THESIS

RESIDENTIAL CLASS INDICATORS:

Census-Based Techniques for Modeling Neighborhood Quality and Social Class in Urban Areas

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THESIS

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PREFACE

The Structure of this Paper

After an introductory section, this research paper will proceed with a lengthy discussion of the important concepts being addressed, providing references to background materials that led up to and enabled this new research. In order to render my explanations of a complicated subject more approachable and interesting, I have taken the liberty of writing in the first person and relating numerous ideas and explanations (such as the identification of weaknesses and areas for further research) where I feel they are most meaningful, even if in an organizational sense they would be expected to appear in a separate section of the paper dealing more specifically with such topics.

My explanation of the progress of my research is generally chronological in the section explaining the RCI model—a deliberate choice which I felt would assist readers in becoming gradually acquainted with the concepts, my evolving mathematical model, and the abbreviations that I use in the equations and discussion of my model's concepts. Again, the narrative at times is a bit personal, which I felt was acceptable to keep under consideration the subjective aspects of the topic. My objective in occasionally using some personal anecdotes is to link the mathematical abstractions of my model with a more colloquial explanation and "common sense" conceptualization of what I have done, and why.

When equations are given, later in this paper, I have in most cases immediately followed them with explanations of the variables that they refer to in abbreviated form. These variables are all either from the decennial census (1990 STF 3A) or are derivable from them in relatively straightforward ways (the examples of the RCI model used census data downloaded from the web site at http://venus.census.gov/cdrom/lookup). To assist readers in understanding these equations, and to avoid excessive repetition in the explanations accompanying them, I have included, following this preface, an alphabetical guide, called "Key to Abbreviations in Equations," that will help make their meaning and use more understandable. My abbreviations also follow a format that is fairly straightforward, once the reader is familiar with all the main concepts involved in the topic. Preceding the "Key to Abbreviations in Equations" is a smaller "Key to Abbreviations." All of the longer abbreviations used in equations are made up of combinations of these smaller abbreviations. I believe that once the subject is understood, the use of these abbreviations will make discussion and application of the concepts much easier than if lengthy phrases or are used to describe each variable and condition.

The first four equations presented in the paper are mere prototypes, whose simpler structure allows the reader to better understand the logic of the lengthier equations that follow. In addition, this renders the evolution of my ideas more clearly, enabling my work to be more easily analyzed, critiqued, and amended to correct for flaws that are found. Various assumptions that are part of the model can be seen more clearly as they appear during my chronological description of its creation. Using this style of exposition, I hope to equip my readers with the means to adjust my equations to match different assumptions that they may make, or different research goals that they may have. The equation that, at the time of writing, I found most useful, is Equation 8. Equations 7 and 9 are considered simpler but similarly sound. I follow this set of equations with another (Equations 10 through 12) that I chose at this time to abandon as less accurate and useful.

I include them because I believe it possible that they may be found to be useful at some later time as more thinking and research is done on this specific topic, and thus the equations relate to one of the areas for further research that I have identified.

Following my main explanatory sections is an example of how my research can be applied and interpreted. This leads almost directly into an assessment of some of the weaknesses in my model, and precautions about certain applications of it that I feel at this point are not yet justifiable. The final, lengthy section takes numerous concepts of the model and proposes how they may be profitably used in numerous future studies. Several appendices appear at the end of the document. These are tables that are referred to by various passages of the text, but which were not included as figures within the text, due to their burdensome sizes of at least two pages each.

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KEY TO ABBREVIATIONS

%	proportion
CR	contract rent
GQ	group quarters (also "gq")
GR	gross rent
hh	household
HU	housing unit
i	institutional
M	mean
Md	median
MSA	Metropolitan Statistical Area
ni	noninstitutional
OO	owner-occupied (also "oo")
p	persons
pci	per capita income
pp	persons per
RCI	Residential Class Indicator
RMA	Ranally Metropolitan Area
RO	renter-occupied (also "ro")
SMOC	selected monthly owner costs
t	census tract
UA	urbanized area (also "ua")
UDA	user-defined area

V	value
wm	with a mortgage
wom	without a mortgage

KEY TO ABBREVIATIONS IN EQUATIONS

The following is a list of the abbreviations used in equations throughout this paper.

gqiRCIt	The term of an RCI equation that estimates the quality of institutional group quarters in a tract (or other small area of study)
gqniRCIt	The term of an RCI equation that estimates the quality of noninstitutional group quarters in a tract (or other small area of study)
gqRCIt	The term of an RCI equation that estimates the quality of group quarters in a tract (or other small area of study)
%GQit	The proportion of persons in a tract (or other small area of study) who inhabit institutional group quarters, found by dividing the number of persons in institutional group quarters in an area by the total number of persons in that area
%GQnit	The proportion of persons in a tract (or other small area of study) who inhabit noninstitutional group quarters, found by dividing the number of persons in noninstitutional group quarters in an area by the total number of persons in that area
%GQt	The proportion of persons in a tract (or other small area of study) who inhabit group quarters, found by dividing the number of persons in group quarters in an area by the total number of persons in that area
MdCRt	The median contract rent of renter-occupied units in a tract (or other small area of study)
MdCRua	The median contract rent of renter-occupied units in the entire urbanized area (or other large area used as a standard of comparison)
MdVt	The median value of owner-occupied housing units in a tract (or other small area of study)
MdVua	The median value of owner-occupied housing units in the entire urbanized area (or other large area used as a standard of comparison)
MGRt	The mean gross rent of renter-occupied units in a tract (or other small area of study)

MGRua	The mean gross rent of renter-occupied units in the entire urbanized area (or other large area used as a standard of comparison)
MVt	The mean value of all owner-occupied units in a tract (or other small area of study)
MVua	The mean value of all owner-occupied units in the entire urbanized area (or other large area used as a standard of comparison)
MVwmt	The mean value of all owner-occupied units with a mortgage in a tract (or other small area of study)
MVwmua	The mean value of all owner-occupied units with a mortgage in the entire urbanized area (or other large area used as a standard of comparison)
MVwomt	The mean value of all owner-occupied units without a mortgage in a tract (or other small area of study)
MVwomua	The mean value of all owner-occupied units without a mortgage in the entire urbanized area (or other large area used as a standard of comparison)
%OOhht	The proportion of households in a tract (or other small area of study) that live in owner-occupied housing units, found by dividing the number of owner-occupied households in an area by its total number of households
%OOpt	The proportion of person in a tract (or other small area of study) that live in owner-occupied housing units, found by dividing the number of persons living in such units in that area by the total number of persons living in that area
ooRCIt	The term of an RCI equation that measures the quality of owner-occupied housing units in a tract (or other small area of study)
%OOwmpt	The proportion of persons in a tract (or other small area of study) that live in owner-occupied housing units with a mortgage
%OOwompt	The proportion of persons in a tract (or other small area of study) that live in owner-occupied housing units without a mortgage
pciGQit	The per capita income of persons living in institutional group quarters in a tract (or other small area of study), found by dividing the aggregate income of all persons living in institutional group

quarters in an area by the number of persons living in institutional group quarters in that area

pciGQnit	The per capita income of persons living in noninstitutional group quarters in a tract (or other small area of study), found by dividing the aggregate income of all persons living in noninstitutional group quarters in an area by the number of persons living in noninstitutional group quarters in that area
pciGQt	The per capita income of persons living in group quarters in a tract (or other small area of study), found by dividing the aggregate income of all persons living in group quarters in an area by the number of persons living in group quarters in that area
pciGQua	The per capita income of persons living in group quarters in the entire urbanized area (or other large area used as a standard of comparison), found by dividing the aggregate income of all persons living in group quarters in that area by its total number of persons living in group quarters
pciOOwmua	The per capita income of persons living in owner-occupied housing units with a mortgage in the entire urbanized area (or other large area used as a standard of comparison), found by dividing the aggregate income of all persons living in owner-occupied units with a mortgage by the total number of persons living in owner-occupied units with a mortgage
ppOOHUt	Persons per owner-occupied housing unit in the tract (or other small area of study), found by dividing the aggregate number of persons in owner-occupied housing units in the tract by the number of owner-occupied housing units in the tract
ppOOHUua	Persons per owner-occupied housing unit in the entire urbanized area (or other large area used as a standard of comparison), found by dividing the aggregate number of persons in owner-occupied housing units in the area by its total number of owner-occupied housing units
ppOOHUwmua	Persons per owner-occupied housing unit with a mortgage in the entire urbanized area (or other large area used as a standard of comparison). I did not succeed in finding or deriving this data for this study, and had to substitute ppOOHUua for this variable.
RCI%	The proportion of a tract RCI over the area RCI (RCIt ÷ RCIua), producing a measure that may allow for the comparison of tracts between metropolitan areas, or in the same area over time, given

	the assumption that class position and relations are relative to local social conditions rather than fixed standards or objective physical conditions of housing
RCIt	Residential Class Indicator for a tract (or other small area of study)
RCIua	The RCI rating that represents an entire UA (or other large area used as a standard of comparison), obtained simply by treating information on that area as if it were for a single tract and applying the RCIt formula to it
%ROhht	The proportion of households in a tract (or other small area of study) that inhabit renter-occupied housing units, found by dividing the number of renter-occupied households in an area by its total number of households
%ROpt	The proportion of persons in a tract (or other small area of study) that inhabit renter-occupied housing units, found by dividing the number of persons in such units by the total number of persons living in that area
roRCIt	The term of an RCI equation that measures the quality of rental-occupied housing units in a tract (or other small area of study)
SMOCwmua	The mean selected monthly owner costs of owner-occupied units with a mortgage, for the entire urbanized area (or other large area used as a standard of comparison)

1. INTRODUCTION

Introduction to the Problem Being Researched

Despite the extensive amount of research on the topic of social class, it is still a difficult task to identify where a person, family, or household fits into a class or stratification framework in an American city. Similarly, although most people have and express ideas about areas of a city that they feel are "good" or "bad" to live in, or somewhere in-between, it is often very difficult to pinpoint just *how good* or how bad an area is. Both social class and neighborhood quality seem linked together, but there is no clear measure in general use to express the nature of this relationship. One of the problems is that there is no simply defined and easily measurable condition that defines one's "social class." Also, while similar types of residential arrangements may be easy to compare to each other, a sizable urban area contains quite a diversity of living arrangements that tend to confound attempts to make comparisons between them. Although owning a home is generally indicative of greater wealth and status than renting an apartment, there may be areas within a city where the construction of a new apartment building is a boon to the neighborhood, and provides housing of a clearly higher quality than the old and shoddy, crumbling houses that surround it.

While it can sometimes be quite easy to reach agreement on whether some person is lower or upper-class, or which neighborhood is one of the nicest or worst in a city, there are many cases between these extremes that are more difficult to classify. Is our definition of how class is to be measured powerful enough that any randomly selected person in the country can be assessed and placed within a descriptive framework that is meaningful to most people? If a location within a city were to be selected at random, is there a way to assess how "desirable" an area it is to live in, or what "class" of person would be likely or expected to live there? The goal of my research is to allow any residential area or neighborhood within an urban area (of sufficient size) to be rated as to its quality, and to use such ratings to help assess the class position, or socioeconomic status, of those who are living there. My research enables such analysis by providing equations that, using readily available census data, produce ratings called Residential Class Indicators (RCI), that assess the residential quality of an area, and thus suggest something about how its inhabitants fit into a contemporary framework of social stratification.

The Need for the Research

There is a need for this kind of research, in the fields of sociology and urban planning, to better apply the concept of class or social stratification to a description or model of urban areas in American society, in a form that is usable by those without extensive mathematical or statistical expertise. This research provides urban and regional planners with a relatively simple way of assessing the residential areas they oversee. Urban geographers should also find my proposed model to be of interest in identifying noteworthy socioeconomic patterns in residential location decisions and trends in an area, since it has similarities with the "social area" analysis tools used in their discipline. This research offers a way to measure concepts of class and neighborhood quality that are usually too subjective (or controversial) to allow clear and explicit analysis, and possibly even evaluation of planning decisions that could affect them. If others agree that my Residential Class Indicators are sufficiently accurate and useful, their application could allow certain types of difficult planning decisions to be conceptualized in a clearer and more objective fashion. Sociologists interested in measuring social class are provided with an extra indicator that can be used both to classify their subjects of study within a stratification framework, and to make class distinctions between subjects who, by other measures, had been assigned to a similar class despite obvious differences in lifestyle, affiliation, and consumption habits.

2. BACKGROUND INFORMATION AND KEY CONCEPTS

The Concept of Class

Having a background in sociology, I have long been aware of the concept of social class, and this concept (along with the related one of social stratification) has guided many aspects of my research. The idea of social class is not completely without controversy. It is a fact that not everyone in our society enjoys the same quality of work, income, status and lifestyle (this is called social differentiation—see Kerbo 10). Exactly how to best measure the ways that people live differently, and what the overall significance of these differences is, is a subject that is still much debated. It might be said that the whole concept revolves around attempts to *judge* other people, by trying to decide what standards of judgement best match societal/cultural standards (that themselves are subject to criticism for favoring some at the expense of others—Kerbo 155-158). The endeavor makes sense from a sociological view as a means of reducing the enormous complexities of socioeconomic relations in modern society into a model that is relatively straightforward and comprehensible (if somewhat lacking in predictive power as a result). The debates about class and measurement of inequality have in recent decades generally taken the form of using and defending one of two general positions, which I will call the class and the stratification approaches. I will summarize and interpret these two predominant approaches to measuring inequality in American society, then discuss how these have informed and affected my research (based mainly on Kerbo 90-95, 128-153, 155-158).

What I shall call the class view of social inequality emphasizes distinct social groups ("classes") with differing and often conflicting needs and goals. People in a society, according to this view, can be generally classified according to a number of characteristics that approximate how much value or power they have in that society (Kerbo 12-14, Gilbert and Kahl 16-18). It is believed in this view that certain characteristics, such as one's wealth, education and occupation, tend to correspond with each other, and are of very great significance in determining how an individual is treated by others, the rewards that are given to (or withheld from) him or her, the subculture that the person operates within, and the sorts of "life-chances" that a person has. "Life-chances" may be viewed not only as a person's chances for survival with good health and nutrition, but also in terms of the number and quality of choices available to the person through his or her life, some of which may be deemed to assist the person in achieving "success" as it is defined by the culture, and passing such benefits on to his or her family and offspring (Gilbert and Kahl 2-3).

It becomes apparent as these concepts of inequality are explored that there is no clear, undisputed means of categorizing every person as a part of one or another distinct class groups (Gilbert and Kahl 46-47, 78-82). Rather, there are categories of people whom most would agree belong at either end of the spectrum of inequality, and a vast majority of persons who have conflicting statuses or interests and therefore must be classed somewhere in the middle (Kerbo 192, 281). There are many suggested characteristics that can be used to judge others (see Gilbert and Kahl 12-15, 37-38), but few people in society rate at either extreme on all of these characteristics. General categories of classes in this classification scheme could be called lower class, working class, middle class, and upper class, although the exact number of categories can vary quite a bit (Gilbert and Kahl 28-31). Such groups are presumed to have certain tendencies in terms of their cultural ideals, spending habits, and other characteristics generally related to the class concepts mentioned before (Kerbo 290-291, 318-322, Gilbert and Kahl 112). In popular conceptions of class, each category tends to have stereotypical features, and persons tend to be classified according to the extent to which they match these class stereotypes (Gilbert and Kahl 306-307). For example, a lower working-class person would be stereotypically expected to have at most a high school diploma (possibly less), to work in a blue-collar, heavily supervised job, which promotes in the worker a culture of gruffness and latent hostility (Ehrenreich 107-121). Whenever such a person is indeed observed, the stereotype, and therefore the presumed validity of the class concepts, may be reinforced in those who utilize a class-based model of society (examples of this kind of conceptualization can be clearly seen in Fussell 29-50). The concept of class is indeed very pertinent when certain patterns are observed that do match the pre-defined types. As I will discuss later, however, if our goal is to understand, through classification, the goals, attitudes, and lifestyles of *all* persons in a country (not just point to those who neatly fit into categories), there are a number of problems with class concepts that have yet to be resolved (Kerbo 177-185, 192, Gilbert and Kahl 241-244).

To illustrate how the concept of class is applied, a small category of people can be defined who on every reasonable measure are "lower class." A good example of this would be those who are impoverished, of inferior intelligence and health, poorly educated, unemployed, and a part of some countercultural group that is opposed by powerful societal forces (such as illegal immigrants in prison for serious crimes). Practically any social scientist can be expected to agree that those in such a category, meeting all the mentioned criteria, are indisputably lower-class. At the other end of the inequality spectrum, consider someone who is very rich, highly educated, in charge of many other people (such as through an important corporate or political structure), and held in high regard by large numbers of people for epitomizing the qualities that are predominantly deemed by their culture to be virtuous. Such a person can clearly be expected to be judged as upper-class by a consensus of social scientists. But what of the large majority of people who are somewhere in the middle and have some qualities that will be judged as higher-class, but at the same time, other characteristics that can be judged as lower-class? (Gilbert and Kahl 16-17, 25-26, 308-310)

What I call the stratification approach to American inequality tends not to attach discrete labels to categories of people, and instead focus on distinct characteristics such as income or amount of education, with which persons or households may be placed at an approximate point in a continuum. Besides being easy to measure, such variables generally are of a type that do not split into a few clear categories, but are instead based on a person's comparative position in that continuum of values for each variable of interest (Kerbo 177-183). Any class assessment deriving from this conception of social stratification would be based on some guess as to the relative importance of each variable, rather than how well each case fits a stereotypical class image. A fellow who grew up in a fairly wealthy family, but has a temporary job as a phone solicitor while he attends pre-law classes at a local community college, is difficult to place in a distinct class, but can be judged on measurements of several distinct variables—an income of $16,000 per year, 13 years of formal education completed, and a job whose status is extremely low (according to *at least* one survey of occupational status—see Kerbo 181 or

Gilbert and Kahl 40). In this sense, then, most Americans are "middle class" because there are usually some factors on which they can be judged as somewhere other than the extreme top or bottom (see also Gilbert and Kahl 234-235).

The "class" view of inequality fits a critical, conflict-based view of society because its distinct class categories are usually applied in a context that emphasizes the qualitative inferiority of one class and superiority of another, and therefore points to a struggle between such classes over the distribution of rewards in society (Kerbo 90-95). The multitude of potentially ambiguous or conflicting indicators of societal position are subsumed into a few basic class groupings that are designed to be hierarchically ordered. The "lower middle-class" office worker, for example, is judged in this view to be better-off than the "upper working-class" skilled blue-collar tradesman.

The "stratification" view of inequality is less inherently critical of society because it tends to be unconcerned with judging the motivations underlying the distribution of benefits that are observed (Kerbo 90-95, 378-384). Rather, it seeks to describe, in quantitative terms, the relative extent of such inequality, or the comparative position of an individual within a statistical distribution of benefits. This distribution of benefits is generally attributed to market forces of various kinds, with the effect that the nature and fairness of the status quo is left unchallenged. The finding of quantitative aspects of distributed benefits allows a hierarchical comparison of socioeconomic position, but generally only for that particular aspect that was chosen for measurement and comparison (for an example, see Kerbo 181-185). If income is chosen for comparison, we may find that a blue-collar tradesman earns significantly more money than a clerical office worker (Kerbo 32). If occupational injury and mortality rates are measured, the office worker's lower rate of injury may rate him or her as higher-class (Kerbo 288-290). How to resolve conflicts between contradictory statuses does not seem to have been worked out at present—judgements will vary with the goals and biases of the observer (for examples, see Gilbert and Kahl 28-31, 37, 43-47, 241-244, Kerbo 190-193). An approach from economics could attempt to quantify the medical costs of the blue-collar injuries and compare job incomes only after subtracting the respective costs of occupational injuries. An economist might claim that good and bad aspects of a job will be reflected in its pay, so that more demanding jobs are matched with higher remuneration. One of the virtues of the class approach to inequality is that by not being distracted by the politically suggestive aspects of limited or single indicators, it can demonstrate that the preceding kind of claim is frequently *not true*. Rather, many of the lowest paid jobs are also dangerous and in many other ways comparatively undesirable. These necessary but undesirable jobs are frequently filled, not through the raising of pay rates as the simplistic economic view would suggest, but by having large numbers of people placed in positions where they are unable to earn needed money in any other legitimate way except by taking these undesirable jobs (Kerbo 324-327). Thus, it is the rule of a limited supply of (but high demand for) jobs that described this, rather than the "fair exchange" of pay for equivalent work, although a minimum wage and government transfers may mitigate the pain of such job-market conditions in some instances (Kerbo 307-310, 330-340, Gilbert and Kahl 278-280).

In this research project, while recognizing the scientific and philosophical strengths and contributions of both perspectives, I focus mainly on the problem of finding an accurate measurement of one aspect of inequality—the quality of residential areas—

rather than the use of such measures in societal criticism. In this, I share the approach of the stratification view of inequality. However, my chosen variable to be measured has a number of characteristics that overlap with the "class grouping" view of inequality, and my measures may later be found useful in societal criticism. I will explain some of the uses and theoretical implications of my research toward the end of this paper. First, other important concepts must be introduced, and a history and description of how my measurements evolved and can be applied will then be given.

The Concept of Neighborhood Quality

In urban planning and geography, the concept of neighborhood quality arises nearly as much as the concept of class does in sociology. The whole point of economic and community development, and redevelopment, is to improve in some tangible way the socioeconomic conditions of an area. Housing should be of decent quality, and located to allow access to jobs, shopping, and urban services (So and Getzels 363). Measurement of improvement in an area's quality might involve the number of new jobs, new housing units, or increased housing values. Neighborhood preservation has the goal of slowing or preventing the decline of an area due to physical aging and weathering of the housing stock, conflicting land use goals, and economic/demographic changes in the area. Fortunately, the goals are a bit less controversial on this subject among planners than those of class analysis are among sociologists. Planning controversies tend to arise about how best to achieve goals that most believe to be laudable.

The analysis of the subject of neighborhood quality is also a bit more straightforward. It is commonly agreed that there is a competitive market for land, and that actors in this market are presumed to be acting in their own self-interests, with the goal of urban planners identified as that of anticipating and resolving conflicts that may arise as a result of individuals' and groups' competing goals for the land and its environment (So and Getzels 71-78, 309, 330-332). In terms of measurement procedures, one of the simplest and most straightforward approaches to the assessment of residential quality is to consider the market value of housing units in an area. Given the basic economic assumption that all positive and negative features of each housing unit will be reflected in its market value, such values act as a kind of weighted average of the sum of good and bad elements affecting its use for residential purposes (Anderson and Funderbunk 137-144). As when a crude economic approach was applied to low-paying jobs, however (in the preceding section on "class" and sociology), there is a corollary to be found here in that some housing is inherently undesirable and yet finds inhabitants willing to pay disproportionately high amounts for it because they are in a position where alternatives are unavailable (Harvey 548-549). Thus, supply of quality housing tends to be low when compared to the demand for it, and the existence and enforcement of construction codes, among other regulations, keeps the price of available housing from going too low (Harvey 558-559, Jacobs 419-420).

Many conditions may affect the price of housing. Of course there are many endogenous factors that relate purely to the structure itself—number of bedrooms, bathrooms, complete plumbing and heating facilities, square footage, construction quality, and so on. These features may be overridden by other, exogenous ones that have nothing to do with the property itself—taxation rates, school district, distance from necessities or amenities, and environmental conditions (So and Getzels 311). Environmental conditions may be physical, as in the exposure of the structure to flooding or pollution hazards. They may also be sociocultural, when the norms and standards of an area and its inhabitants run counter to those valued by the housing shopper. In this latter category may be placed concerns about image (including so-called "visual pollution"), noise, crowding, crime, or ethnic/cultural differences (Anderson and Funderbunk 139-140).

The point of my research is to attempt to measure, using readily-available census data, the quality of residential areas within all parts of an urbanized area, and connect such measures with broader patterns of inequality and stratification in that area. Just as my concern with social stratification is to be able to evaluate *all* residents of an urban area, my goal in assessing residential quality is to evaluate the status of all *inhabitants* of the area—not just homeowners. My model of residential quality therefore includes measures to evaluate those living in rental units and in group quarters. The focus is on the people as well as the housing. These distinctions, and the merging of residential quality with sociological class analysis, show that I am addressing the topic somewhat differently from real estate analysts.

Sociologists and urban geographers frequently employ models that are too demanding or time-consuming for routine use by planners. (See Ley 75-77 for an overview of social area analysis and factorial ecology. While social area analysis has many similarities to my approach, factorial ecology assumes a comfort with advanced techniques of multivariate statistical analysis. Both require extensive time to calculate or set up in a computer.) My model provides an approach that I feel is informative and can be readily used, with just a bit of study, by planners and researchers who have only a basic knowledge of algebra and statistics, and access to common census data through a library or computerized source.

The Traditional Class Indicators and Unit of Analysis

In studies of stratification and inequality, three good indicators of social class, or "socioeconomic status," are a person's income, occupation, and education (Hess, Markson, and Stein 182-183). Although I have said "person," it is generally the household that is the unit of analysis for stratification studies. I acknowledge that it is far easier to study household characteristics than individual characteristics, but I do not share the view that it is intrinsically more correct to examine the stratification of households rather than individuals in modern society. This could easily lead to a separate paper of its own (see Kerbo 192 as this point relates to studies of the status of women, so I will merely give a number of criticisms as a way of pointing out some inadequacies of household-based conceptions of social class. I feel these flaws are worth pointing out even though I ultimately had to abandon using an individual view of class in the development of my model, due to the fact that most available data is patterned to be useful only for a household analysis.

The traditional view of social stratification basically assumes that all members of a household are of the same social class. I believe this assumption is probably fine in many instances. For example, a traditional agrarian system has minimal measurable economic links between relatively self-sufficient farming households and the merchant activities of the towns (Wallerstein 24). As industrialization proceeded and capitalist systems spread throughout Europe, America, and elsewhere, the number of measurable monetary interactions between a household and other parts of society increased continually. New forms of taxation, compulsory education, and the increasing specialization of new production processes had the effect of transforming old economic systems (based on divisions of labor within relatively autonomous households, and light exchange networks between such households and towns/governments) into new ones in which previously unmeasured household production became commodified (that is, became organized in a way that allowed for market valuation and exchanges of those goods and services—see Wallerstein 13-43). The direct labor value of children within the household, for example, was to be challenged by the abstract value of increases in the marketability of their labor within a tax-supported and compulsory schooling system. The labor costs of household tasks performed domestically by household members could be compared with the prices of modern devices such as dishwashers and drying machines, and the lessening of time required for household labor allowed for additional family labors to be sold in broader markets for wage remuneration (Harvey 554-555).

By the 1950s and 1960s, certain economic and cultural changes became clear which I believe demonstrate the desirability of shifting to an individual-level analysis of stratification rather than a household-based one. Rising numbers of households had two working parents, and so the "family wage" concept started to be reshaped (Gilbert and Kahl 106). The whole assumption that one parent (the father) functions as the head of the household became harder to sustain, as there were too many obvious cases where a woman's income was much greater than her husband's, and her job more prestigious and highly-skilled. Although married couples became more likely to include comparable occupational status as one of their marriage criteria, disparities are still common and complicate class analysis at a household level (Gilbert and Kahl 120-125, 237-239).

Also, the breaking down of fixed gender roles and stereotypes freed many women and men from the traditionally rigid life-cycle concepts. Many married couples pursued separate careers and began choosing *not* to have children. Women did not automatically have to seek marriage and mothering roles (see Gilbert and Kahl 74-76 on "pink-collar" jobs). Many couples also decided that marriage itself was not vital to their plans. Female-headed households have increased (Gilbert and Kahl 289-291). The gender-based restrictions on so many parts of society and the workforce began to disappear. Glass ceilings in many professions were pushed up or broken through. Female access to higher education became equal to (and in some measures now exceeds) that of men (Hess, Markson, and Stein 211-218).

We have also observed the rise and unprecedented proliferation of youth subculture and niche markets. One of the big changes in the 1950s and 1960s, this trend has showed no signs of stopping. Young people under age 18 have more spending money than ever, and entertainment, recreational, and fashion markets and trends aimed at youth have expanded to include older persons as these youths age. The increasing separation between youth activities and adult ones has enhanced the creation and maintenance of distinct youth subcultures with each generation, which in many ways seem to be just as distinct as any cultural differences presumed to separate the traditional social classes, and which seems most closely affiliated with lower-class values (Ehrenreich 91-96). On the flip side, we also have seen a significant rise in the percentage of elderly persons, and in many cases, a lowering of the retirement age, resulting in increases in recreational spending and political power for this group as well.

Many traditional views of social class ignore the strong correlation between age and the traditional class indicators of education, occupation, and income, assuming that children are trained in such a way that they can be considered that same class as their parents (or at least, parent of the same gender). Classic studies of status attainment (Kerbo 369-373) seem to have ignored the effects of age on occupational status (see Hess, Markson, and Stein 228-229 for an overview of age-based inequalities). While it is true that occupational inheritance (or at least a correlation between a parent and child's occupational status, education and income) is a demonstrable feature of the stratification system, the number of deviations from this expected inheritance is so large that it must not be ignored (Kerbo 349-354). In addition, even if one's ultimately expected social class is at a certain high level, in many cases, this is not achieved instantly, but must be worked toward. College students of lower middle class (or below) origins, for example, typically have lower-working class jobs or even live in poverty for significant periods of time while working to attain middle-class or professional status (Ehrenreich 75-78). There is no agreement as to what aspects of class position should be emphasized at any given time and which should be ignored. The poor student may complain that she is lower class, because of her low income and menial job while in college, but her life-chances are significantly better than the poor person in that job who is not in college. This shows the significance of the educational component of class—in many cases, the student would have a much better job, were it not for the commitment to spend so much time and money in pursuit of educational advancement. Is the student lower class (income), working class (occupation), or middle class (education), or some average of the three? If the student is considered middle class in this example because of her life-chances, is this still a true assessment if she dies before achieving true middle class status—especially if from an occupational injury or lack of money or insurance for health care? Since college completion is of far greater importance than mere attendance (Kerbo 376) there is no certainty that a currently enrolled student will obtain and successfully use a degree, it would seem logically invalid to place too much weight on assessments of future attainment, when current lifestyle conditions are so different in comparison.

Although I have been presenting a case for an individual-level analysis of stratification, critical data on income is provided mainly for households. The amount of income available to individual members of a household generally cannot be determined by this data source. Income information is typically collected for entire households or families, and the way that this income is distributed *within* households is not detailed. As part of my model's development, I proposed a measure based on per-capita calculations, but decided to abandon it as it became clear that it was too sensitive to household sizes (similar to the income analysis problems reported in Hess, Markson, and Stein 181). It should also be noted that many of my critiques of household-level analysis were rooted in a framework presented by a school of thought that insists that a household-level of analysis is the most appropriate one to use (Wallerstein 23-26, Wallerstein and Smith 234-252). It is possible that my reluctance to accept household-level analysis is rooted in biases from my own background and class position (Gilbert and Kahl 120-125).

A Class Indicator Based on Residential Location

I have mentioned three traditional indicators of social class as being income, education, and occupation, all of which have means of measurement and which to some degree are present in decennial census data (although occupation is typically measured in terms of occupational *prestige*). I will discuss these a bit, and their limits, and argue for the consideration of my suggested new indicator, which is based on residential location, in future stratification studies and urban analysis. The Residential Class Indicator (RCI) provides an assessment of residential quality which otherwise lacks a straightforward measure from a single census variable. The importance of residential location for class analysis will also be explained.

Income is an important variable for indicating class or status position because it can be used to purchase many of the other indicators, whether leisure and cultural pursuits, education, political influence, or even, through the presence of a surplus that allows for investments, more income! Part of the lifestyle component of class is considered to be that of consumption—the choices of how one spends one's money (see Harvey 553-556, Veblen 68-101, 133-139, and all of Fussell). Education and income are measured directly by the decennial census questionnaire, and consumption may be assumed to correlate with income. The correlation may not be ideal, however, since we do not know from the income data how much of a person's (or family's or household's) reported income is available for spending or investment. A college graduate may technically have a high income, except that most of it in some cases may be unavailable due to large debts that have accumulated. A more accurate class indicator would probably be wealth, which is not asked about by the census bureau (Kerbo 28-31, 38-40, Gilbert and Kahl 101-104). A high-class person may technically have no income at all during a given year because he is able to live off of accumulated wealth. In such instances, my proposed indicator of residential quality, based on available measures of housing values and housing expenditures, would seem to be a better indicator of that person's lifestyle and overall wealth. Housing data is also more visible and subject to verification, and so is less prone to false answers than a question on income.

Some views of class hold that affiliation is very important, not only from the status gained or lost by association with one's acquaintances, friends, and family, but also in an economic or "life-chances" sense, when someone is assisted in their needs or endeavors by gifts or favors from wealthier or more influential family or friends. Education and occupation may be considered correlates of class affiliation, but here also is an excellent example of where my indicator of residential location would be helpful in assessing this aspect of a person's class position. The place where a person lives suggests some affiliation or similarity with others who reside in that area. There are many instances where choices of residential location are shaped by where one's relatives and friends live (Gilbert and Kahl 135-137). In addition, class interests may be shaped by residential location (Harvey 559-560).

In some cases, a person's other census-measured characteristics may not match his or her true class preferences and affiliations. For example, a moderate income person may spend an unusually large portion of her money to afford housing in an area that she considers to be of good quality, based on her background and tastes. Conversely, a wealthy man who wishes to disdain a rich lifestyle and continue to affiliate with the working folk he grew up with may stay in a run-down old house near his old factory. The choice of where to live can be considered an important indicator of culture, affiliation, and consumption patterns for a person, and therefore my goal was to measure patterns of housing inequalities which would reflect this.

Other variables that have been considered a part of class standing include political power and class consciousness (Turner 220-228, Hess, Markson, and Stein 175, 177, 184, Gilbert and Kahl 13-14), authority over the actions of self and others (Kerbo 112-116), and socialization and family background (Gilbert and Kahl 13, Roberts 238, Hartigan 8). These variables in some ways relate to those measured in the census, but are not directly dealt with in my research because of the difficulty of clearly linking census variables to them.

There are numerous references to the importance of residential location in one's class position, in both popular and theoretical literature on class and urban areas. Often, the subject is mentioned casually as a matter of common knowledge, but is seen as a true condition from a number of distinct interpretations of its significance. Those who have studied poverty note the reality of zones where the poor are concentrated in much higher proportions than elsewhere (Kerbo 326, Roberts 237). An analysis of the richer areas reveals areas of exclusionary zoning, gated communities, and "exclusiveness," (So and Getzels 48, 51, 282-283, Fussell 76-83, Gilbert and Kahl 132). A broader approach shows aspects of differentiation between residential locations throughout the class strata (Palen 154-158, 197-199, Ley 55-92, Muller 63-65). One school of social theory fits residential segregation into a broader framework of class conflict (Harvey 560).

More empirical and complex analyses have developed in the ecological school of class analysis (Kerbo 182). While the classic stratification studies of Robert and Helen Lynd ("Middletown") and Lloyd Warner ("Yankee City") focused on small communities, a study by Coleman and Rainwater in the 1970s assessed class positions for Boston and Kansas City (Kerbo 126-127, Gilbert and Kahl 33-38). In urban studies, the "Chicago school" researchers had begun extensive analysis of residential segregation patterns focusing on race and ethnicity (Ley 60-61). Following these initial studies were many others which included numerous indicators of class position or socioeconomic status in their geographic analyses, so as to identify numerous types of neighborhoods or, at a larger level, "social areas" (Ley 62-67). Social area analysis included a measure of "social rank" based on occupation and education (Palen 104-106, Ley 75-76). This marked a significant methodological step forward from initial crude and very generalized descriptive models of urban land use, such as the concentric zone, sector, and multiple nuclei models (Hess, Markson, and Stein 538-539, Palen 90-103, Ley 72-75). For assessing patterns of change, the concepts of invasion and succession were introduced, followed by more sophisticated concepts such as filtering and neighborhood development cycles (Hess, Markson, and Stein 539, Palen 87-90, Ley 248-268).

My research idea started from a consideration of the simple ecological approach of mapping single census variables for block groups or tracts throughout urban areas. (I considered factor analysis to be far too demanding in its time requirements, and too difficult more most urban planners to use because of the number of variables considered and the statistical technique used to analyze them.) Urban areas are examined because census data for them is plentiful and linked with pre-defined geographic areas (tracts and block groups) which are delineated finely enough to enable useful spatial studies of residential distributions. Also, a fuller range of stratification is likely to be present in urban areas than in nonurban ones, since our society's functions and culture are mainly urban for most of its population (Palen 3-5).

With regard to the boundaries for a city, I consider a contiguous built-up area of non-rural density, oriented around centralized areas of greater density and higher land uses, to be an economic and social whole that I call an urban area. The individual political and corporate municipalities with fixed geographic boundaries (in Michigan, these can be either cities, villages, or townships) which compose the urban area as a whole are certainly of interest for any urban study, but in my opinion these boundaries are overly distracting for most researchers. For my purposes of residential class analysis, discussion of central city/suburban differences are wholly unsatisfying and much too imprecise for modeling inequalities. I agree completely with David Rusk's attitude that "the real city is the total metropolitan area" (Rusk 5, 7). My own research on contemporary urban areas, and a consideration of the locational trends over the last several decades (for example, Muller 62-82) has led me to conclude that so-called suburbs are in most cases now functionally, economically, and visually merely part of an urban area as a whole. Instead of a city annexing adjacent areas as it grows, contemporary cities now grow *across* political boundaries, with the areas in outlying jurisdictions basically serving the same functions as the fringe of the central city in the era when it was politically self-contained. The geographic distribution of land uses is merely seen on a larger scale now, and in many cases, the placement of cities' corporate limits seems quite arbitrary in relation to its effect on actual land uses. An observer in the field would frequently find it impossible to tell where city ends and "suburb" begins, except when there are actual signs posted to mark the "transition." In this research, I find the census-defined "urbanized area" to be a fairly good demarcation of the functional boundaries of an urban area (see Palen 115-116 for definitions of urban area measures).

I tend to reject using the (commonly used) Metropolitan Statistical Area (MSA) values as an area of analysis. This is because I have been dissatisfied with the way that the MSA is defined in terms of entire counties, which is a particularly crude geographic delineation when dealing with cities of only medium-size. Its use leads, for example, to the claim that the Lansing "area" was larger in 1990 than the Flint "area," which any detailed comparison of the two areas would show to be untrue. The MSA includes many relatively unassociated rural areas as being a part of the metropolitan Lansing area, even when their distance has caused most land valuation effects from the city to have dissipated (following the distance decay principle in economic geography—see Haynes and Fotheringham 12-13, 15). I did not want a measure whose values were thrown substantially off by the inclusion of distant small cities, such as Olivet, and the large agricultural areas throughout Lansing's three associated MSA counties. I also noted the crudeness of the measure in the case where Battle Creek is assigned Calhoun County as its MSA, and Kalamazoo is assigned Kalamazoo County as its MSA, even though the city of Battle Creek is contiguous with the boundary of Kalamazoo County. Rather than being a part of the same MSA (as in the case of Saginaw-Bay City-Midland), they are treated as separate; while included in the Battle Creek MSA is a moderate-sized city like Albion, which is 25 miles away (and therefore has a much smaller "gravitational" force of interaction with Battle Creek than Kalamazoo's urbanized area, which is 23 miles away and has more than a dozen times the population).

For a while I was impressed with the Rand-McNally Corporation's "Ranally Metro Area" (RMA), which comprises minor civil divisions rather than entire counties. It defined Lansing's RMA as the two central cities, plus some dozen townships (and the small cities and villages within them) in which half or more of the residents were assessed as commuting to the central area, and therefore economically and socially associated with it. When I found that the census bureau's "Urbanized Area" (UA) measure more compactly defined the Lansing-East Lansing area according to contiguous and associated urban land uses, regardless of local political boundaries, I have preferred it ever since. Later I will describe how to apply the model to any urban area, regardless of how it is defined, or how to use an areas custom-defined by the researcher (called a "user-defined" area, abbreviated herein as "UDA").

3. THE RCI MODEL EXPLAINED

The Origin of this Model of Residential Inequality

My contemplation of residential class indicators pre-dates the formation of this formal research project regarding them, and in some ways even pre-dates my formal training as an urban planner. Therefore, some of the evolution and testing of my ideas did not follow the classical social-scientific tradition, such as performing an initial literature review. Many who have given a critical analysis of scientific methods have pointed out that there is a great deal of research that did not follow a classical model, but is then written up in a way that suggests that it had (Mills 56-58, 69-71, Merton 4-7). In following the recommendations of such analysts for greater candor, I will present in this section a description of how my creative process for the RCI model actually occurred. The literature review proper was given in the preceding section. The chronological descriptions in this section will help to explain the many aspects of the RCI model in a more approachable fashion (paralleling how I actually determined them), but will also allow this paper to be of use to those who study methods of scientific research, and the creative aspect of the research process. A possible drawback to this chronological approach is that there are a number of ideas included in my descriptions which do not ultimately figure into the RCI model I am recommending. The inclusion of these extra ideas may be distracting for some readers, but they have a value for facilitating (1) a critique of the model, (2) the correction of any flaws found in my reasoning and research process, and (3) the identification of areas for further research on this topic (described in a section at the end of this paper).

During my readings and classes in sociology, urban planning, and related disciplines such as geography and economics, I noted that the idea of neighborhood quality often arose as a useful concept, but was rarely dealt with in an objectively measurable sense. Although such measures exist (references are in the previous section), they can be too difficult for most people to calculate, and too time-consuming for most planners to conveniently research. By contrast, the RCI model allows the calculation of residential inequalities for an entire urban area in just a few hours, for those who have spreadsheet software, computer-formatted census information (or a link to the census internet site), and a map of census tracts or block groups (also obtainable over the internet from http://factfinder.census.gov/). Even if none of this equipment is available, a researcher can go to census reference materials in a library, locate a few key values for the urban area, and then look up and calculate values for individual tracts, using only a couple minutes per tract if a hand calculator is used.

The concepts that were molded into my RCI model date back nearly ten years and originated in my use of census data to help me select relatively affordable locations to rent apartments in the Lansing-East Lansing Urbanized Area. Initially, I examined traditional social indicators such as the percentage of residents in poverty, and per capita income. However, since I was mainly looking for affordable but decent-quality housing, my concern with such social indicators became of secondary importance, although I noted that an apartment could be rented in many different types of neighborhoods in the Lansing-East Lansing area at prices that were not so different from each other. This is especially true for those who can split the cost of a housing unit with another person, a option that enabled me, as a young college student, to live near one of the wealthiest subdivisions in the whole area (in southern Okemos).

Over the years, I noticed more about the relationship between the social characteristics of an area and the housing values the census lists for that area. When I sought to rent an apartment of my own, I mapped out the values for some census variables for the entire urbanized area. I found a section near downtown Lansing where the apartments were very affordable, and the housing values were not too low. There was a sizable percentage of people in poverty in that tract, but since almost everyone there had completed high school, I figured this merely meant that they were students like me. It soon became clear that my naive review of a few basic indicators had some severe weaknesses. Although the apartment complex itself that I lived in was spacious and an excellent deal for the money, the nature of the area accounted for its relative cheapness. I had to get used to the sound of gunshots and nearby domestic violence, and my daily walks to the bus stop often included hostile or undesirable encounters. When I entered graduate school and gladly moved to a nicer area close to campus, I began again to consider how census data might be employed to assess neighborhood quality.

My previous mistake was to exaggerate the importance of the educational component, and to not have noticed that the fairly decent housing values applied only to the *nine percent* of units that were owner-occupied. I began to tinker with ways to make a combined measure of neighborhood quality, for there were too many rental units in most areas to make housing values alone a reliable indicator of residential quality. I wanted to make some sort of an index by combining variables that were not measured in the same terms.

The actual mathematical formulation of the RCI model was inspired by the various ratio-based measures I had seen in the Urban Planning profession, such as location quotients and shift-share analysis (as in Klosterman 113-186). By using and extensively critiquing such analytic techniques, I felt I had acquired a good understanding of how "simple division," the use of ratios, could be productively applied to the evaluation of social data. Needing a standard to which census tract values could be compared through ratio techniques, I chose the median values for the urbanized area—contract rents for rental units, and housing values for owner-occupied units. I made little ratios for each type of unit which compared its median tract values to those of the whole Lansing-East Lansing area, and added weighting factors that added up to unity so that when the ratios for each housing type were added together, the result would appear in the same form that the original ratios had been. Multiplying by 100 put the ratio results into a familiar, percentage-style range—the tract value is expressed as a percentage of the overall UA (or UDA) value Users of the RCI model would therefore only have to develop a comfort with one rating scale to begin interpreting the results of their calculations.

It became clear that some sort of adjustment factor was needed so that renter-occupied (RO) units that matched the median rent for the urbanized area (UA) would not be counted as equal to owner-occupied (OO) units that matched the median value of the urbanized area, since RO units tend to be socioeconomically much different than OO units. Intuitively (based on my general knowledge of the area from over 10 years of living there, and about 5 years of delivering pizzas), I estimated a rental adjustment factor of 0.6, which I now believe to have been a very good first guess. I put together an initial RCI formula, which looked like this:

(Equation 1) Prototype 2-Component RCI Model

$$RCIt = \left[\%OOhht\left(\frac{MdVt}{MdVua}\right) + \%ROhht\left(\frac{MdCRt}{MdCRua}\right)0.6\right](100)$$

where "RCIt" means the residential class indicator of the tract, "%OOhht" refers to the number of owner-occupied housing units in the tract divided by the total number of housing units in the tract, and %ROhht is similarly the proportion of renter-occupied housing units in the tract, the number of rental units divided by the total number of units. These proportions serve as weights to balance the ratios of the MdVt (median value of owner-occupied units in the tract) over the MdVua (median value of owner-occupied units in the whole urbanized area) and the MdCRt (median contract rent of rental-occupied units in the tract) over the MdCRua (median contract rent of rental-occupied units in the whole urbanized area). Thus, each type of housing is compared with the urbanized area standard, weighted, and summed, then multiplied by 100 to convert the rating to a more ordinary-feeling, percentage-style number. I call it a model at this point because the ratings are intended to be mapped out or plotted by a Geographic Information System (GIS) for an entire urbanized area to provide a context with which to assess the position of any given tract or small area. The numbers gain meaning from a comparative assessment of how a tract or block group rating compares with others, and to the larger UA or UDA area used as a standard of comparison.

The model seemed to hold up pretty well in describing the appearance and "feel" of actual areas I saw around Lansing, and so I mapped out large portions of the Detroit UA and the Grand Rapids UA using it. When I explored those areas (I grew up around

Detroit and was already a bit familiar with it) I was very pleased at this simple model's power to predict the type of neighborhood I would see, mile after mile—wealthy, average, run-down, or frightening!

I had some others evaluate what I had done (not an unbiased group, perhaps, but producing some good initial feedback on the model). My stepfather, who had grown up in Detroit, perused a tract map of that city based on my prototype RCI equation, and found the ratings to be accurate—except for the area around Wayne State University. I then applied my model to a block group analysis of the city of Evanston, Illinois (part of the Chicago UA), made a map, and it evaluated by a couple of friends who had lived there for almost a decade. The feedback was generally favorable, but also confirmed for me that the ratings in university areas were problematic. I requested from a friend in the Buffalo UA a few locations that he knew well that I could map out and have him evaluate. I mapped out three areas in this fashion, with the favorable feedback that my numbers were, "in a relative sense, spot on." He noted however, that I had not adequately identified the fact that one particular area was not just middle class, but had sections with mansions in it and so should have weighed in as upper middle class. As a mathematician, he pointed out that this oversight could have arisen because I was using median values in my assessments. I had already felt a bit uncomfortable about the mathematics of dividing medians, but since the medians were readily available from my CD-ROM census sources, and were producing generally good estimates, I had continued to use them. It was also considered traditional to use medians as a measure of central tendency when dealing with monetary figures, since the tendency of such values to be greater than zero, yet have no fixed upper limit, skews their distributions to the right.

I should also note that, in following the " class " approach to inequality, I had, through comparing my RCI ratings with field conditions, come up with estimated class divisions that could be matched with the ratings this prototype formula produced. The estimated class divisions at that time were as follows:

RCI rating	**Estimated "social class" category**
Below 40	Lower class
40-59	Lower working class
60-89	Upper working class
90-135?	Lower middle class
135? -??	Upper middle class
?? and above	Upper class

I did not feel that I could accurately pinpoint the cutpoints of the upper classes, since there did not seem to be any exclusively upper class areas in most of the places I studied. Areas of the Grosse Pointe cities northeast of Detroit received very high ratings of as high as 500 (for Grosse Pointe Shores), but although this was therefore clearly upper class, there were too few of these areas to define where the lower rating boundary of such a classification should be placed. I had intended such categories to be helpful for persons unfamiliar with my model to interpret and evaluate the ratings it produced. However, I chose to keep the ratings in their original raw form rather than standardize them within a fixed rating scale (such as from 1 to 100).

Initially, I also chose not to adjust them so that they had a clear central point, such a rating of 100, which could be considered average. Rather, a rating of about 85 seemed to be the "natural" average of the RCI ratings, and my assignment of class categories was roughly intended to duplicate the kind of class distribution figures found in past research on American stratification (Kerbo 182, 272, Gilbert and Kahl 26, 34, 235). In an explanatory sheet, I commented on the subjective nature of one's impressions of an area;

whereas I might feel uncomfortable living in an area rated below 50, for another person this point might be lower, such as at a rating of 40, or higher, such as a rating of 80. I did not wish to try to interpret the meanings of the ratings for others, but simply provide a measurement of neighborhood quality that would allow the more precise expression of such preferences. Later, as the implications for social stratification became clearer, I developed means to standardize the ratings around 100 for ease of interpretation (the RCI% rating, which will be explained later), and to rank areas using percentiles, for comparison with or placement in a stratification hierarchy.

My initial feedback, and continued field observations, confirmed my impressions that the majority of RCI ratings were indeed measuring comparative neighborhood quality. There were two types of areas, however, that the model did not seem to work well for. Downtown areas seemed to be rated excessively low, and where university areas were measured, the campus area would rate extremely low, while adjacent student areas seemed by comparison to be rated as too high. I believe that the low ratings the model observed in downtown areas were accurate, but that my own sense of such areas had been distracted by their important commercial and business functions. I had trouble accepting the ratings until I recalled that they were based on *residential* characteristics. My intuitive assessment of downtowns emphasized their important and often prestigious business uses, which often attract higher-class persons to them. I had also failed to take into consideration the impact of the "interaction effects" (discussed as an area for further research) of people travelling into the area from elsewhere and seeming to change its character. When I took a closer look at the quality of the housing actually available in these areas, I decided that the RCI ratings were appropriate.

It was the treatment of university areas that made me determined to change the model, after I assessed (and then moved into) an area of East Lansing known locally as the "student ghetto" (see Ley 65). While the MSU campus itself had received ratings in the 30s from my prototype equation, the area just north of it was rated in the 80s. Although this area was one in which "riots" had occurred, many locals dismissed the significance of such events as merely being large student parties, which sounds innocent enough. Their dismissive attitude was wrong, making the assumption that college students can be treated simply as the future middle-class (again, refer to Ehrenreich 75-78, 91-96). Although the area has some expensive and nice apartments, the majority of it contains moderate-quality dwellings that are subdivided or shared by numerous students, and others. (The city of East Lansing has recently passed ordinances to address this problem by certifying each rental unit for a *specific* number of occupants.) There are substantial numbers of people in the area that have no official connection with the university, including various transient persons and some who are undergoing medical or psychiatric treatment. Crime is quite high—at least, low-level crimes such as vandalism, public drunkenness, noise disturbances, littering, and public urination were so frequent that it seemed no one was concerned with enforcing the laws against them in that area. There is also a high level of assault and theft crimes. While crime is not necessarily a good indicator of social class, having much greater correlations with a young male population than with traditional class indicators (Nettler 102-106, 113; see also Jacobs 146-148), some other information on the area is very suggestive. A full 65% of the area's residents were classified by the census as living in poverty, and 27% lived in group quarters when the census was taken in 1990.

I decided that my initial crude model was weak at dealing with these areas because it had ignored the residential conditions of people who do not live in households. The census records data on such persons under the category of those living in group quarters, which includes rooming houses of 10 or more units, homeless shelters, medical, psychiatric, and rehabilitation treatment facilities, fraternities, dormitories, and transient persons living in street locations. I added to my model an assumption that group quarters could be considered the lowest quality of residence, and reduced my 2-component RCI ratings so that the percentage of inhabitants living in group quarters were effectively counted as having a rating of zero, for weighting purposes, just as the rental-occupied term in the prototype equation was reduced by being multiplied by 0.6. (This apparently severe judgement to treat group quarters as a zero rating was made, in part, because the census provides no information about the housing expenses of people living in group quarters.) The new, 3-component equation I began using was

(Equation 2) Prototype 3-Component RCI Model

$$RCIt = (1 - \%GQt)\left[(\%OOhht)\left(\frac{MdVt}{MdVua}\right) + (\%ROhht)\left(\frac{MdRt}{MdRua}\right)(0.6)\right](100)$$

where %GQt refers to the number of persons in group quarters divided by the total number of persons in the tract, and the central part of the formula is the same as in Equation 1. The tacking on of this adjustment factor was helpful, as it reduced the rating of Tract 41 (part of the "student ghetto") from the 80s to the 50s, which I felt was much more appropriate (a later model treating GQ residents as higher than zero lifted the rating into the 60s). I later realized that equation 2 mixes a population proportion with household proportions. A more mathematically consistent way to treat the group quarters component (which produces results that are very close to Equation 2) would be to shape the equation in the form of

(Equation 3) Variation on Prototype 3-Component RCI Model

$$RCIt = \left[0(\%GQt) + (\%OOpt)\left(\frac{MdVt}{MdVua} \right) + (\%ROpt)\left(\frac{MdRt}{MdRua} \right)(0.6) \right](100)$$

in which the %GQt term would always be equal to zero and can therefore be removed from the equation, as in

(Equation 4) Simplification of Equation 3

$$RCIt = \left[(\%OOpt)\left(\frac{MdVt}{MdVua} \right) + (\%ROpt)\left(\frac{MdRt}{MdRua} \right)(0.6) \right](100)$$

so long as %OOpt now refers to the proportion of *persons* in owner-occupied units in the tract (rather than the proportion of *households*) and %ROpt is similarly a proportion of persons rather than households. Equation 3 allows a value other than zero to be selected as a reduction factor for the group quarters term, should that be determined to be more appropriate. After all, it seems harsh to assign all nursing home or dormitory residents an RCI value of zero, which would be the same rating assigned to the homeless or imprisoned in this model.

The Evolution of a Refined RCI Model

Once I declared this to be the subject of my master's research paper, I began to seriously question and reconsider every component and assumption of my first RCI equations. Once I gained access to modern spreadsheet software (previous calculations were all done with paper and hand calculators) I knew that there was no longer any reason to tolerate the simplifying but questionable aspects of the early RCI model. The first change was to stop using statistical medians and instead use the more mathematically proper statistical mean. Not only had it become clear that the median was ignoring too much information that could affect residential quality by pulling a tract average up or down, but another clear weakness of the median emerged as well when I started working at a block group rather than tract level of analysis. I would find a tract rating of, for example, 50. Then, when calculating RCI values for all of the block groups within that tract, I would sometimes find that *all* of the block groups had ratings higher than 50. The use of medians was preventing a proper averaging of component parts within the larger areas being analyzed. Using means instead of medians, a subdivided area will have some parts rated above, and some below, the value of the broader area they compose, or else all ratings will come out about the same (as in a very homogeneous area).

I also found the surprising fact that some distributions of monetary information are in fact skewed to the left. In most cases dealing with rents, incomes or housing values, the median will be lower than the mean, as the mean is easily pulled up by a relatively few cases of very high values, due to their distance from the typical value in that area, whereas in this study, there are never any reported negative values that could pull a mean down as easily. In quite a few instances, however, I found areas whose median values were *higher* than their mean values. An example would be where the bottom 40% of a tract is valued very low, and the top 60% has moderate reported values, all of which are quite close to each other. The median reflects only the top 60%, whereas the mean includes all available information on housing values—in this case summarizing the area as being of lower quality than the median had suggested. I therefore now use the mean in every instance, although this usually needs to be derived from census data by taking aggregate values or aggregate rents and dividing these by the total number of analytic units (usually persons or households) in the "universe" for which those aggregates were tabulated. Thus, a mean value of owner-occupied units is derived by taking the census figure labeled as the aggregate value of "selected owner-occupied units" (called the universe for that variable) and dividing it by the total number of "selected owner-occupied units." This extra work handled fairly easily by the use of spreadsheet software, once census data is entered or downloaded into it.

Next, I had to convert the crude estimate of 0.6 as an adjustment factor modifying the renter-occupied ratio to a value that was theoretically justifiable and objectively derivable. An assumption of my approach is that owner-occupied units, and their values, are the norm against which other residential arrangements must be compared. (In one school of thought, owner-occupancy is considered a useful norm whose promotion helps legitimize capitalism in our society, giving a greater vested interest in the system to a larger portion of the population—Harvey 551.) The measurement of owner-occupied units is expressed in terms of value, a measure which has an imperfect correlation with income (and other class indicators), and which can be more indicative of the sorts of class characteristics not always addressed by income and other census variables. For example, housing constitutes a major component of most people's wealth, and to this extent may be *more* indicative of class position than income (Gilbert and Kahl 102-103).. Rental housing units are measured in terms of monthly rents, which are not directly comparable to the norm of housing values observed for owner-occupied units. Similarly, group quarters had up to this point not really had its quality measured at all, and so it was certainly not directly comparable with the other varaibles. It was necessary to have some means of fairly comparing one type of measurement with another, so as to assess all residential types in an area of study. My estimated rental adjustment factor of 0.6 had allowed such comparisons by treating a unit whose rent was two-thirds higher than the mean rent in the UA as the residential class-equivalent of the average owner-occupied housing value in the UA.

My initial assessment of group quarters was that they would never improve the overall residential quality of an area. I had to question this assumption as well, since not all group quarters are detrimental to an area's quality of life. There are some nursing homes, for example, that are not only quite nice, but also very expensive (although only a fraction of this expense may be considered to relate to housing costs and quality). I had to review all available decennial census variables and their definitions to determine how I could best compare measures that were expressed in very different units. I found more detailed information on the categories of group quarters, and contemplated giving different weights to these (so that prisons would be lower than nursing homes, for example), but this technique would have ignored the variations between different-quality nursing homes, or between local jails and federal prisons. Moreover, the actual values of the weights assigned to each category of group quarters would still seem quite subjective and even arbitrary.

Finally, I found that the census provides data on per capita income for those in group quarters. I had hoped to find information measuring residential quality, rather than mere income, which as I pointed out is one of the traditional variables for class analysis, but decided that for the group quarters term of my equations, it was really the best available census indicator of residential quality of life. Using it could draw distinctions between group quarters of differing quality, on the assumption that higher-income persons would tend to inhabit group quarters of higher quality. Also, most areas have a very low percentage of their residents living in group quarters, and so the use of income as a proxy variable seemed a fair way to factor in the effects of group quarters while the RCI indicator as a whole remained distinctly different from a mere analysis of income distribution. Since owner-occupied units are the standard of comparison, the income of those in group quarters in a particular tract would be compared with the UA standard for that type of residential arrangement, and this ratio would be weighted by a factor that makes it comparable to owner-occupied lifestyles. With this factor needing to be based on a comparison of income, the standard of comparison would be a proportion based on dividing the average income for those in group quarters in the UA by the average *per capita* income for those living in owner-occupied units in the UA:

(Equation 5) Refined Group Quarters RCI Component

$$gqRCIt = \left(\frac{pciGQt}{pciGQua}\right)\left(\frac{pciGQua}{pciOOwmua}\right) = \left(\frac{pciGQt}{pciOOwmua}\right)$$

where gqRCIt is the group quarters component of the area's RCI, pciGQt is the per capita income of those in group quarters in a tract, pciGQua is the per capita income of those in group quarters in the urbanized area, and pciOOwmua is the per capita income of those in owner-occupied units with a mortgage in the urbanized area.

The factor to adjust the rental-occupied term of the RCI was similarly derived, but rather than using the less-related variable of income, a variety of other variables were available which had a more direct bearing on residential quality of life. I ultimately selected "gross rent" (rather than contract rent) as the key variable for rental unit quality. This would be compared with the "selected monthly owner costs" (SMOC) of selected owner-occupied housing units, to produce a ratio from which a more empirical and theoretically valid factor could be substituted for my initial estimate of 0.6 to adjust rental units and allow a comparison with the owner-occupied standard. In this procedure, I faced another choice, however, for the census information on owner-occupied units provides not only a measure of all owner-occupied units, but also a sub-division of this category based on whether or not there is a mortgage on the owned property. The differences between households with a mortgage, without a mortgage, and overall, are often substantial. I selected a comparison of owner-occupied households *with* a mortgage since a household will typically progress from a rental unit to an "owned" unit *with* a mortgage, rather than without one (Ley 243). Thus, the comparison of rental and owned units is based on the ratio between monthly gross rent and selected monthly owner costs with a mortgage (SMOCwm).

SMOCwm includes mortgage payments, property taxes, and costs of utilities and upkeep on a home and was intended by the Census Bureau to be a good summary of the monthly costs of home ownership. The gross rent value sums the contract rent and average utility and related costs to give a total monthly cost for a rental unit's housing expenses. Comparing these two measures seemed an excellent way of relating RO expenses to OO expenses, especially since the inclusion of mortgage payments and property taxes in the SMOCwm values provides a clear link between monthly housing costs and the preferred class-indicator variable of housing values.

Selected monthly owner costs without a mortgage (SMOCwom) are much less than with a mortgage. Overall SMOC values are a weighted average of SMOCwom and SMOCwm, and so are also significantly less than SMOCwm. In the case of the Lansing-

East Lansing UA, the ratio of mean gross rent (MGR) to overall SMOC is roughly 0.685, which is not too far from my initial estimated rental adjustment factor of 0.6. (Interestingly, the ratio of per capita income between all renters and owners in the UA is an even closer 0.589.) The ratio of the MGR to the SMOCwm comes out as a lower factor of 0.556, and was adopted as the most theoretically defensible adjustment factor. The equation for the rental component of the RCI is therefore

(Equation 6) Refined Rental-Occupied RCI Component

$$roRCIt = \left(\frac{MGRt}{MGRua}\right)\left(\frac{MGRua}{SMOCwmua}\right) = \left(\frac{MGRt}{SMOCwmua}\right)$$

where roRCIt is the rental component of the RCI, MGRt is the mean gross rent in the tract, MGRua is the mean gross rent for the urbanized area, and SMOCwmua is the *average* selected monthly owner costs for "selected owner-occupied units" with a mortgage in the urbanized area. (In my downloaded census data, I had to calculate these average values by dividing aggregate rent and aggregate SMOC by the number of RO and OO units that the aggregate values had been tabulated for. Other sources of census data may provide the values of these averages plainly and not require derivation from aggregate values.)

Since the owner-occupied term of the RCI equation is essentially the same, the new basic equation for the model is expressed as

(Equation 7) The Basic RCI 3-Component Model

$$RCIt = [(\%GQt)(gqRCIt) + (\%ROpt)(roRCIt) + (\%OOpt)(ooRCIt)](100)$$

or

$$RCIt = \left[(\%GQt)\left(\frac{pciGQt}{pciOOwmua}\right) + (\%ROpt)\left(\frac{MGRt}{SMOCwmua}\right) + (\%OOpt)\left(\frac{MVt}{MVua}\right)\right](100)$$

where RCIt is the RCI rating for the tract (or area of analysis), %GQt, %ROt, and %OOt are all the proportions of persons living in the three identified kinds of residential arrangements, MV is the mean value of owner-occupied units, MGR is mean gross rent, SMOCwm is selected monthly owner costs with a mortgage, pci is per capita income, and the small letters "ua" and "t" are again designating whether the measure is for the urbanized area or tract.

I will again note that while I have selected an urbanized area as the standard of reference, any other area may be chosen to replace it, so long as data is available for that area and the area is one that it makes sense to compare the smaller areas to. Similarly, I have been calling such smaller areas "tracts" but they could also be combinations of tracts, a block group, or any other area that is significantly smaller than the area of comparison and for which adequate data is available. More exploration of such variations on, and applications of, the basic RCI model will appear in a later section of this paper, addressing areas for further research..

Although I have called it the "Basic RCI Model," I have never actually used Equation 7, because once I had conceptualized the Basic RCI Model, I realized that I could split the GQ component into two subcomponents, each of which has per capita income data available for it in the census. These components are institutional group quarters, such as prisons and hospitals, and noninstitutional group quarters, such as dormitories and homeless shelters. That way I would be utilizing more of the available data in my calculations.

The full equation, as I currently use it, is:

(Equation 8) The Advanced 4-Component RCI Model

$$RCIt = 100 \times$$
$$[(\%GQit)(gqiRCIt) + (\%GQnit)(gqniRCIt) + (\%ROpt)(roRCIt) + (\%OOpt)(ooRCIt)],$$
or

$$RCIt = (100)\left[(\%GQit)\left(\frac{pciGQit}{pciOOwmua}\right) + (\%GQnit)\left(\frac{pciGQnit}{pciOOwmua}\right) + \right.$$

$$\left.(\%ROpt)\left(\frac{MGRt}{SMOCwmua}\right) + (\%OOpt)\left(\frac{MVt}{MVua}\right)\right]$$

with the "i" and "ni" in the group quarters components referring to institutional and noninstitutional group quarters, respectively. This will be the equation that is primarily used in the next section of this paper, showing an application of the RCI model.

There is also of course, a basic 2-component version of this model, shown in Equation 9, below, which follows the same reasoning and form as Equation 4 except that arithmetic means are used in place of medians, and the arbitrary 0.6 rental adjustment factor has been replaced. In cases where there are no group quarters in an area, the ratings from this model will come out the same as in Equation 8.

(Equation 9) Basic 2-Component RCI Model

$$RCIt = \left[(\%OOpt\left(\frac{MVt}{MVua}\right) + (\%ROpt)\left(\frac{MGRt}{SMOCwmua}\right)\right](100)$$

Please note that when calculating RCI values with a spreadsheet, areas lacking values for RO or OO components will need some cell contents deleted in order for the formulas programmed into other cells to work properly and calculate ratings for those areas. The cells needing deletion will be those where formulas have caused error messages to appear, such as those indicating an attempted division by zero, or the absence of a value in some referenced cell.

4. APPLICATION OF THE RCI MODEL

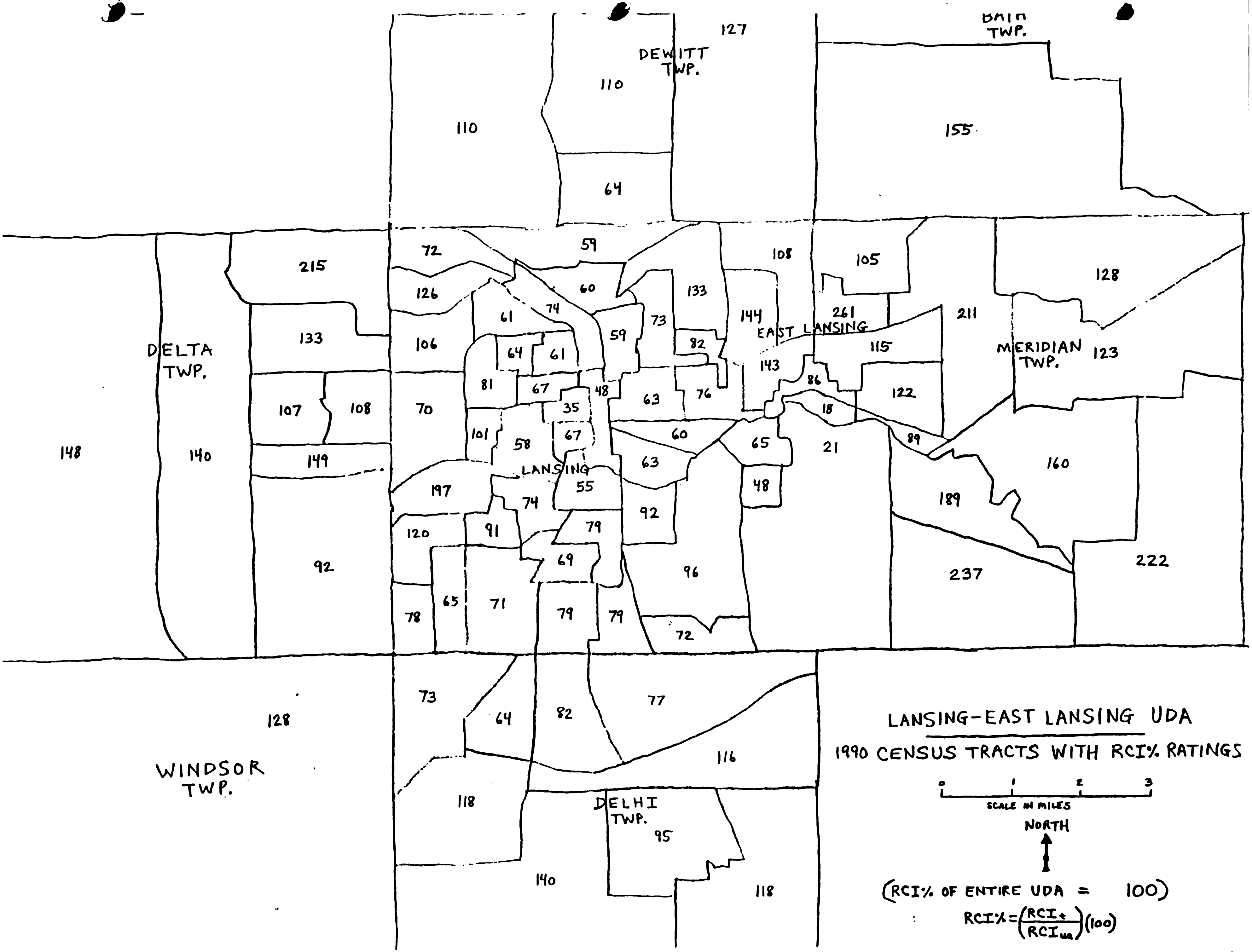
A Sample Application in a User-Defined Area

Having explained various ways of measuring neighborhood quality, it will now be helpful to illustrate an actual application of an RCI model. When I was developing and testing various RCI equations for correlation with what I knew of the Lansing-East Lansing UA, at one point I fed eight of the mean-based equations into a spreadsheet containing tract data for the entire UA and examined the resulting ratings to see where and why deviations occurred. (It was this process that enabled the analysis and critique of my model that appears in other sections of this paper. A printout of the application of four of these equations can be found in Appendix A.) The result was an eventual determination that the four-component model (Equation 8) was the most theoretically sound. It is that equation I will use in the example applying my model to an analysis of an urban area. In Appendix B is a two-page table showing the results of my calculations for every census tract that is at least partly included in the Census Bureau's definition of the Lansing-East Lansing Urbanized Area.

The fact that some tracts have areas lying outside the UA means that the calculations for those tracts will be slightly off from what they should be if a user-defined area were chosen that included those tracts in their entirety. For many researchers who simply wish to research a few tracts, it is much easier to overlook these slight differences. (Although I consider the amount of inaccuracy introduced by using the UA figures like this to be less than the inaccuracy of using the MSA figures with all tracts from the three-county Lansing area, those who prefer using the MSA will enjoy the benefit that its boundaries will match completely with those defined by its collection of component census tracts.)

Most beginning or casual RCI researchers will plug in the required numbers and produce RCIt ratings for every tract in their area of study, then map this out using a GIS or by writing or color-coding rating numbers onto existing census tract maps of the area. This in itself is very informative, immediately showing the relative quality of the housing throughout the metro area. For the most thorough and accurate study using a UA or other irregular area, serious researchers must take note that all variables in the formulae that refer to the entire UA should be replaced with values calculated (using a spreadsheet) from the sums and averages of the entire area chosen for analysis, as I do for this example. The design of the RCI model is such that a geographic redefinition of the area used as a standard of comparison will likely affect all the produced RCI ratings as a result. The customized UA I created for this example differs from the census-defined UA only in that it consists entirely of undivided census tracts. I used a spreadsheet to recalculate all the values needed for RCI modeling. My custom-defined area is identified in Appendix B as a user-defined area (UDA), and for comparison, UA figures are also shown in an adjacent row of data beneath it.

Appendix B shows the population of each census tract, ratings for each component of the RCI model, a total RCI rating for the tract, and an additional rating following it, called RCI%, which is the ratio of the RCIt rating over the RCIua rating for the entire defined area (the UDA). The RCI% and RCIua ratings will be explained shortly. On the next page is a map of the Lansing-East Lansing UA, with census tracts and RCI% ratings illustrated on it.



LANSING-EAST LANSING UDA

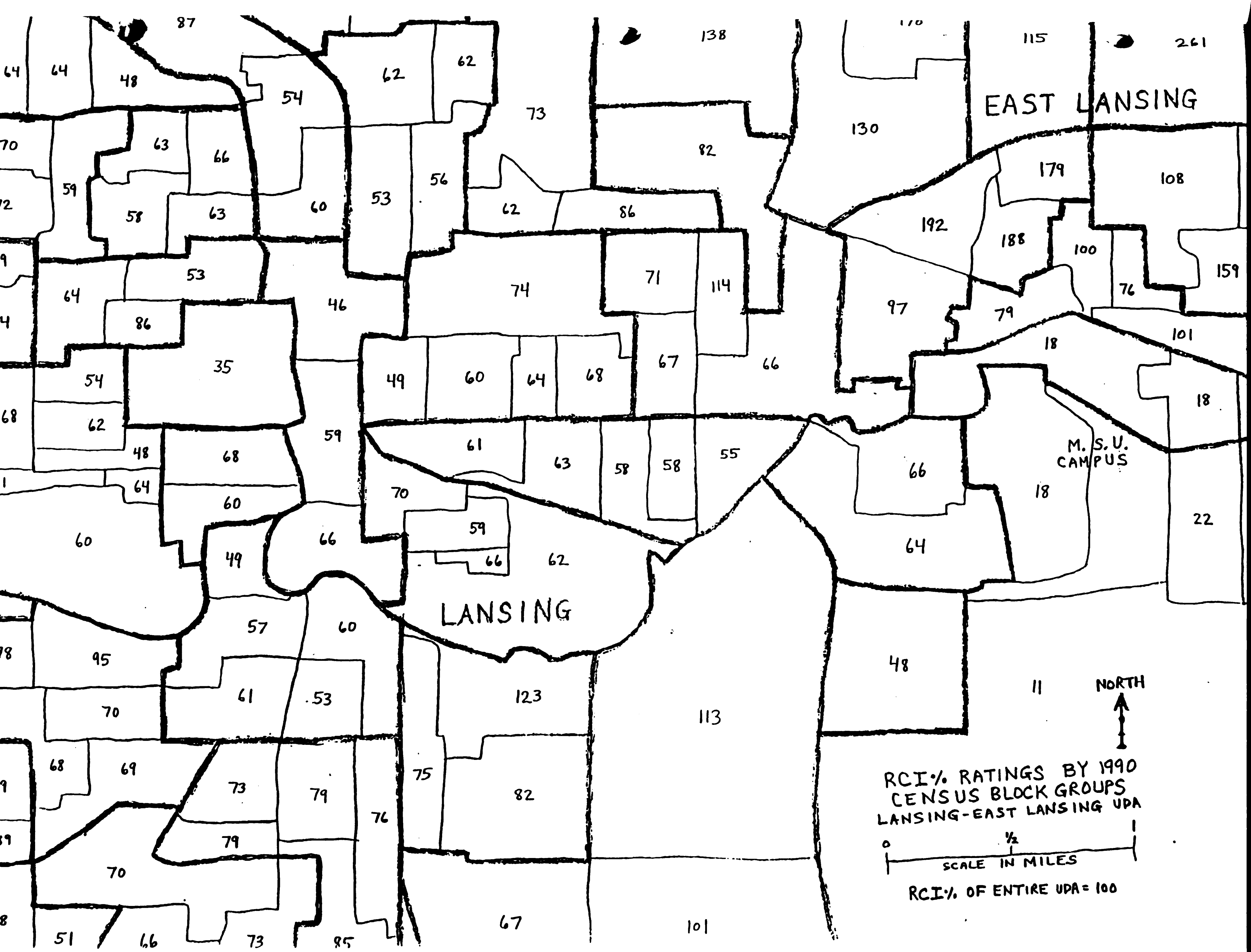
1990 CENSUS TRACTS WITH RCI% RATINGS

(RCI% OF ENTIRE UDA = 100)

$$RCI\% = \left(\frac{RCI_t}{RCI_{ua}}\right)(100)$$

An Application at the Block Group Level

After much field research to compare obtained ratings with actual area conditions, I am convinced that an analysis by census block group is more revealing and accurate than an analysis of census tracts alone. Many census tracts may be composed of several block groups of distinctly different character, and different RCI ratings will usually result from calculations on these smaller areas. Calculations and mapping by block group is much more time-consuming but its greater geographic accuracy will reveal much new detail in many areas as a result. On the following page is a block group map of a portion of the Lansing UA, which can be compared to the tract map on the previous page.


EAST LANSING
LANSING
M.S.U. CAMPUS
NORTH
RCI% RATINGS BY 1990
CENSUS BLOCK GROUPS
LANSING-EAST LANSING UPA
0
½
1
SCALE IN MILES
RCI% OF ENTIRE UPA = 100

The Interpretation of RCI Data

In addition to producing maps of the relative quality of neighborhoods, some additional research is recommended. Each UA, or large area with which tracts are compared, itself has an RCI, the RCIua rating, which can be found simply by treating the UA data as if it were for a single tract, and applying the RCIt formula to it. The resulting rating number represents the relative quality of the UA, when compared with its component tracts (until now I have described only informal comparisons of tracts with each other). The RCIua therefore provides an overall standard against which to compare the individual tract ratings. (The RCIua ratings appear in Appendix A under the "UDA stats" or "UA stats" rows.)

There are at least two good ways to compare the RCIt ratings with the urbanized area as a whole. One is to use them in a ratio, (RCIt/RCIua)x100, which will produce numbers showing the RCIt as a percentage of the RCIua. I abbreviate this indicator RCI%, and it can be seen in the last column of Appendix B. It has the effect of standardizing the ratings so that 100 designates the norm for that UA, and RCI ratings are expressed as percentages of that norm. This sort of expression will be easier for people to interpret than the unstandardized RCIt ratings.

The other way to compare RCIt ratings with the entire urbanized area is to express the tract ratings as percentiles of the UA's population, as shown in Appendix C. To do this, tracts are sorted by rating and a cumulative total of the tracts' populations is tabulated. The percentile of a given tract is found by dividing the cumulative population of it, and all tracts that received a lower RCI, by the total population of the UA (or UDA). In Appendix C, tract 42 is listed first because it has the lowest RCIt rating. All persons in the tract (5,442) are treated as being represented by that tract's RCI rating. The 5,442nd person in the population ranked by RCIt would be placed at the 2nd percentile of the UA's population as a whole. The median-quality tract for the Lansing-East Lansing UDA would be number 202.02, which is at the 50th percentile. Such percentiles could serve as a means for assigning class categories within certain rating ranges, such that they broadly match with the class distributions found in other studies of stratification (referenced earlier in this paper). Other ecological studies have assessed geographic areas using percentiles in a manner similar to this (Ley 80-82).

A person living in a tract may rightly feel that its rating does not represent his own household. Since the RCIt rating measures the quality of an area using weighted averages (with adjustments), and since not all areas are homogeneous, such a problem is to be expected. The RCIt rating accounts for *all* of the residential types in an area. While an analysis by block group tends to be more precise, in some cases it may also make sense to examine each component of the RCIt rating, by housing type. Appendix B shows four columns with the component RCI ratings: gqiRCI, gqniRCI, roRCI, and ooRCI. (When examining housing components of an area, it is helpful to express each ratio as in percentage-style values, by multiplying the ratio by 100. This way, all RCI values are expressed in the same terms and can be directly compared. The standardizing RCI% technique can also be used, producing measures such as the gqiRCI%, gqniRCI%, and so on.) To select one area as an example, a tract such as 44.03 has a large difference between its roRCI rating (42.5) and its ooRCI rating (103.3). When each of these components is weighted by the population living in each residential type, the overall tract rating is 51.4, which is 64.8% of the rating for the UDA area as a whole (the tract's RCI%), and located at the 22nd percentile for the urban area.

It may make sense, when disparate housing types are clumped together like this, to separate the tract or block group rating into its components, so long as the housing types are known to be spatially (or otherwise) separated from each other. The predefined census boundaries may therefore be amended using whatever more detailed land use information the researcher has confidence in, and such areas may be split into two or more parts. (For more discussion of this, see the section on "Critique of the RCI Model.") In cases where extensive land use knowledge is possessed, it may be meaningful to rate and rank-order, for the entire UA, all component RCIs for areas which are indeed distinct from those grouped with them in the same tract, thus enabling an even more precise geographic analysis than the use of census block groups can provide. This subdivision of areas should only be done, however, when the researcher is certain that such areas are quite distinct from the others. Areas without clear distinctions, such as those having a mixture of owner-occupied and renter-occupied houses along a small grid of streets, should not be separated by type, but must be rated as a whole area, due to the extensive interaction between the different types of residents.

While the use of increasingly detailed delineation of areas provides more information about residential patterns, it may seem to some that such information comes at the expense of measuring the broader "feel" of an area that is affected by extensive interactions with those surrounding it (see Jacobs 150-152 for a critique of the notion that urban neighborhoods are discrete or self-contained entities). There is something to be said for such a criticism, but one of my explicit assumption in RCI modeling is that such "interaction effects" from adjacent areas are already reflected in reported housing values (Harvey 548).

An alternative technique of attempting to overcome the limitations of the use of a single rating to describe areas of residential diversity, could be to include an analysis of ratings based on tract quartile information, in addition to the standard RCI based on the mean or median. Two areas may have the same RCIt rating, but one may be found to have a much broader range of residential class within its area (as revealed by quartile ratings that are spaced farther from the initial central rating) than the other.

Researchers interested in a detailed area analysis would probably want to examine categorical data on housing values and rental rates (rather than the summary mean or median values and rents). Certain value or rent categories could be assigned RCI values based on comparisons with those of the UA, and each tract or block group would then have certain percentages of its residents measured as part of these RCI categories and weighting them in an overall average for that area of study. This sort of analysis can be expected to provide a much more accurate weighting of different components of a heterogeneous area, and should be explored further. This detailed technique was considered a bit too time consuming (and mathematically distinct from the other RCI equations) to include any assessment or applications of it in this current research paper.

The main point to keep in mind when interpreting RCI ratings is that they are statistically measuring central tendency within an area, not dispersion. They are also very sensitive to how the areas of analysis have been defined. Still, my application of them in the study of several urban areas has convinced me that the RCI ratings are generally successful in modeling the distribution of different-quality residential types throughout a metro-area, and identifying how the quality of individual areas compares with others.

5. CRITIQUE OF THE RCI MODEL

Weaknesses of the Model's Concepts, Assumptions, and Applications

I have identified some weaknesses of the RCI model throughout other sections of this paper, from the initial concepts of class to its potential applications in future research. There are a number of weaknesses that will be mentioned separately in this section, even though some of these are mentioned elsewhere in the paper. Some weaknesses are fully addressed *only* in this section.

Some of the model's shortcomings are rooted in the use of the census as an information source. Census data is readily available and therefore to need data only from that one source is a big advantage of using the RCI model. However, the types of information provided were selected in advance by the census bureau, and in many cases need some manipulation to create the type of data used in RCI calculations.

One of the major weaknesses in the RCI model is that the geographic areas (census tracts and block groups) are sometimes defined in ways that do not match the purposes of the RCI model. There are numerous areas where a portion of the housing and inhabitants do not really match the others observed in that area, but do match up with an adjacent one. Since RCI ratings are assigned for entire areas, there is a noticeable loss of representativeness for tracts or block groups that include items better matching some adjacent tract (others have noticed this also—see Hartigan 295-296). In many instances, this problem is rooted in the tendency of the census to preserve historic tract boundaries, to facilitate longitudinal analysis. In other instances, the boundaries seem to have been deliberately drawn so as to "dilute" the statistical effects of particular areas. For example, the census-defined place of Haslett comprised two census tracts in the 1990 census—

tracts 47 and 48 in Ingham County. An old cottage area just southwest of Lake Lansing that was pretty run down at that time was divided between these two tracts, and so a tract level analysis of the area shows nothing below middle class. A better geographic delineation of neighborhood types would have taken half a dozen streets from that area and given them a working-class rating (probably in the 60s, if its RCIt were actually calculable), quite distinct from the middle class areas to its north and southeast. The data and RCI model provide no way to distinguish the areas from each other—they are treated as a unit. Even when dealing with block groups, this remains a problem for many areas.

A second weakness of the model is that it expresses a measure of central tendency, but not dispersion, for the housing in each area. Two areas may receive the same rating, but feel quite different because a homogeneous area's rating may accurately represent its entirety, but a heterogeneous area's rating could be derived from a large number of possible combinations that happen to average out to the resulting RCI. In some cases, by examining adjacent tracts, a trend can be seen and an assumption made that within a tract, a location adjacent to a lower-rated tract is of lower quality than the tract as a whole, while a location on the other side of the tract, adjacent to a higher-rated area, is of higher quality than the tract as a whole, with the two balancing out in the averaging formula which assigns a rating to the entire tract. In many cases, though, it is only local knowledge of an area that can confirm whether such a pattern actually exists. For the most part, the accuracy of the model is limited to the validity and homogeneity of the tract or block group areas defined by the census.

Ideally, I would have used a measure of housing value for every type of housing, but proxy variables of gross rent and per capita income had to be substituted for this when rental housing and group quarters were assessed. I did not attempt to assess the residential impact of vacant housing units or seasonal housing units. Second homes are also unassessed, although such units should be quite indicative of class position (Meyersohn and Malone 324-325). In some areas, these types of units compose a very high percentage of the total, and so should be accounted for in some way, but suitable information suggesting what the impact of these units would be was not readily available, and to burden the model with additional, yet-untested assumptions about them seemed unwarranted.

A possible additional problem may arise with the overinterpretation of RCI data. The model's measurements are ultimately somewhat limited, and after all the normal RCI calculations have been performed, only additional research (using other information sources) will illuminate further the nature of an area (Roberts 236, Jacobs 11-16). Assumptions, for example, that a $120,000 house is less desirable in an area rated 50 than in one rated 120, are not only unwarranted and indefensible, but also violate one of the key assumptions of the model, which is that the value is determined by a market assessment of all known benefits and drawbacks of the housing unit. Some of these benefits may turn out to have nothing to do with residential quality (such as a high land value from profitable location and zoning for commercial uses) but even when they all do, such specifics are not addressed by the model. Although the $120,000 house in the area rated 50 may be much larger and in better condition than one of the same price in the area rated 120, the latter's small size and worse condition may be offset by a better location or better school district. The same pricing indicates that these features are equivalent in terms of the regional housing market (but not necessarily equivalent for consumers with *specific* housing or locational needs—Ley 242-243).

An important point that should be kept in mind is that there is probably a tendency, since I have addressed the issue of residential stratification in terms of class, to confuse the residential aspect of the RCI with other aspects of social class. A low rated area in the RCI model will not necessarily have high crime rates, for example. A high rated area may still have a significant amount of poverty (an income-based variable). Although correlations might be expected between indicator variables of class, of which the RCI is one, they must not be taken for granted—especially when in many cases the data on many other indicators is readily available in the census and therefore does not need to be estimated indirectly by the RCI. The RCI is intended to measure a somewhat different aspect of social class than other class indicators do, and its distinct nature should be kept in mind by all of its users.

Where RCI ratings indicate that an area is "lower class," for example, recall that the RCI is but one of many class indicators. Specifically labeling an area as "lower class" or a "slum" can have harmful repercussions, whereas the reality of social organization in lower-quality housing areas may be much different from the many assumptions that might be made about it (Gans 64-68, 99, 119-120, 126-127, Jacobs 354-358). Social class is a product of *social relations* in society—"lower classes" are a part of society, and their status can't be changed through zoning, planning, or design techniques which address only physical aspects of an area (or even attempt to cause certain types of people to leave the area). It is a part of our American social system that class relations, or conditions of inequality, are reflected in the layout of our cities (Jacobs 8-9) and that urban forms are based on competition between different groups or interests (Harvey 558-559).

In terms of assessing overall social class, the RCI model is merely one indicator among many others—not a definitive way of accurately assigning all citizens into a particular class category, although it can and does suggest placement at an approximate point on a stratification continuum based on class aspects of residential location. If the RCI is examined along with other variables such as the education and income levels in an area, the variables *together* should generally succeed in categorizing areas in terms of overall class assessments. Note that education is measured for *individuals* rather than households, again suggesting the pertinence of an individual-level analysis of stratification despite the traditional preference for household-level analysis.

Some might consider it a theoretical weakness that I did not claim that a class approach or a stratification approach was notably preferable for this type of analysis. While the continuous nature of the RCI measure aligns it most closely with the stratification approach, I have shown that this measure could be used to estimate the cutpoints demarcating class categories, and the assignment of particular areas to those categories. An assumption could even be made, if desired (and supported by an analysis of other indicator variables), that such areas would have the subcultural characteristics relating to those classes, possibly even aspects of class consciousness in cases where the census defined areas actually function as neighborhood communities.

In many cases my selection of particular census variables may deserve criticism. For example, the choice of using owner-occupied units with a mortgage was one that I deemed most suitable, and have found satisfactory in its results, but which was selected mainly due to the limited alternatives provided in the census data. All of my selected measures for each RCI component are considered to be merely the best I saw available in readily accessible census data, not necessarily the best possible choices if other data are available.

Another noteworthy weakness in the model is the difficulty of a user accurately and objectively defining an urban area within which full stratification is presumed to exist, to enable the valid assessment of tracts and block groups. Although I assume that the census UA is of sufficient size, it probably excludes many wealthy persons who commute to the city and act as a community member there, but who choose to live in essentially rural areas, or in exurban "small towns" (Palen 201, 204). Such commuters have high transportation costs, but enjoy rural taxation rates and residential costs of living which in many cases allows their residential quality of life to be much higher than could be obtained for a comparable price in the city (Harvey 549). Knowing of no way to definitively distinguish, from the data, exurban or rural *commuters* from those who live a truly rural lifestyle, I simply excluded such areas from comparison. The cost of living seemed sufficiently different that I was certain that a different standard of comparison must be used to assess rural areas—urban wages can be expected to purchase a lot more there. Still, the variation in RCI ratings from including or excluding fringe areas turns out not to be that large, so this may not be a great problem for the model.

Probably of greater importance is the model's use of survey-based data from census summary file 3A. Not only is error a part of the model because the data was obtained from a questionnaire instrument where respondents may not answer accurately, there is also a sampling error that can be fairly significant when assessments are made at the tract or block group level (or even smaller, when housing components are considered). The use of more complicated, multi-component versions of the model will likely cause some of these errors to be compounded.

Some questions are based on "selected" households only, such as information on housing values and gross rent. The model weights responses to these questions according to the proportions of a different group of respondents, however, which in one instance introduces a clear problem into the use of the RCI formulae. There are certain areas where particular categories of housing compose only a small portion of the total, and these proportions are sufficiently small that samples of "selected" units turn out to be zero. In the formula, there is a small weight attached to a component RCI value that is left undefined. In these instances, the undefined component will be treated as contributing no additional housing quality to the component summation for that tract, effectively counting that residential segment of the area as having an RCI of zero. Fortunately, since these components compose only a small fraction of the entire area, the reductive effect of this anomaly on the RCIt rating is quite small. In cases where an entire tract has little or no population, a zero rating will be produced by the RCI formula as a result.

One extra issue on the use of census data concerned rental information. The census identifies a segment of renter-occupied units for which there is no cash rent paid for the unit. At first I was inclined to include this segment in my calculations of mean rent, by treating their monthly rental costs as $0, since I intuitively pictured such persons as merely staying in a friend or family member's otherwise vacant unit. According to census definitions, however, the "no cash rent" category includes many persons who contribute services in exchange for their housing, such as the management of an apartment complex , which can have considerable value. I decided not to count these cases at all when calculating rents, with the result that their presence in an area will not at all affect its rating. Although my choice was arbitrary, the effect on the ratings for all areas I have calculated to date has been negligible. If an area is observed which has a significant proportion of inhabitants with "no cash rent" paid, some alternative solution should be found to address this category of renters.

6. AREAS FOR FURTHER RESEARCH

Equation Modification

I have presented my model in such a way that it is very easy to change its equations to reflect different assumptions than those I have used. A person may disagree, for example, with the reasoning behind the rental adjustment factor I have proposed, and wish to change it. A different researcher may decide to drop the group quarters components of the equations and weight the two remaining factors according to their proportion of households, rather than population. These are examples of perfectly acceptable adjustments that I intended to be "tried out" in my model at some future point.

Another interesting adjustment that could be made is to represent group quarters differently in the equation. Following my prototype model, certain kinds of group quarters, such as prisons, could be assigned a zero (or even negative) rating, so as to better match the sort of effect such institutions are presumed to have in an area. Other group quarters, such as nursing homes, might be weighted differently, or assumed to have no effect on the surrounding area. It was my choice not only to count everyone in an area as having an effect on it, but to have the ratings assigned to such persons rooted in actual census data, to reduce subjectivity. However, more use of the model, and comparisons of its resultant ratings with actual comparative neighborhood conditions, may reveal through "trial and error" that certain values or weights are more appropriate than the census-based variables I chose. Where such improvements can be found and agreed to better model actual residential conditions, their use should of course be encouraged. There are a large number of variables that can be considered to potentially affect residential quality, and I have used only a few, in which I had more confidence, in my model so far.

One of my ideas that I eventually decided was not yet developed enough to improve the model, was to increase its complexity by using the individual person as the unit of analysis throughout. Toward the beginning of this paper I reported that I believe such a measure would be preferable (or at least worth investigating) because I mistrust the validity today of assuming that all members of a household are of the same social class. I attempted to correct for this by assuming that per capita housing values (or expenses) could be used as an approximation of the individual position of its members, by dividing household figures by the average number of persons reported in households in each tract or block group area. I guessed that the reality that at least one household member in a family with kids will have a higher class position than some other in the household, might not matter too much in view of the averaging nature of the model in general. An individualized measure, like "per capita housing expenses," derived either from the rent divided by the number of persons, or the housing value (or SMOC) divided by the number of persons, would also help to match these components with the already individualized analysis done on those in group quarters.

The conditions I mainly wished to assess through individualized measures of residential class were those relating to the effect that household size (and possibly crowding) might have in creating inaccuracies in RCI ratings. That is, wouldn't a family of eight, living in one apartment, be lower in class position than a family of two, living in the same apartment? The per capita housing expense of the large family is clearly much lower! Similarly, wouldn't a single person living in a house have a higher class position than a large family living in that same house? The per capita housing value is much higher for the single-person household.

My development of per-capita RCI models involved two-component, three-component, and four-component models, just as I had created for the household-based models described earlier. These three equations appear below, and share the weakness that I was unable to find or derive data on ppOOHUwmua, and had to substitute ppOOHUua for it instead when applying these equations to actual census data.

(Equation 10) Rejected 2-Component Per-Capita RCI Model

$$RCIt = \left[(\%ROpt)(roRCIt) + (\%OOpt)(ooRCIt)\right](100)$$

(Equation 11) Rejected 3-Component Per-Capita RCI Model

$$RCIt = \left[(\%GQt)(gqRCIt) + (\%ROpt)(roRCIt) + (\%OOpt)(ooRCIt)\right](100)$$

(Equation 12) Rejected 4-Component Per-Capita RCI Model

$$RCIt = 100 \times \left[(\%GQit)(gqiRCIt) + (\%GQnit)(gqniRCIt) + (\%ROpt)(roRCIt) + (\%OOpt)(ooRCIt)\right]$$

where

$$gqRCIt = \left(\frac{pciGQt}{pciOOwmua}\right),\ gqiRCIt = \left(\frac{pciGQit}{pciOOwmua}\right),\ gqniRCIt = \left(\frac{pciGQnit}{pciOOwmua}\right),$$

$$roRCIt = \left(\frac{MGRt \div ppROHUt}{SMOCwmua \div ppOOHUwmua}\right), \text{ and } ooRCIt = \left(\frac{MVt \div ppOOHUt}{MVua \div ppOOHUua}\right)$$

NOTE: ppOOHUwmua (from the denominator of the roRCIt equation) could not be found or derived from the census data I was using, and so ppOOHUua was used instead as a substitute.

When I actually applied these models to the Lansing-East Lansing UA, I felt that the quality of match between the ratings and my perception of the areas themselves had declined from that of the household-based models. Eventually I decided that this was because this new, per capita averaging model was too distorted by variations in household size (just as household-based income studies are—Hess, Markson, and Stein 181). Using these models, single-person households are treated as having a much higher class position than was realistic. This is because a single-person household must spend a certain amount of money to maintain itself—on items whose benefits could, in a multi-person household, be shared by others, with the result of a much lower per capita expense. As an example, we can look at changes in the poverty line based on the size of a household. If a one-person household is in poverty with an annual income of $8,000, but not in poverty with an annual income of $10,000, this does not mean that a two-person household is in poverty at a $16,000 income and above poverty with an income of $20,000. Rather, the two-person household is considered above the poverty line at about $13,000, and a three-person household at $16,000. The attempt to derive meaningful per capita class assessments fails for my housing variables because it is based on simple averages rather than a curvilinear standard, such as are used in poverty calculations. A more flexible standard of comparison that doesn't merely use averaging will need to be incorporated into the equations in order to render the per capita model appropriate for the kind of analysis it was intended for. If household size could be taken into account so that one of its occupants is compared to a standard for a person living alone, and then any additional occupants are compared at some standard that is a fraction of that for the first (similar to the distribution of poverty levels that are based on household size), then the expanded formula might work. This is why I have included lengthy descriptions relating to it in this paper, and suggest it as an area for further research.

An extra problem with per capita models is that since I found no way to calculate the number of persons per owner-occupied unit with a mortgage, I had instead to substitute the value for all owner-occupied units. This can be expected to have a significant effect, since according to the census, the incomes (and I would guess, ages and family sizes) of those in owner-occupied housing units without a mortgage was quite different from those with a mortgage. If it is actually possible to calculate the "with a mortgage" segment properly, and therefore derive a more adequate estimate of per capita owner-occupied housing values, these rejected equations may ultimately prove to have much-increased validity.

I also considered splitting the owner-occupied component of the RCI equations into two terms, just as I had done with the group quarters component. Initially, I had rejected the idea because, if OOwom was to be treated as the other components and adjusted for comparison with the OOwm standard, I could not conceptualize a valid way to link differences between SMOCwom and SMOCwm to their inhabitants' class positions. Any such linking to me seemed to introduce unverified assumptions about the characteristics of these two categories of owners. Adjustments to OO subcomponents should be based on housing values rather than a SMOC-derived adjustment factor, since I have based the model on the assumption that housing values are the most revealing indicator of class position. Therefore, a new component should be created by comparing the mean values of OO units with a mortgage in the tract (MVwmt) with the respective mean value for the UA (MVwmua), and similarly comparing the mean values for OO units without a mortgage (the ratio of MVwomt over MVwomua).

I didn't start to imagine how this addition to the formulae might *improve* the analysis until just before this paper was completed. Its main justification seems to be mainly to use more data in the model's calculations. It is certainly worth testing, however, because of the possible class-related differences between residents of OOwom units and those of OOwm units. For example, OOwom residents may be longer-term inhabitants of an area, and OOwm residents may be newer inhabitants, and the life-cycle position of a person or family is certainly important to housing submarkets, as well as correlating with age, income, lifestyle, and other class indicators (Ley 242-243, Hess, Markson, and Stein 228, 230, Gilbert and Kahl 87-89). Therefore, I include in this section for further research the following proposed five-component model:

(Equation 13) Proposed 5-Component RCI Model

$$RCIt = (100)\left[(\%GQit)\left(\frac{pciGQit}{pciOOwmua}\right) + (\%GQnit)\left(\frac{pciGQnit}{pciOOWMua}\right) + (\%ROpt)\left(\frac{MGRt}{SMOCwmua}\right) + (\%OOwompt)\left(\frac{MVwomt}{MVwomua}\right) + (\%OOwmpt)\left(\frac{MVwmt}{MVwmua}\right)\right]$$

Of course, the most advanced RCI model I currently envision would be one that adjusts equation 13 for individual-level analysis, as discussed in the preceding section with equations 10 through 12. This would probably take some time to develop though (if it is even feasible), and many researchers may not want to take the extra care to use such expanded models unless the resulting ratings were found to be of significantly improved accuracy or greater validity.

Transitional Zone Analysis

If the RCI model is both valid and accurate, its application will identify areas in the city where there are significant class differences between adjacent or proximate areas—areas which I will call transitional zones. In many cases, transitional zones are quite sizable and are based on geographic distance. A middle class neighborhood (for example, with an RCI% of 125) may sit adjacent to an upper-working class neighborhood (let's say with an RCI% of 95), on the other side of which are the seedy areas of town (with RCI% ratings under 65, let's say), so that the distance between incompatible class areas is substantial. In other cases, the transitional zone may be small in distance, but use a river or wall or expressway (or the proverbial railroad tacks) to limit interaction between areas. A study of such areas in the field, including interviews with residents, and analysis of physical design characteristics, should prove quite informative for urban and regional planners who are concerned with screening and buffering around otherwise incompatible areas.

One of the concerns of better-off residents is the maintenance of certain spatial, physical, or psychological impediments discouraging extensive interaction with lower class areas nearby. These concerns are acknowledged in planning hearings, although planners themselves are understandably reluctant to admit the influence of class criteria in their decisions, keeping such criteria implicit or unstated, for the most part. In some cases, the issue is plain to see, however; planners are often faced with the dilemma of where to place government-subsidized (i.e. lower-class or lower working-class) housing. The RCI measure could provide a quantifiable aspect to the study of what size of class differences are generally tolerable between adjacent areas, and what techniques of design may help increase such tolerances (bushes, lighting, the orientation of buildings, windows, and access points, the use of gates, alarm systems, security staff, and so on).

Interaction Studies

An interesting area for future research could be to measure the amount of interaction that occurs between different classes of neighborhoods. Certain types of transportation modeling and market analysis examine household economic characteristics. In similar fashion, it may be found that despite the assessed market-values of particular residential locations, the actual quality of life there may be affected by proximity to or access from lower-class areas in ways that have not factored sufficiently into the market pricing of the unit. The RCIt rating alone may be misleading, and need adjustment for the effects of interaction between it and lower (or higher) class areas.

A good example is found in the setting around the campus of Michigan State University. The campus itself has housing that consists almost completely of dormitory units, and receives a gqniRCI rating of about 15, since two or three low income persons frequently share a single room of small size, and rooms generally lack complete plumbing, kitchen, and bathroom facilities, which must be shared among groups of residents (which is why these have been classified as group quarters by the census bureau). The surrounding census tracts receive much higher RCIt ratings of 38, 51, 68, and 71. The notorious block parties/riots that have received much media coverage in the last couple of decades might, according to the RCIt ratings, be expected to have taken place in the lowest-rated areas—the campus itself, and possibly a couple of the low-rated adjacent areas. The reality was that although areas of the campus *were* involved, the majority of the destruction and criminal activity took place in two tracts to the north and northeast of campus (locally sometimes known as the "student ghetto") which received RCIt ratings of 68 and 71. A detailed analysis of areas based on local land use knowledge suggests why these locations were most affected.

To the west of campus are university-run apartments which have complete facilities in each unit but are often overcrowded (about 20% of the units have more than one person per room, 11% have more than 1.5 persons per room) and which obtained an roRCI rating of 37 (see Nettler 151 for these definitions of crowding). These apartments are in three groups, Spartan Village (in tract 44.02, which has an RCIt of 38), University Village, and Cherry Lane Apartments (both of the latter are in tract 44.03, which has an RCIt of 51). Much of these units are relatively far from the center of campus, and are inhabited by foreign and older students and staff at the university, many of whom have families. Tract 44.03 also contains a significant area of owner-occupied middle-class homes.

To the northeast of campus is tract 43.02, which has an RCIt rating of 71 and in which is located the infamous Cedar Village Apartment Complex, at which many of the civil disturbances have begun. To the north of campus is tract 41, whose RCIt rating calculates as 68, and which contains the main commercial, recreational, and office areas serving the campus and its student population. Although crimes show a much greater positive correlation with the presence of young males, there is also a weaker but significant correlation with variables such as wealth (a negative correlation), rental values (a negative correlation), neighborhood characteristics ("slum" status), and urban area size (Nettler 100-106, 111-113, 141, 144-147). Although I have given cautionary statements about not overinterpreting the RCI ratings, and the necessity of considering additional variables before assessing an area's *overall* social class, the RCIt values in this case seem not to have identified these areas properly. If we assume that riotous parties are a lower-class activity, did the RCI ratings at all suggest the possibility that such damage and disorderly conduct would occur in tracts 41 and 43.02? I have already given some indication of the spatial and demographic aspects that would explain the ability of the lower-rated tracts of 44.02 and 44.03 to avoid riot problems. As it turns out, an analysis of RCI ratings at the block group level reveals some areas within the two riot-prone tracts that receive very low ratings (compare the two maps in the RCI application example earlier in this document). In addition, however, I suggest it could be helpful to consider the effects of interaction between the lowest-rated areas—the dormitories on the campus itself—and the tracts to their north.

Recall that the RCI is intended to measure *residential* quality, rather than the quality of commercial or industrial areas. In my experience, the quality of interaction in commercial areas often does not match the character of the adjacent residential areas very well, because commercial areas tend to be situated in a way that enables traffic from around the region to gain access to its shopping, office, and work amenities. It being generally profitable to attract as many customers as possible, retail commercial areas accessible by less prestigious persons tend not to be as exclusive as residential areas, with the result that persons in major commercial areas tend to reflect the diversity of the urbanized area as a whole, rather than merely the surrounding neighborhoods. So although about 17,000 students live on campus in tracts 42 and 44.01, the vast majority of these travel into tract 41 for recreational and shopping activities. Tract 41 also has direct bus links with lower quality sections in the city of Lansing, and attractions (such as a clinic which buys blood plasma) which appeal to a lower class of residents.

A detailed assessment of land use shows a general pattern of ascending social class the farther one lives from the campus boundaries. There are areas adjacent to the campus that share its low residential quality, but do not benefit from the direct institutional support and administration of the university. Tract 43.02 has about 10% of its 3,211 residents living in noninstitutional group quarters, and its gqniRCI component rating is only 23. Tract 41 has about 27% of its 5,017 inhabitants living in noninstitutional group quarters, which have a gqniRCI rating of 22. So on the one hand, the majority of each tract's residents live in fairly decent (roRCI ratings in the 70s) rental units and merit a residential label of working class (fitting with tending to be productively engaged in school, yet employed in lower-status temporary and lower paying jobs, and with their youth and not-yet-attained higher education holding them back from a higher status). On the other hand, there is a sizable minority of the population in this area living in rooming houses, fraternities, and shared housing arrangements that reflect a lower-class income, culture and lifestyle. It is also possible that, despite such conditions, many of the inhabitants of nearby apartments have chosen to reside near such arrangements because of a cultural or class affiliation with the activities that go on there. In contrast, many of MSU's students choose to live in otherwise middle class areas surrounding the university, in tracts 38.01 (20% of persons aged 3 and above enrolled in public college), 38.02 (26% in public college), 39.02 (30% enrolled), 40 (30% enrolled), 43.01 (40% enrolled), 45 (20% enrolled), 49.01 (17% enrolled), 49.02 (27% enrolled), and 50.01 (11% enrolled). It might be inferred that in these areas, the residential quality better matches preferences originating in a middle-class or upper-working class childhood. The roRCI rating in most of these areas is in the 60s and 70s, showing their relative affordability (since that RCI component is based on gross monthly rental costs) and therefore suggesting the importance of lifestyle and consumption preferences in the selection of residential location, despite the notably lower income available to most students.

Although procedures for a more general analysis of this type are not yet detailed, it can be seen how the RCI ratings are useful for descriptive and explanatory purposes.

Further research on the nature of interaction between areas could enhance the explanatory power of the RCI model beyond merely considering issues of stratification. Perhaps the incorporation of a gravity model of interaction (Haynes and Fotheringham 23-24) would provide new analytic breakthroughs, or perhaps more simplistic approaches could be similarly effective. For example, interaction effects between the campus and its surrounding tracts could be estimated by combining their data and treating them as a single tract. As subdivision of tracts was recommended for a detailed residential assessment, combining of areas could be useful when there seem to be interaction effects not adequately reflected in the housing values and rents for an area.

Applications in Urban Planning

With much additional research, the RCI model might eventually be used to assist residential planning decisions, by estimating the impact that new developments will have on the quality of an area. Some means would have to be found to convert present values to the equivalent of the census data, but also to account for shifts in values that may result from the impact of a new development. On the other hand, there may not be such shifts due to screening, buffering, or interaction-reducing security and design measures surrounding the new development.

For example, a planner may be calculating the locations of subsidized housing units in an area, and wishes to distribute such units so that each community has its "fair share," yet minimize the presumed deleterious effects on surrounding areas. Supposing that these subsidized units have their roRCI calculated as a 30. The planner resists the temptation to locate them in a lower working class area with a rating in the 40s, even though residents of this area probably would publicly register few complaints about the

location such developments, because of a concern that the ratings of these areas would be pulled into the lower class range below 40. The planner instead spreads out the housing units so that no RCIt rating is lowered more than a couple of points—insufficient to drop an area down a class. In areas where there is a great difference between the original RCI and the project's estimated RCI, the planner investigates techniques of lowering the impact through location and design measures. The new residents should be able to enjoy the benefits of living in nicer-quality areas, having access to jobs, schools, shopping, parks, or other amenities accounting for the area's higher RCI, and may also enjoy increased interactions with their wealthier neighbors, rather than feeling trapped and socially isolated in a "ghetto" or "slum" setting.

Let's say that one area of project development in this hypothetical example had an original RCIt rating of 84, and the planner calculated that the new rating would be about 81 as a result of the new development. With the release of new census data 7 years after the project's development, however, the new rating calculates as a 68! Housing values had declined significantly between census periods. Although it is not certain that such a drop was due to the effect of the subsidized housing units, the planner is left to wonder about this, and attempt to defend the location decision against accusations that the development started the neighborhood into an unstoppable decline.

Although invented for example purposes, such a scenario illustrates my current reluctance to employ the RCI model for residential "impact studies." The RCI model is much too new and too little tested to bear such burdens at this point. Future verifications of the model's assumptions and accuracy may eventually enable this sort of use, however, or even attempts to use the model for projections about future patterns of residential quality throughout an urbanized area. Such applications are, in my opinion, a long ways off, and I believe that the initial models presented in this paper would be used irresponsibly if wielded in such a fashion (refer also to Jacobs 417-439).

Use of the RCI for Historical Trend Studies

Normally, historical trend analysis of economic data requires using inflation information to adjust dollar values from one year and allow comparison with those from another year. The usual technique is to examine changes in a cost-of-living index, such as the consumer price index, and make a ratio of the two values to produce a multiplier that will allow the values from one year to be expressed in terms of the other year's monetary values. However, information about housing costs are one of the items used to determine values of the consumer price index, and the rate of change for housing costs may be quite different than for other costs, thus making the consumer price index as a whole less than ideal for accurately measuring changes in housing expenditures over the long term. Also, housing standards change as society does, and the older, more crowded living arrangements that were the urban norm 70 years ago are now considered sub-par by many consumers today. Changes in technology (for example, the number and capacity of electrical outlets) and code requirements (such as larger setbacks between structures, for fire safety, and provisions for parking and vehicular access) have rendered many older housing units to be inferior than newer ones. Since class is a relative thing, in which comparisons are made within a society, a measure of historical changes in class should be measured using a flexible tool that these difficulties won't affect.

The RCI model, by basing its class assessments on the relation between an overall urban area and its component parts (or neighborhoods), seems to provide this flexibility.

Both the RCI% rating and percentile ratings that can be determined for an area (as shown in Appendix C) are relative measures I created to allow comparisons to be made between independent systems, such as between different historical periods. Information on changes over time in a residential area (neighborhood succession) can be studied using the RCI model, or variations on it that allow the use of different indicator variables from earlier census periods.

Researchers of historical trends should keep an eye open for a few quirks that the data may produce in this sort of analysis. First, area that are completely stable and practically unchanged over time may appear to grow worse, if wealth and standards of living in the surrounding areas have increased. Second, if the size of an urban area increases over time, researchers should expect the range of stratification observed in that area to increase, as described in the next section.

Use of the RCI for Comparative Studies between American Cities

Just as one urban area in separate historical periods of time can be considered two independent stratification systems for RCI modeling (in that measured values in economic variables are relatively incompatible, rather than "independent" in the statistical sense of one condition not affecting another), so also can separate urban areas be considered independent. This is because the costs of living may be much different in the cities that are chosen for comparison, as well as the ranges of their stratification systems. My choice of creating the model around a comparison of small tract areas with an overall urban area, rather than a state or nation as a whole, was due to the large effect that cost-of-living differences would have had on such comparisons. Thus, an important assumption of the RCI model, which is only fully revealed when considering comparisons between UAs, is a localized form of stratification in which the UA serves as a class reference for all its inhabitants. In this function it is viewed as being, for the most part, a more important reference point for status assessment than the state or nation of which it is a part. (For a differing view, see the next section, which assesses stratification using larger frames of reference.)

For the RCI models presented so far, it is assumed that the biggest impact of class distinctions (at least for the majority of people who do not have great wealth) is to be felt at the local level, and that people's frame of reference is most strongly shaped by the immediate area that they live in (the UA, for example). If this is a fair assumption, then a direct comparison of RCI ratings for tracts in different urbanized areas will not only be misleading due to the differences in cost-of-living (which, after all, shouldn't in itself be that difficult to adjust for) but also due to the extremes of variation around the averages which are used as a standard. In the Lansing-East Lansing UDA (which in today's America I consider to be a medium-sized metro area), having a population of 289,509, the top RCI% rating was only 206.8, for tract 39.01 (the "White Hills" subdivision in East Lansing). This tract is considered top-notch for the Lansing area, but doesn't seem like much compared to the rich areas around larger cities such as Chicago or Los Angeles. For example, when I applied my prototype RCI (Equation 1) to a tract analysis of the Detroit UA, the tract composing the village of Grosse Pointe Shores received a rating over 500!

On the flip side, there were many tracts in Detroit whose housing values were so low that they were expressed in the census only in terms of being less than some minimal value, such as "under $10,000" or "under $15,000" (the cut off point is different depending on whether the data is obtained from the printed books or from the CD-ROM). Large areas of Detroit received RCIt ratings below 30, without even adjusting for the effect of group quarters (since Equation 1 did not include this), whereas in the Lansing UDA, such a low rating was only obtained for the downtown tract (Tract 14), and two tracts on MSU's campus that are almost exclusively dormitories.

It may be that in smaller urban areas, extremes of wealth and poverty are at too small a scale to show up well in their own individual tracts, and so get diluted or averaged in with surrounding areas that are closer to the norm. An alternative explanation is that the extremes of wealth and poverty in large cities are due to qualitative differences in their economic and social functions, and that, along with the wider range of values in indicator variables, we have a similarly wider range in relative social status. People without money or homes are in many ways similar no matter where they are—they are at the bottom of the social ladder. People at the bottom in a large city, though, tend to be farther from the norms, and farther from the people at the top, than we see in small or medium-sized areas. This may account for the qualitative differences observed for large cities, in addition to the proportional differences one would expect from increased size (Ley 346-348, 350)

The description I have given underlying the RCI model is also in accord with the premises of central place theory (King 31-32) in which the large city is the focus of a region and has land valuations shaped by its important functional roles, within a hierarchy of different cities, playing more powerful regional (or national or global) roles which cause economic referents to be measured on a more competitive scale. The importance of such hierarchies also figure prominently in the contemporary world-systems approach to urban analysis (Lyons and Salmon 102-103), in which the presence of global networks and competition finds expression in the organization of larger and more important cities.

The mathematics of the RCI model is also rooted in the sociological concept of relative poverty, in which poverty is defined in relation to the concepts of social class, and social relations of inequality, which are subscribed to in a cultural environment at a particular time and place. Relative poverty is based on how a person's needs, expectations, or standards of living are defined by the particular social, economic, and cultural environment in which that person is socialized and earns a living (Kerbo 308, Gilbert and Kahl 276-277). The standard of class comparison issue will be discussed a bit more in the next section.

Thus, the RCI model would establish the residential component of social class with reference to standards for a particular urban area, by calculating an RCI% rating. I hypothesize that the RCI% rating should allow accurate comparison of tracts located in completely different urban areas, which might even be across the country from each other. This hypothesis is based not only on the presumed validity of the RCI model, but also on the assumption that urban conditions throughout the country have enough qualitative similarity so as to allow comparison. If such a comparison were made between cities in different nations, with sufficiently different cultures and societal structures, the results, while technically comparable (after having adjusted for differences in currency and census variables), would not necessarily point to similar lifestyles or standards of living. Rather, they would probably be providing information on international lifestyle differences between those of the same (societally relative) class standing. This in itself could make for some very interesting research, comparing, for example, the living conditions of skilled manual laborers (upper working class) in Brazil or Indonesia with those in rich countries like the United States. The variables chosen to measure class, however, were based on American society, and probably have numerous weaknesses when applied to most other regions of the world.

Use of the RCI for State, Regional, and National Analysis of Stratification

As mentioned before, a researcher who operates from different assumptions than I have may still be able to use the RCI model for research and analysis. If a researcher does not share my assumption that class is primarily defined with reference to the urbanized area of residence, a different standard of comparison may be employed. A broader region may be defined (such as the southern lower peninsula of Michigan), or the entire state or country may be used as the standard. Such an approach to the model might assume that any regional differences in cost of living are due to significant benefits derived from living in that area, such as a greater availability of jobs or, in hierarchical terms mentioned in the last section, the presence of more capital or wealth in the area.

If such an assumption is indeed warranted, then a corollary would be that class is best defined in relation to the entire country (or other large-scale area of comparison); that persons actually compare themselves with reference groups that may not even be visible to them in their lives. An argument can be made for this because of the extensive effect of modern communications, but my current opinion is that such an assumption was much larger than I wanted to make at this point. I believe that lower income persons, for example, compare their lot with the nearest example of a stratification system, which may be their immediate environment, or the nearest urbanized area, and that if such an area is important enough, its role in a national or world economic system will cause areas of it to reflect conditions elsewhere in the nation or world (for example, that infant mortality rates in sections of Detroit are comparable to third world rates—Ley 336). A poor person living in Monroe County (on Michigan's border with Ohio) is likeliest to compare his residence either to the city of Monroe, or to the adjacent large metro areas of Detroit or Toledo, rather than the rural poor in Montana, Alabama, Appalachia, or any other distant area. Clear exceptions to this could be if the person travels to or communicates with those areas, such as from media reports or family correspondence, but this would be a selective and biased comparison with such areas, not a balanced assessment of conditions throughout the country, which would require systematic analysis. It seems to make sense to use a state or a researcher-defined regional area as a standard of class comparison, where a knowledge of that area suggests that it is economically and culturally valid to treat it as part of the same stratification system, and where inhabitants of the smaller area under study are likely to have experience of such conditions with which to make class comparisons.

A plausible argument can be made that the wealthier classes, due to their generally more extensive travels, affiliation, and education, are as a result sufficiently aware of national stratification conditions, and sufficient in their local influence, to impose such nationally-based standards on those in their local environment. My experience in rural areas of Michigan suggests that although the wealthier classes in an area are aware that they are not so wealthy compared to many other areas, for local purposes they act as a kind of elite, functioning in their communities at a higher level than a state or national assessment of their class position would suggest. Persons who in a large city might be judged as "merely" lower middle class, due to their occupation, education, and income, frequently hold influential positions in rural, relatively poor areas. My observation of this has led me to prefer, for this research, the assumption that class is relative to the standards of a fairly localized area. If this assumption is untrue, or unshared by other researchers, the RCI model can easily be adjusted so that the values that tracts are compared with are drawn from state or national data.

Use of the RCI Outside of Urban Areas

It may be possible to apply the RCI model to judge rural and small-town areas. Following the same sort of reasoning I just detailed in the preceding subsection, if an area is chosen that makes sense to act as a standard of comparison for smaller areas within it, then the usual RCI analysis may proceed. I do not at this point make any claims for the validity and usefulness of such an application, for several reasons. First, I am unsure how the boundaries of the larger area of comparison would best be defined. Such an area must have sufficient diversity to show the presence of a meaningful stratification system, but otherwise would seem to have boundaries that were chosen in a rather arbitrary fashion, unless their selection is informed by research that I am currently unaware of. Second, areas that are not defined as urban by the census may not have data available in the spatial detail enabled by the use of census tracts and block groups. Such convenient areas of "neighborhood" analysis are defined only within MSAs. The third shortcoming is related to the second: the large size of the geographic areas the census uses in rural areas is such that in many cases it is doubtful whether they constitute a neighborhood, or meaningful residential grouping. While some patterns and regularities doubtlessly exist in rural areas, the RCI analysis presumes a level of interaction between inhabitants of an area that may no longer apply in areas of very low population density.

Nevertheless, attempted rural applications of the RCI model could still be useful for sociologists and regional planners. When I was in an earlier stage of developing my model, I applied the prototype Equation 1 to Alcona County, in Michigan's northern lower peninsula, adjacent to Lake Huron. I used the whole County as the larger area of comparison, and then rated all the political subdivisions within it (11 townships and one very small city). Although the ratings did seem to reflect residential disparities, there was not a great amount of variation within the county, and the highest-rated area may have been assessed as higher than the others merely because of the presence of a resort community (which on investigation turned out to be a private, "gated" one and thus presumably of less influence on the township as a whole than the RCI rating might suggest). Thus, the model's weakness that comes from having the ratings affected by the census bureau's selection of an area's geographic boundaries seems merely to be amplified as it is applied to larger areas of low population density. One reason that I prefer to use a UA rather than an MSA for the a standard of comparison is that I observed that most MSAs have numerous rural tracts at their peripheries which I felt uncomfortable describing with a single RCI rating.

Combining the RCI with Other Class-Related Variables

As described before, social class is not a distinct or simple concept comprising only a few clear indicators. My intention is to have residential location (as measured by the RCI model) considered as an important indicator of class position, in addition to others that have been identified. The RCI model should not be evaluated purely in class terms, although correlations with other indicators can be expected, as well as with variables such as crime rates that might also be associated with social class. The RCI is based on variables related to housing values and expenditures, and so is most directly an assessment of relative neighborhood quality, under the assumption that increases in reported values or expenditures reflects either increasing housing quality, or other valuable benefits of a particular location or environmental setting.

It is intended to be easy to incorporate the RCI measures of class into any multivariate framework of stratification. The trick with this is of course to assign it the correct weight in comparison with the other factors. My research has not led me to explore the specifics of how this has been done, but if the concept of social class is to have respectable scientific validity, it should be possible to obtain and analyze specific objective data about persons or households and apply a class category or stratification measure to them, which others can agree is descriptive and meaningful beyond the original data that composed it. Researchers who have dealt with the use of data on education, occupation, income, or other measurable variables are invited to use the RCI model in expanding their work, and assess how well it fits in with other concepts of class and stratification.

7. CONCLUSION

My own field research to investigate the meaning and accuracy of RCI ratings as a measure of residential quality have led me to believe that it is a useful modeling technique. The ratings also provide a good framework in which to discuss otherwise subjective impressions of how "good" or "bad" an area is. While it is insufficient in itself to assign people to specific social class categories, it does assign an approximate location for residential areas in a hierarchical continuum that serves as an important indicator of social class. It also provides localized assessments of residential inequalities, based on a widely accessible data source. Its clearly-defined techniques and assumptions give it a degree of objectivity that allows results to be checked and verified by other researchers, or adjusted to allow for applications in research based on somewhat different assumptions and goals. Many examples of such future applications have been suggested in this paper, and I believe that many of these will be of great use and interest to urban planners, sociologists, and geographers.

APPENDICES

APPENDIX A — A printout of the RCI ratings resulting from the application of four different equations. (Referenced on pages 44 and 49)

APPENDIX B — A table showing the results of my calculations for every census tract that is at least partly included in the Census Bureau's definition of the Lansing-East Lansing Urbanized Area. Also includes RCI% ratings. (Referenced on pages 44, 45, 49, and 50)

APPENDIX C — A table sorted by the RCIt ratings calculated for tracts in the Lansing-East Lansing UA, using the 4-component household model (Equation 8). This sort has allowed the spreadsheet software to then calculate percentile rankings for each tract, as show in the rightmost column. (Referenced on pages 49 and 76)

APPENDIX A

Tract #	Persons	RCIs Calculated by household: 2-component	4-component	Per capita RCI calculations: 2-component	4-component
1	2159	47.9	47.9	49.2	49.2
2	1575	58.5	58.5	63.6	63.6
3	2705	48.0	48.2	49.0	49.3
4	3526	64.2	64.2	66.8	66.8
5	2140	47.6	50.9	40.2	43.6
6	2162	52.1	53.2	73.8	74.8
7	3032	47.9	48.0	55.3	55.3
8	3698	46.5	46.5	41.9	41.9
9	2208	57.9	57.9	68.2	68.2
10	2523	60.1	60.1	66.7	66.7
12	2667	47.6	47.6	44.6	44.6
13	1598	37.3	38.2	53.0	53.9
14	207	21.2	27.8	44.5	51.1
15	2525	45.9	45.9	60.5	60.5
16	1331	79.8	79.8	73.2	73.2
17.01	1105	156.2	156.2	185.3	185.3
17.02	3878	95.2	95.2	104.4	104.4
19	739	36.6	53.1	59.0	75.4
20	4258	43.8	43.8	47.9	47.9
21	2429	50.1	50.1	51.0	51.0
22	1866	72.9	72.9	82.7	82.7
23	3605	62.6	62.6	74.3	74.3
24	3563	59.0	59.0	64.0	64.0
25	2541	71.8	71.8	84.3	84.3
26	2413	54.9	55.0	63.7	63.8
27	3371	62.7	62.7	67.5	67.5
28	2891	62.3	62.3	72.0	72.0
29.01	3329	74.3	75.8	77.3	78.8
29.02	3406	57.3	57.3	82.4	82.4
31.01	1302	64.6	64.6	104.7	104.7
31.02	3406	105.6	105.6	106.8	106.8
32	2573	46.3	46.6	43.9	44.2
33.01	3360	57.4	57.4	61.7	61.7
33.02	2625	100.2	100.2	100.6	100.6
34	2614	84.0	84.0	97.2	97.2
35	3017	55.5	55.5	65.1	65.1
36.01	4312	61.9	61.9	53.5	53.5
36.02	4075	51.7	51.7	48.7	48.7
37	5944	55.5	56.1	61.4	61.9
38.01	4555	114.5	114.5	116.5	116.5
38.02	2859	85.4	85.4	121.2	121.2
39.01	2214	204.7	206.8	205.3	207.4
39.02	4286	84.7	91.4	99.2	105.9
40	4175	112.5	113.0	124.2	124.7
41	5017	63.0	67.9	60.4	65.3
42	5442	0.4	14.6	0.7	14.9
43.01	5836	96.8	96.8	97.4	97.4
43.02	3211	66.0	70.6	72.1	76.7

Tract #	Persons	RCIs Calculated by household: 2-component	4-component	Per capita RCI calculations: 2-component	4-component
44.01	10450	0.2	16.9	0.5	17.3
44.02	3039	38.0	38.0	44.8	44.8
44.03	2930	51.4	51.4	58.5	58.5
45	3536	83.5	83.5	95.7	95.7
46	2686	166.9	166.9	180.5	180.5
47	2718	101.2	101.5	113.0	113.3
48	6924	97.5	97.5	110.1	110.1
49.01	5723	126.9	126.9	124.7	124.7
49.02	3889	149.6	149.6	155.7	155.7
50.01	4240	188.2	188.2	160.8	160.8
50.02	3500	174.5	176.2	154.2	155.9
51	3502	58.0	58.1	52.0	52.1
52.01	4771	50.6	50.6	54.2	54.2
52.02	1804	93.2	93.2	92.8	92.8
53.02	4742	92.2	92.3	99.5	99.6
53.03	4878	65.2	65.2	70.3	70.3
53.04	3627	60.7	61.0	70.2	70.5
54	7701	75.6	75.6	77.4	77.4
55.01	3870	110.7	111.3	108.2	108.8
55.02	4268	93.5	93.6	86.7	86.7
57	4562	119.8	119.8	109.4	109.5
65	4059	49.9	49.9	56.8	56.8
101.02	2190	100.4	100.4	126.9	126.9
102.01	2287	87.0	87.3	88.8	89.0
102.03	1793	50.9	50.9	59.1	59.1
102.04	1273	86.9	86.9	74.8	74.8
111.02	3064	123.1	123.1	126.1	126.1
201.01	2463	170.5	170.5	147.5	147.5
201.02	2747	85.2	85.2	113.6	113.6
201.03	4178	104.6	105.3	103.6	104.4
201.04	4014	85.9	85.9	87.8	87.8
202.01	2588	118.0	118.0	121.8	121.8
202.02	4505	73.2	73.2	72.9	72.9
203.01	5178	110.3	111.3	118.3	119.3
203.02	3951	117.3	117.3	107.0	107.0
214	7586	99.3	101.5	101.3	103.5
UDA stats	289509	77.9	79.3	82.7	84.1
UA stats	265151	76.6	78.1	80.5	81.9

UDA=user-defined area,
UA=Census Bureau's Lansing-East Lansing Urbanized Area

APPENDIX B

Tract #	Persons	Component RCI ratings: gqiRCI	gqniRCI	roRCI	ooRCI	Summary tract ratings: RCIt	RCI%
1	2159	0.0	0.0	56.6	44.0	47.9	60.4
2	1575	0.0	0.0	42.4	84.3	58.5	73.8
3	2705	36.2	0.0	52.6	45.1	48.2	60.8
4	3526	0.0	0.0	56.5	67.8	64.2	80.9
5	2140	51.2	0.0	56.7	47.3	50.9	64.2
6	2162	4.5	49.6	48.6	75.3	53.2	67.1
7	3032	0.0	3.9	47.6	49.9	48.0	60.5
8	3698	0.0	0.0	53.1	41.0	46.5	58.6
9	2208	0.0	0.0	62.8	55.0	57.9	73.0
10	2523	0.0	0.0	57.1	61.7	60.1	75.8
12	2667	0.0	0.0	55.3	41.0	47.6	60.1
13	1598	0.0	20.1	39.4	36.1	38.2	48.1
14	207	29.3	25.0	23.8	89.1	27.8	35.1
15	2525	0.0	0.0	43.7	52.2	45.9	57.9
16	1331	0.0	0.0	63.2	83.1	79.8	100.6
17.01	1105	0.0	0.0	72.5	170.1	156.2	197.0
17.02	3878	0.0	0.0	54.9	106.5	95.2	120.0
19	739	0.0	150.0	36.7	83.0	53.1	66.9
20	4258	0.0	0.0	47.6	38.0	43.8	55.3
21	2429	0.0	0.0	56.0	45.1	50.1	63.1
22	1866	0.0	0.0	51.6	78.3	72.9	91.9
23	3605	0.0	0.0	56.8	63.9	62.6	78.9
24	3563	0.0	0.0	53.7	61.0	59.0	74.4
25	2541	0.0	0.0	58.1	74.2	71.8	90.6
26	2413	0.0	22.5	52.1	56.6	55.0	69.3
27	3371	0.0	0.0	60.5	63.1	62.7	79.1
28	2891	0.0	0.0	50.5	65.6	62.3	78.5
29.01	3329	27.2	0.0	62.0	88.0	75.8	95.5
29.02	3406	0.0	0.0	57.3	56.6	57.3	72.2
31.01	1302	0.0	0.0	53.0	91.1	64.6	81.5
31.02	3406	0.0	0.0	63.8	112.2	105.6	133.1
32	2573	0.0	97.1	42.6	47.8	46.6	58.8
33.01	3360	0.0	0.0	43.4	69.6	57.4	72.4
33.02	2625	0.0	0.0	62.0	102.4	100.2	126.4
34	2614	0.0	0.0	53.0	93.3	84.0	106.0
35	3017	0.0	0.0	55.3	55.7	55.5	70.0
36.01	4312	0.0	0.0	52.9	64.4	61.9	78.0
36.02	4075	0.0	0.0	41.6	60.3	51.7	65.2
37	5944	24.7	0.0	42.8	65.3	56.1	70.7
38.01	4555	0.0	0.0	62.7	145.9	114.5	144.3
38.02	2859	0.0	0.0	70.9	118.3	85.4	107.7
39.01	2214	47.3	0.0	62.8	285.1	206.8	260.8
39.02	4286	81.1	18.2	60.8	131.3	91.4	115.3
40	4175	0.0	12.7	59.6	151.3	113.0	142.5
41	5017	148.3	17.2	83.7	103.2	67.9	85.6
42	5442	0.0	14.3	42.0	0.0	14.6	18.4
43.01	5836	0.0	0.0	86.0	107.8	96.8	122.0
43.02	3211	87.0	17.9	75.9	0.0	70.6	89.1

		Component RCI ratings:				Summary tract ratings:	
Tract #	Persons	gqiRCI	gqniRCI	roRCI	ooRCI	RCIt	RCI%
44.01	10450	0.0	16.8	40.1	49.5	16.9	21.4
44.02	3039	0.0	0.0	37.0	148.5	38.0	47.9
44.03	2930	0.0	0.0	42.5	103.3	51.4	64.8
45	3536	0.0	0.0	67.9	103.1	83.5	105.3
46	2686	0.0	0.0	77.9	179.8	166.9	210.5
47	2718	0.0	27.4	44.0	133.1	101.5	128.0
48	6924	28.0	0.0	60.3	118.1	97.5	123.0
49.01	5723	0.0	0.0	64.9	153.9	126.9	160.0
49.02	3889	0.0	0.0	64.9	206.2	149.6	188.7
50.01	4240	0.0	0.0	72.9	220.6	188.2	237.3
50.02	3500	28.8	0.0	37.0	192.6	176.2	222.2
51	3502	44.9	0.0	46.6	62.2	58.1	73.3
52.01	4771	0.0	0.0	46.7	54.2	50.6	63.8
52.02	1804	0.0	0.0	46.0	101.8	93.2	117.6
53.02	4742	0.0	22.5	69.3	104.8	92.3	116.3
53.03	4878	0.0	0.0	43.0	75.9	65.2	82.2
53.04	3627	15.0	0.0	55.1	80.9	61.0	77.0
54	7701	0.0	0.0	53.0	85.4	75.6	95.4
55.01	3870	24.4	30.7	71.1	116.2	111.3	140.4
55.02	4268	15.4	0.0	51.9	100.9	93.6	118.0
57	4562	19.4	0.0	67.2	123.7	119.8	151.1
65	4059	0.0	0.0	48.7	51.5	49.9	62.9
101.02	2190	0.0	0.0	63.6	106.6	100.4	126.6
102.01	2287	0.0	22.8	62.3	90.3	87.3	110.1
102.03	1793	0.0	0.0	41.9	54.2	50.9	64.2
102.04	1273	0.0	0.0	65.2	90.0	86.9	109.5
111.02	3064	0.0	0.0	50.4	134.6	123.1	155.3
201.01	2463	0.0	0.0	67.0	171.3	170.5	215.0
201.02	2747	0.0	0.0	65.5	127.6	85.2	107.4
201.03	4178	0.0	28.1	49.3	131.4	105.3	132.8
201.04	4014	0.0	0.0	66.5	91.3	85.9	108.3
202.01	2588	0.0	0.0	62.3	128.6	118.0	148.8
202.02	4505	0.0	0.0	58.6	84.8	73.2	92.3
203.01	5178	30.9	135.5	69.6	129.6	111.3	140.4
203.02	3951	0.0	4.5	57.0	120.3	117.3	148.0
214	7586	36.3	62.5	48.0	111.7	101.5	127.9
UDA stats	289509	43.9	17.6	56.0	100.0	79.3	100.0
UA stats	265151	46.9	17.5	56.5	100.0	78.1	100.0

UDA=user-defined area,
UA=Census Bureau's Lansing-East Lansing Urbanized Area

APPENDIX C

Tract #	Summary tract ratings: RCIt	RCI%	Persons	Cumulative	percentile
42	14.6	18.4	5442	5442	2
44.01	16.9	21.4	10450	15892	5
14	27.8	35.1	207	16099	6
44.02	38.0	47.9	3039	19138	7
13	38.2	48.1	1598	20736	7
20	43.8	55.3	4258	24994	9
15	45.9	57.9	2525	27519	10
8	46.5	58.6	3698	31217	11
32	46.6	58.8	2573	33790	12
12	47.6	60.1	2667	36457	13
1	47.9	60.4	2159	38616	13
7	48.0	60.5	3032	41648	14
3	48.2	60.8	2705	44353	15
65	49.9	62.9	4059	48412	17
21	50.1	63.1	2429	50841	18
52.01	50.6	63.8	4771	55612	19
102.03	50.9	64.2	1793	57405	20
5	50.9	64.2	2140	59545	21
44.03	51.4	64.8	2930	62475	22
36.02	51.7	65.2	4075	66550	23
19	53.1	66.9	739	67289	23
6	53.2	67.1	2162	69451	24
26	55.0	69.3	2413	71864	25
35	55.5	70.0	3017	74881	26
37	56.1	70.7	5944	80825	28
29.02	57.3	72.2	3406	84231	29
33.01	57.4	72.4	3360	87591	30
9	57.9	73.0	2208	89799	31
51	58.1	73.3	3502	93301	32
2	58.5	73.8	1575	94876	33
24	59.0	74.4	3563	98439	34
10	60.1	75.8	2523	100962	35
53.04	61.0	77.0	3627	104589	36
36.01	61.9	78.0	4312	108901	38
28	62.3	78.5	2891	111792	39
23	62.6	78.9	3605	115397	40
27	62.7	79.1	3371	118768	41
4	64.2	80.9	3526	122294	42
31.01	64.6	81.5	1302	123596	43
53.03	65.2	82.2	4878	128474	44
41	67.9	85.6	5017	133491	46
43.02	70.6	89.1	3211	136702	47
25	71.8	90.6	2541	139243	48
22	72.9	91.9	1866	141109	49
202.02	73.2	92.3	4505	145614	50
54	75.6	95.4	7701	153315	53
29.01	75.8	95.5	3329	156644	54
16	79.8	100.6	1331	157975	55

Tract #	Summary tract ratings: RCIt	RCI%	Persons	Cumulative	percentile
45	83.5	105.3	3536	161511	56
34	84.0	106.0	2614	164125	57
201.02	85.2	107.4	2747	166872	58
38.02	85.4	107.7	2859	169731	59
201.04	85.9	108.3	4014	173745	60
102.04	86.9	109.5	1273	175018	60
102.01	87.3	110.1	2287	177305	61
39.02	91.4	115.3	4286	181591	63
53.02	92.3	116.3	4742	186333	64
52.02	93.2	117.6	1804	188137	65
55.02	93.6	118.0	4268	192405	66
17.02	95.2	120.0	3878	196283	68
43.01	96.8	122.0	5836	202119	70
48	97.5	123.0	6924	209043	72
33.02	100.2	126.4	2625	211668	73
101.02	100.4	126.6	2190	213858	74
214	101.5	127.9	7586	221444	76
47	101.5	128.0	2718	224162	77
201.03	105.3	132.8	4178	228340	79
31.02	105.6	133.1	3406	231746	80
203.01	111.3	140.4	5178	236924	82
55.01	111.3	140.4	3870	240794	83
40	113.0	142.5	4175	244969	85
38.01	114.5	144.3	4555	249524	86
203.02	117.3	148.0	3951	253475	88
202.01	118.0	148.8	2588	256063	88
57	119.8	151.1	4562	260625	90
111.02	123.1	155.3	3064	263689	91
49.01	126.9	160.0	5723	269412	93
49.02	149.6	188.7	3889	273301	94
17.01	156.2	197.0	1105	274406	95
46	166.9	210.5	2686	277092	96
201.01	170.5	215.0	2463	279555	97
50.02	176.2	222.2	3500	283055	98
50.01	188.2	237.3	4240	287295	99
39.01	206.8	260.8	2214	289509	100
UDA stats	79.3	100.0	289509		

UDA=user-defined area

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