>
<td>% 2 autos</td>
<td>.77</td>
</tr>
<tr>
<td>Median value</td>
<td>.76</td>
</tr>
<tr>
<td>% rent&gt;$150</td>
<td>.73</td>
</tr>
<tr>
<td>Median income</td>
<td>.68</td>
</tr>
<tr>
<td>% college</td>
<td>.58</td>
</tr>
<tr>
<td>Soc. and rec. trip index</td>
<td>.53</td>
</tr>
<tr>
<td>Soc. and rec. trips/head</td>
<td>.48</td>
</tr>
<tr>
<td>% males blue collar</td>
<td>-.62</td>
</tr>
</tbody>
</table>

#### IV. RESIDENTIAL/NON RESIDENTIAL

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>% vacant land</td>
<td>.68</td>
</tr>
<tr>
<td>Manslaughter per head</td>
<td>.62</td>
</tr>
<tr>
<td>% residential</td>
<td>.55</td>
</tr>
<tr>
<td>% industrial</td>
<td>.48</td>
</tr>
<tr>
<td>Forcible rape per head</td>
<td>.47</td>
</tr>
<tr>
<td>% freeways</td>
<td>.37</td>
</tr>
<tr>
<td>Median rental</td>
<td>-.40</td>
</tr>
<tr>
<td>% streets</td>
<td>-.78</td>
</tr>
</tbody>
</table>

#### V. PUBLIC BUILDINGS/ACADEMIC GHETTO

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>% high school</td>
<td>.45</td>
</tr>
<tr>
<td>Mean length shopping trips</td>
<td>-.38</td>
</tr>
<tr>
<td>Sex offenses per head</td>
<td>-.49</td>
</tr>
<tr>
<td>% 3+ autos</td>
<td>-.66</td>
</tr>
<tr>
<td>% public building</td>
<td>-.83</td>
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</tbody>
</table>

#### VI. ACCESSIBILITY AND ACTION SPACE

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>% water</td>
<td>.49</td>
</tr>
<tr>
<td>% rent&lt;$20</td>
<td>.47</td>
</tr>
<tr>
<td>% private open space</td>
<td>.46</td>
</tr>
<tr>
<td>Mean length work trip</td>
<td>.44</td>
</tr>
<tr>
<td>Air pollution</td>
<td>.43</td>
</tr>
<tr>
<td>% public open space</td>
<td>.30</td>
</tr>
<tr>
<td>% mining</td>
<td>-.28</td>
</tr>
<tr>
<td>Shopping trip index</td>
<td>-.56</td>
</tr>
<tr>
<td>Work trip index</td>
<td>-.56</td>
</tr>
</tbody>
</table>
Fig. 3.—General Social Welfare
units. Both men and women are found in blue collar occupations, and the rate of unemployment is high for both sexes. Further indications of low economic sufficiency are the high numbers of married couples who do not have their own households, and the percentages of people without automobiles. In addition, these central areas experience a high incidence of violent crime, namely murder, aggravated assault and robbery, as well as serious crimes against property. Finally, these tracts contain noxious land uses such as railroad yards, bus stations, truck depots and public utilities.

Moving out from the central business district the social welfare improves, with areas exhibiting negative scores on this bi-polar component suggesting the absence of the characteristics listed above. The most noticeable features of these outer tracts are high levels of education, high proportions of families owning a car, and long distances involved in social and recreation trips. This last point supports the notion that better educated and affluent individuals have very attenuated action spaces, at least as far as their leisure activities are concerned.\(^5\)

The second component has a sum of squares of 8.29 indicating that it is only slightly less important than the first dimension. It is related to all the crime variables with the exception of murder, aggravated assault and forcible rape. Those tracts with a high incidence of offenses are found in and to the south of the C.B.D., while the crime rate appears to decline consistently towards the outskirts of the city. (Figure 4) Since the highest rates are found in and around the C.B.D., high positive scores also indicate the presence of substantial areas of commercial land use. However, a more significant relationship exists between high crime rates and high living densities, expressed as either people or buildings per residential acre.

Apart from studies of juvenile delinquency, little work has been done on general criminality within an ecological context. However, in a study of crime and deviant behavior in Luton, England, Timms identified the major causal variables as a disintegrated community, low socio-economic status, an absence of family structure and many unrelated individuals living in deteriorating rental properties, while the employment situation is essentially blue collar with a high rate of

"Action Space Formation: A Behavioral Approach to Predicting Urban Travel Behavior." (Mimeo)
5.84  Highest crime rates
3.97
2.16 to 1.96
1.37 to .56
.25 to -.39
-.46 to -.80  Lowest crime rates

Fig. 4.—Crime
unemployment. Although his study is conducted in England, Timms maintains that his explanatory variables compare well with studies in the United States. These neighborhood characteristics appear relevant to Columbus since, in a previous ecological study of the city, the inner city tracts, where high crime rates prevail, are identified as having just the attributes discussed above.

With a sum of squares of 7.12 the third oblique dimension can be clearly labelled socio-economic status or affluence. It is a more specific component than general social welfare, being associated only with the highest categories of income, education and housing value. Just as dimension one identifies the underlying pattern of poverty and its associated characteristics, this index reflects affluence, the opposite end of the

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spectrum. Positive scores are found in all the outer sections of the city except on the south side. (Figure 5) In these tracts are observed the highest proportions of families earning over $25,000, houses valued at more than $25,000, and dwellings renting for more than $150 a month. Furthermore there is a high percentage of persons with college education. It is to be expected that the number of families with more than three cars is high, as is the accessibility to social and recreation activities and the number of such trips per head of the population. The more central tracts, on the other hand, have negative scores and have large percentages of men and women in blue collar occupations with a high rate of unemployment for women. There are more rented properties, and in general, a maximum of one automobile is available to a household. In contrast to the suburban areas education levels are significantly lower, with few, if any, people proceeding beyond high school. From the social area analysis and factorial ecology literature, this component should be expected

5.14 to 4.01 Lowest S.E.S.
2.32 to 2.14
1.32 to .39
.27 to -.06
-.13 to -.62
-.67 to -.91 Highest S.E.S.

Fig. 5.—Socio-Economic Status
to be distributed in a sectoral pattern; however, no firm conclusion can be made without information on tracts outside the city proper.

Component four, with a sum of squares of 3.87, is related to neighborhood land uses indicating a residential versus non-residential polarization. As such it provides an index of environmental quality, and from it welfare implications may be inferred. A concentration of residential land use and areas devoted to streets is associated with negative scores. Tracts with positive scores are characterized by the presence of vacant and open space, water bodies, and land given over to communications, industrial uses and freeways. The pattern of scores in figure 6 follows the fragmented arrangement of different land uses within the city, but not unexpectedly it reflects a further dichotomy between suburban and inner city areas.

The spatial pattern of scores from component five in figure 7 clearly supports its interpretation as an "academic ghetto"/public building dimension. It is the only component without immediate implications for social welfare. However, it does contain elements of both environmental quality and economic well-being. With a sum of squares of 3.7 it has the lowest explanatory power of all six of the indices, but it is not
Fig. 6.—Residential/Non-Residential

4.81 Predominantly non-residential
2.76 to 1.74
1.22 to .53
.24 to -.46
-.58 to -1.48 Predominantly residential
Fig. 7.—Public Buildings/Academic Ghetto

-0.68  O.S.U./Public buildings

-1.89 to -1.11

-0.88 to 0.05

0.09 to 0.44

0.48 to 1.45  Few public buildings
inconsistent with results obtained from other ecological studies of Columbus.\textsuperscript{10} Its extraction is apparently influenced by the massive concentration of public buildings on the Ohio State campus and in the downtown area in close proximity to the Capitol, as well as by the anomalous population characteristics of the area surrounding the university. The "academic ghetto" is thus characterized as having large proportions of households with more than three automobiles, married couples without their own households, a high incidence of sex offenses, a high density of dwelling units per acre, unemployed women, and families below the poverty line. It is clear that some element of economic sufficiency is included in this dimension, and tracts with positive scores are found on the edge of the city with high median incomes.

The final dimension with a sum of squares of 4.09 is particularly significant for evaluating social welfare within a city, related as it is to accessibility and action space. (Figure 8) Accessibility is defined here in a limited way, referring only to proximity to the place of work, shopping and recreational facilities; however, the scores on this index produce a significant

\textsuperscript{10}P. E. King, \textit{op. cit.}
3.42 to 2.87  Lowest accessibility
1.69 to 0.67
0.53 to -0.18
-0.25 to -1.20
-1.37 to -2.42  Highest accessibility

Fig. 8.—Accessibility and Action Space
spatial pattern. Tracts with negative scores, indicating high accessibility, are located on the outskirts of the city, and with the exception of two areas near the C.B.D., the inner city has positive scores indicating a much lower level of access. It is significant that the mean length of work trips also loads on this dimension, but with an opposite sign to the work trip potential index. This not only supports the growing contention that inner city residents do not enjoy a prime location with respect to access, but, according to this dimension, they are also depicted as living with the greatest amounts of air pollution and with many households not owning a car. In addition, many families live below the poverty level and reside in close proximity to freeways in poor quality rental properties. Nevertheless, these areas have more than the average parks and privately owned open space, although the latter is generally undeveloped industrial land.

These six components account for a substantial portion of the variance among the original variables, and

all but the academic ghetto/public buildings dimension relate to a major aspect of social welfare within the city. They fulfill Olsen's\textsuperscript{12} requirement that they be normative statistics, in that a change in the values of the scores could be interpreted as an improvement or a deterioration in well-being for an area. Although they do not facilitate time series comparisons, they do provide the basis for investigating the variations in welfare over space for one point in time.

\textbf{Relationships Among Categories of Social Welfare for which Data Are Collected}

As discussed in chapters I and II, several authors provide lists of problem areas which are to be monitored by social indicators. The writers assume implicitly that the aspects of society they mention are independent dimensions of well-being. This assumption, however, is not borne out by the results of the present empirical investigation. It is clear that the aspects of social welfare for which data are collected are not independent, since variables in thirteen categories are reduced to six oblique components. In fact the loadings on the six indicators reveal an intricate pattern of relationships as is illustrated in figure 9. Each component is

**GENERAL ASPECTS OF URBAN SOCIAL WELFARE**

**URBAN INDICATORS**

- Health
- Density
- Crime
- Transport Availability
- Land Use
- Occupation & Employment
- Leisure & Recreation
- Income & Poverty
- Housing
- Education
- Access
- Physical Environment
- Location

- General Social Welfare
- Crime
- Socio Economic Status
- Residential/Non Residential
- Academic/Public Building
- Accessibility

---

*Fig. 9.—Visual Summary of Component Loadings*

*A line from an area to a component indicates at least one variable from that particular aspect of social welfare has its highest loading on that particular component.*
related to the variables from at least three aspects of social well-being; and general social welfare is linked with all but two of the sets of social characteristics. Thus, a large degree of redundancy exists in the list of problem areas used as a basis for data collection in this study.

Relationships Among the Urban Indicators

Although the six urban indicators are clearly different from each other, they are not statistically independent, as is shown in the component correlation matrix in table 4. The strongest relationship is a positive one between general social welfare and accessibility, and both indices are clearly related to the distance from the C.B.D.\textsuperscript{13} A positive relationship also obtains between general social welfare and socio-economic status, while crime levels decrease with increased well-being. Access is negatively related to socio-economic status and crime levels, while land use characteristics and the academic ghetto/public building indicator are virtually independent of one another and of all the other dimensions. A linkage analysis of the component

\textsuperscript{13}Care must be taken in interpreting the signs since negative scores on a dimension may indicate a preferred state of social well-being. Thus a negative component correlation may infer a positive relationship between the named aspects of social welfare.
### TABLE 4

**Oblique Component Correlation Matrix**

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1.0</td>
<td>.27</td>
<td>-.33</td>
<td>.17</td>
<td>-.09</td>
<td>.34</td>
</tr>
<tr>
<td>II</td>
<td>.27</td>
<td>1.0</td>
<td>-.17</td>
<td>.14</td>
<td>-.09</td>
<td>.24</td>
</tr>
<tr>
<td>III</td>
<td>-.33</td>
<td>-.17</td>
<td>1.0</td>
<td>-.13</td>
<td>.01</td>
<td>-.31</td>
</tr>
<tr>
<td>IV</td>
<td>.17</td>
<td>.14</td>
<td>-.13</td>
<td>1.0</td>
<td>-.04</td>
<td>.08</td>
</tr>
<tr>
<td>V</td>
<td>-.09</td>
<td>-.09</td>
<td>.01</td>
<td>-.04</td>
<td>1.0</td>
<td>-.12</td>
</tr>
<tr>
<td>VI</td>
<td>.34</td>
<td>.24</td>
<td>-.31</td>
<td>.08</td>
<td>-.12</td>
<td>1.0</td>
</tr>
</tbody>
</table>
correlation matrix yields the pattern presented in figure 10. Although causal inferences cannot be made from these simple correlations, the two most significant dimensions, in terms of their linkages with the other indicators, are general social welfare and accessibility.

**Urban Neighborhoods Based on Social Welfare**

The spatial patterns associated with each individual indicator have been discussed briefly above; however a typology of areas based on all six indices is also obtained. Tracts are grouped using the HGROUP algorithm according to their scores on all six urban indicators. The increase in "error" at successive levels of group aggregation is illustrated in figure 11. On the basis of this graph, and following the criteria that an optimal grouping should have generality while incorporating as little within group variance as possible, eight categories of census tracts are identified. This includes five major classes of tracts, three inner city groups and two outer ring or suburban groups, as well as three sets of unique and non contiguous tracts. Twenty-two distinct neighborhoods are identified over the study area as illustrated in figure 12.
Fig. 10.—Highest Correlations Among the Six Urban Indicators
Fig. 11.—Error Curve from HGROUP Algorithm
Fig. 12.—Neighborhoods Based on Social Welfare
Inner City Groups

Group one is made up of two tracts in the heart of the city encompassing the C.B.D. Not unexpectedly this area has little heavy industry, but there is a high concentration of commercial activities and land under streets. The few people that do live in the area are not the poorest in the city, nor do they exhibit the lowest education and health ratings, even though socio-economic status is well below average. The major differentiating characteristic, apart from the concentration of commercial land, is that both tracts experience crime rates higher than any other part of the city. A significant point, mentioned above, is that accessibility in terms of the trip behavior of the residents is low, and this is in conflict with the classical rent models of city structure and action space studies which suggest that the center of the city is the most accessible point in an urban area with compact opportunity and action spaces.\(^{14}\)

The two other major inner city types are groups two and three in figure 12. Again, both are characterized

\(^{14}\)The rent models of Alonso and Wingo, for example, are both formulated on the precept that the C.B.D. is the most accessible point in the city as well as being the source of all employment. Horton and Reyonlds, \textit{op. cit.}, also suggest that inner city residents have a more compact opportunity set and as a result a more spatially restricted action space.
by low values on the potential indices suggesting relatively poor access to work, shopping facilities and leisure resources. They also experience a high incidence of air pollution and violent crime, with poor health conditions, high unemployment in a predominantly blue collar work force, and the largest proportions of substandard housing. The two groups differ primarily with respect to the amounts of noxious land uses that they include; group three, located further out from the center of the city, is less developed industrially and commercially, but on the other hand has higher rates of unemployment and a larger percentage of families below the poverty line than group two.

The two separate tracts that comprise group four are offshoots from group two. They appear as a distinct type primarily because they have the highest proportions of non residential development in the city. The northern tract, although partly given over to a large urban renewal project, has a large area of land covered by freeways and interchanges. The southern tract has a large area of water, and also undeveloped land on the flood plain of the river.

These four categories, forming ten neighborhoods, constitute what may be called the inner city with low values on all the urban indicators. They show relative
deprivation and varying amounts of low social welfare related to personal characteristics, the physical environment and accessibility.

Suburban Groups

The two outer ring or suburban categories are marked as groups five and six on figure 12, and their levels of social welfare are distinctly different from the types discussed above. Both groups cover areas with a marked absence of noxious land uses, air pollution and other physical characteristics associated with the inner city. In general, educational levels are the highest in the city and both areas have high socio-economic status in terms of income, housing values and the availability of automobiles. Their scores also indicate that a large number of social and recreation trips in particular are made in these areas, suggesting more leisure activities outside the home than are found in the central parts of the urban area. Both categories five and six are predominantly residential; however, group six has a larger proportion of open, undeveloped land and a slightly higher rate of crimes against property. The final difference between the two classes of tracts is that group five has low accessibility values and, consequently, on the average residents travel further for work, shopping and leisure than the people in group six.
The two isolated tracts on the east side of the city, identified as group seven, are distinguishable as the most affluent areas within the city limits, with the most expensive houses and highest levels of education and incomes. However, they are situated in a relatively old residential area and this is reflected in slightly lower scores on the general social welfare indicator than the other suburban areas. On the other aspects of social welfare, there is little distinction between them and groups five and six.

Despite minor internal variations, these suburban areas have consistently higher levels of social welfare than the central portion of the city. This is reflected in lower crime rates and density of development, a lack of industrial and commercial land uses, high economic status and high access to a specialized number of urban resources.

One anomalous area remains, the campus of The Ohio State University. Designated as group eight in figure 12, it has a similar rank on general social welfare as the tracts in group five that surround it, but is distinguished by having the lowest crime rate in the city. This is in marked contrast with the surrounding area of off campus housing. Not surprisingly, the area scores very low on socio-economic status with low
incomes and high rates of unemployment, while accessibility is average.

The stability of these neighborhood types is revealed in figures 13 through 19 where successive levels of grouping generality are mapped. Differentiation within the inner city tracts is first to disappear and the distinction between suburban tracts is absorbed when only six groups are obtained. With only five groups, the two anomalous tracts to the west of the C.B.D. join the inner city area. The other, non contiguous tracts on the east side are next to merge, this time with the outer ring, just before the C.B.D. is absorbed by the central area. The university is sufficiently distinct to remain a separate category with three groups, but it joins the central tracts when only two categories are mapped, and thus leaves a clear pattern of differentiation between the inner city and the suburban ring.

Summary

In this chapter the results of the empirical analysis were discussed in terms of the objectives stated in chapter III. The conclusions derived from these findings are set forth in the final chapter.
Fig. 13.—Seven Classes of Tracts
Fig. 14.—Six Classes of Tracts
Fig. 15.—Five Classes of Tracts
Fig. 16.—Four Classes of Tracts
Fig. 17.—Three Classes of Tracts
Fig. 18.—Two Classes of Tracts
CHAPTER V

SUMMARY AND CONCLUSIONS

Although this study does not provide any novel results, it serves to identify six major dimensions of social welfare, and reveals how they are distributed within the city. It indicates that even without a model of urban society, and accepting data deficiencies, cross sectional patterns can be obtained which could provide a general base for planning policy. With this type of ecological analysis it is possible to identify areas which are more or less deprived on a number of objectively measured components of social well-being.

While it is impossible to generalize from this one study, it is significant that some degree of correspondence exists between these results and those obtained by Smith\(^1\) and Wilson\(^2\) at very different scales of


There is a danger of drawing such conclusions merely on the basis of labels given to factors in different studies; however the types of measures loading on Smith's first two state components are very similar to the variables related to the first two dimensions in this study. This suggests that socio-economic well-being and crime, or social pathology as Smith calls it, may be major dimensions of social welfare with some claim to generality at different levels of spatial aggregation. The other indicators may also be applicable in other cities and at other scales of investigation, but there are no other studies with which to compare the results. The academic and public building index may be appropriate only in cities with large state universities and concentrations of state and local government offices.

The component correlations provide some insights into the linkages between these different dimensions. The correlations are not high, but general social welfare is linked to all but the "academic ghetto"/public building dimension. The highest correlations involve general welfare, accessibility and socio-economic status, suggesting a triad of significant indicators. A causal interpretation is not possible, but it is clear that where tracts exhibit such characteristics as good
health figures, low residential densities, good quality housing and good availability of private transportation then socio-economic status will also be high and residents will be accessible to a variety of urban functions. The next highest correlation indicates that general crime levels decrease as general welfare improves supporting the contention that the deprived members of society, on the most part, are both the perpetrators and the victims of much of the crime in the city. The relationship between land use characteristics and other elements of well-being is very low which does not necessarily discount the existence of externality effects, since they are probably masked by the level of spatial aggregation. It is expected that such effects operate at a more local level than the census tract. However the index can still be used to differentiate neighborhoods if some negative connotation is added to non residential uses of space.

The major problem in interpreting these indicators, and a difficulty shared by all objective measures, is that they contain no information on personal or cultural values. Perceived or experienced levels of welfare have to be imputed to them. It is assumed, for example, that white collar employment is preferred to blue collar occupations and that low density housing is preferable
to high density living. Thus the value system of the researcher or the planner cannot be separated from the analysis, and there is no allowance for differences in preferences and attitudes between segments of the population.

From the maps it is possible to identify neighborhoods which are internally homogeneous with respect to the quality of life, and are distinct from other parts of the city. These results are consistent with the idea of a sifting process in residential site selection and with Harvey's thesis that "much of what goes on in the city can be interpreted as an attempt to organize the distribution of externality effects in order to gain some income advantage." Such a process results in a territorial organization of the city in which positive externalities are maximized within a neighborhood while at the same time contacts with groups generating negative effects are minimized. It is apparent from figures 12 through 18 that the most dissimilar neighborhoods are in fact farthest apart.

It is also significant that the pattern based on social welfare is remarkably similar to the pattern of

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neighborhoods derived from a standard set of social area analysis measures, as can be observed by comparing figures 12 and 19. The overlap of variables is not sufficient to influence the similarity. It appears that areas delimited according to distinct levels of well-being also show remarkable homogeneity with respect to life cycle characteristics, ethnic composition and also residential stability. This is again consistent with individuals seeking a location in which their values and norms are reinforced while avoiding areas and groups from which they experience negative effects. Once a neighborhood achieves an identity and internal homogeneity, it begins to generate its own particular level of social welfare.

The major pattern to emerge is the marked distinction between the inner city and the surrounding areas on all aspects of social well-being. This is consistent with the operation of Harvey's "hidden mechanisms" of real income redistribution, several of which work to the detriment of central locations.\(^5\) The low values on all the indicators, including access, suggest that even in


\(^5\) Harvey, *op. cit.*
Fig. 19.—Social Area Analysis Neighborhoods
1960 the "price of accessibility" and the "cost of proximity" were high for inner city residents. This suggests that inner city deprivation results from more than just low incomes and poor housing conditions. The inner city also experiences the lowest value on all the indices extracted here, making the gap between city and suburb much wider than if measured in simple economic terms.

Thus, although the results are not unexpected, the study includes a large number of variables not generally incorporated in ecological research, and investigates an area not previously covered in the geography literature. The results also provide the basis for comparison with work in other cities. These investigations point out some of the deficiencies in objectively measured indicators and suggest that survey data will have to be collected on a regular basis if measures are to aid in the planning process. The study also lends support to several theoretical statements concerning the territorial organization of urban areas and changing patterns of accessibility. It also points out the need for further investigation into the spatial variation of social variables and provides a first step towards identifying

\[6\text{Ibid.}\]
causes, and possibly solutions, to social problems facing the nation and its cities.
### Appendix

**Primary Pattern Matrix: Six Oblique Components**

<table>
<thead>
<tr>
<th></th>
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<th>V</th>
<th>VI</th>
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<td># d.u./residential acre</td>
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<td>% industrial</td>
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<td>% vacant land</td>
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