A GEOGRAPHICAL ANALYSIS OF TENNIS SUPPLY IN SIX CONTIGUOUS STATES

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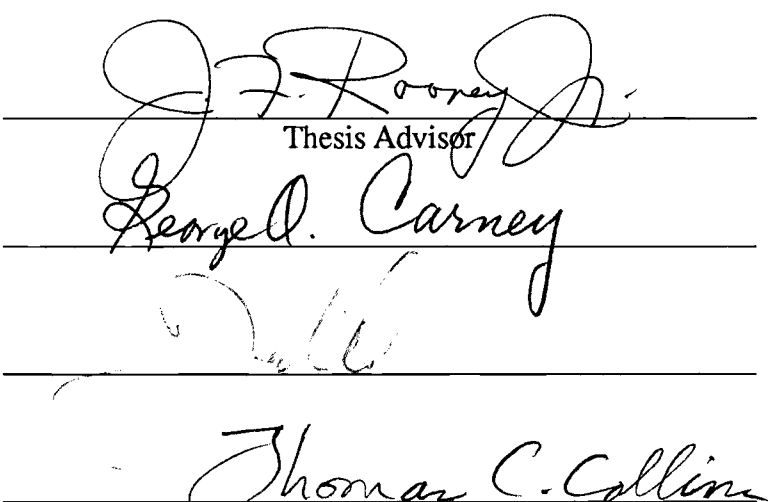

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CHAPTER I

INTRODUCTION

The Emergence and Unique Identity of Sports Geography

In a short commentary that was published in 1962, Burley suggested that more geographical research should be done on the cultural trait of sport and its many attributes. He stated that as the standard of living increases, sports and leisure become increasingly important to society. Furthermore, it was his belief that the more abstract or intangible aspects of sporting activities, like the molding of character for example, had already been well-documented; hence, he said geographers ought to be more concerned with the "material manifestations" of sport.

Echoing many of these sentiments in 1985 were the authors Mitchell and Smith. They believed that geographical studies on sports and recreation, which had been accumulating throughout the years since Burley's essay, were worthy of their own subdivision within the discipline of geography. The emergence of such studies, the authors asserted, was rather timely as society was moving away from an industrial-based economy to an information-based one with the workforce having much more free time and disposable income.

Mitchell and Smith (1985) did feel, however, that sport and recreational geography lacked a standard philosophy or methodology. Judging from the amount and content of survey articles on the subfield, it does seem safe to say that geographers have often had a difficult time trying to place the spatial perspective of sport in a proper context. While some believe that the geographical analysis of sport is merely just a part of economic or cultural geography, others maintain that sports geography should be considered a subdiscipline all its own. The relationship of sports geography to these other two subdisciplines is illustrated as follows.

Indeed, since much of the same reasoning often associated with rational, economic land use principles is used in deciding where to locate a new sport franchise or recreational facility, many scholars feel that sports geography should fall under economic geography. For instance, when Mitchell (1969) studied the location of different sized urban parks all within a "cityside," he urged readers to consider his findings on recreational land uses in terms that Von Thunen, Weber, Losch, and Christaller would have used to describe agricultural or manufacturing activities. However, in one interesting essay on sport economics, Neale (1964) argued that the business of sport is unlike many other conventional businesses. That is, he believed that the distribution of quality teams, with teams being the "consumer products" in sport, must remain balanced over space or else fans will lose interest in the game if there are only one or two teams that are always dominating.

Another subdiscipline in geography which often lends its

terminology and its aims to the spatial study of sports is cultural geography. Similar to the way geographers look at house types, town layouts, and other landscape features, Raitz (1987) believed that geographers needed to study the most basic element of sport--its use of space--to see what cultural values the people who construct and use leisure landscapes possess. Likewise, Bale (1988) felt geographers were hardly recognizing the importance of sport places to culture, citing such examples as the "home field advantage" phenomenon, or the way international sport competitions like the Olympics expose places and their citizens to the rest of the world. Despite the lack of examination of these issues, one can not ignore the entrepreneurial spirit which seems to pervade the geographical study of sports, as evident in one study on factors that influenced attendance at Toronto Blue Jays home baseball games. With Wall and Myers' (1989) conclusion that three variables--the day of the game, the nature of the rivalry between the teams, and special event days--were the major factors which owners could control somewhat to increase attendance, it can be argued that studying how sports affect places not only gives geographers academic insights on cultural matters, but also some useful economic information as well.

Thus, although sports geography may borrow many ideas from both economic and cultural geography, some philosophical differences still exist between it and the other two subfields which seem to give the geographical study of sport its own identity. Of course, because the subfield has often been associated with these and other perspectives in geography, several different types of sports geography studies have emerged. Some of these studies, including many

contributions by a major figure in sports geography, Dr. John Rooney, will be featured in the next chapter. But first, it is important to discuss another rise in popularity which was occurring at about the same time.

The Emergence of Tennis as a Popular Sport

While many geographers were busy pursuing a new avenue of research, many Americans in general, were busy pursuing a new recreational activity. This activity, the sport of tennis, was not really new in the sense of "recent," as the modern day version of the game has been traced back to the late nineteenth century. Rather, because of its aristocratic beginnings in 1873 by an Englishman, Major Walter Clopton Wingfield, and its subsequent introduction into the U.S. mostly among upper class circles, the game of tennis did not really appeal to the masses for quite some time (Phillips 1986). However, after World War II and especially during the 1960's and 1970's, the game started to shed its high brow image, and was overwhelmingly taken up by the general public. Several studies were cited by Phillips in making this point, including a national report on outdoor recreation in which it was found that in a little over a decade, the number of Americans who played tennis rose drastically from 5 million people in 1960 to 20 million in 1973. According to Phillips, a peak year for massive involvement in the game occurred in 1979 when 32 million Americans responded as being tennis enthusiasts in a Nielsen survey. Some of the factors which Phillips attributed to the

game's growth were the opening of tournaments to professionals, increased spending on public parks and tennis courts, and television coverage of major tournaments.

This period of growing interest in the sport was also noted by Rooney and Pillsbury (1992) in their investigation of professional and amateur participation in tennis. They commented that the famous Bobby Riggs versus Billie Jean King match in 1973 sparked a considerable amount of interest in the sport, particularly in women's tennis. Furthermore, the authors saw the creation of the Association of Tennis Professionals in 1972 as another promotion of tennis as a legitimate pastime, with players banding together to standardize tournament play. An increasing interest in tennis was also found among younger players in the U.S., as the greatest number of participants in high school tennis programs occurred between 1975 and 1980, with levels of participation reaching nearly 170,000 for boys and 150,000 for girls. Hence, the authors asserted that the game of tennis had definitely grown in popularity from its East Coast origins to a scale of national proportions.

Statement of Purpose and Study Objectives

According to Phillips (1986), popular interest in tennis had declined and tapered off somewhat from the sport's heyday in the late 1970's. Again, he referred to the results of a 1982 Nielsen survey which showed a decrease in participation, and suggested that the difficult nature of the game and the 1980's shift to more fitness-

oriented activites like weightlifting and aerobics had contributed to tennis' decline. It was his contention that with reportedly less people playing tennis, many areas were becoming relatively over-supplied with tennis courts. Thus, he urged developers of tennis facilities to take a thorough inventory of tennis courts in the market area where they wanted to build. He said that feasibility studies must compare the supply of courts against adequate measures of interest in the game, in addition to simply comparing supply and gross population which, incidentally, is the method the United States Tennis Association (USTA) uses to develop their recommended number of courts for various-sized communities. Such studies comparing the supply and demand for tennis, Phillips believed, would more accurately indicate where there is a surplus or lack of courts.

Indeed, many of Phillips' assertions and suggestions have prompted this research, in which the purpose is to analyze the present-day supply of tennis courts in the six states of Iowa, Illinois, Indiana, Ohio, Kentucky, and Missouri (Figure 1). Just as Phillips called for an inventory of actual tennis courts, not mere estimations of them, so too will this study be based on actual provisions, where each individual 120' by 60' tennis court will constitute one unit of supply. More specifically, the total number of tennis courts in each county will be studied with respect to the county's population, various levels of interest in the game, and its share of private facility development. By present-day it is meant about a five year time span from the late 1980's to the early 1990's (1988-1992). Some hypotheses of this study include:

1. As a county's population size increases, the per capita rate of tennis court supply will decrease.

2. As a county's interest or demand for the sport increases, the per capita rate of tennis court supply will increase.

3. As a county's level of interest in tennis increases, especially an urban county's demand, the rate of private tennis facility development will increase.

4. Within MSAs, central city counties will have lower supply rates than surrounding counties.

The first hypothesis is based on the belief that rural areas tend to be better served with places to play than urban areas. The second hypothesis reflects the notion that the supply of tennis courts is a function of demand measures. Hypothesis #3 attempts to determine whether or not player demand in urban centers has resulted in more private court development. And lastly, the basic premise of the fourth hypothesis is that more densely populated cities do not have the space nor resources to supply courts at the higher rate of the more affluent suburban communities.

In this analysis, each of the region's 616 counties will be placed into one of seven groups or classes of counties. These classes represent significantly different levels of population from rural areas under 10,000 people to urban areas of a million or more (Figure 2). Thus, in addition to looking at individual county and state-level data, a county population class-level of study will also be included so that

counties of different size can be analyzed at a much more manageable scale.

Indeed, this six-state region is a much larger "market area" than Phillips had probably intended. In fact, it was originally hoped that for this supply study, the entire United States would serve as the "market area," especially since many surveys of demand are conducted at this scale. However, since a preliminary investigation into the types of information available from each of the fifty states produced only a few states with court inventories, the decision was made to restrict the study area to this contiguous "mini-region" in part of the Midwest. That is, these six particular states were chosen based on the availability of data and because of a contiguity constraint. Nonetheless, the real strength of this study is that supply measures are based on actual courts, or alternatively, on actual "material manifestations" of the sport of tennis.

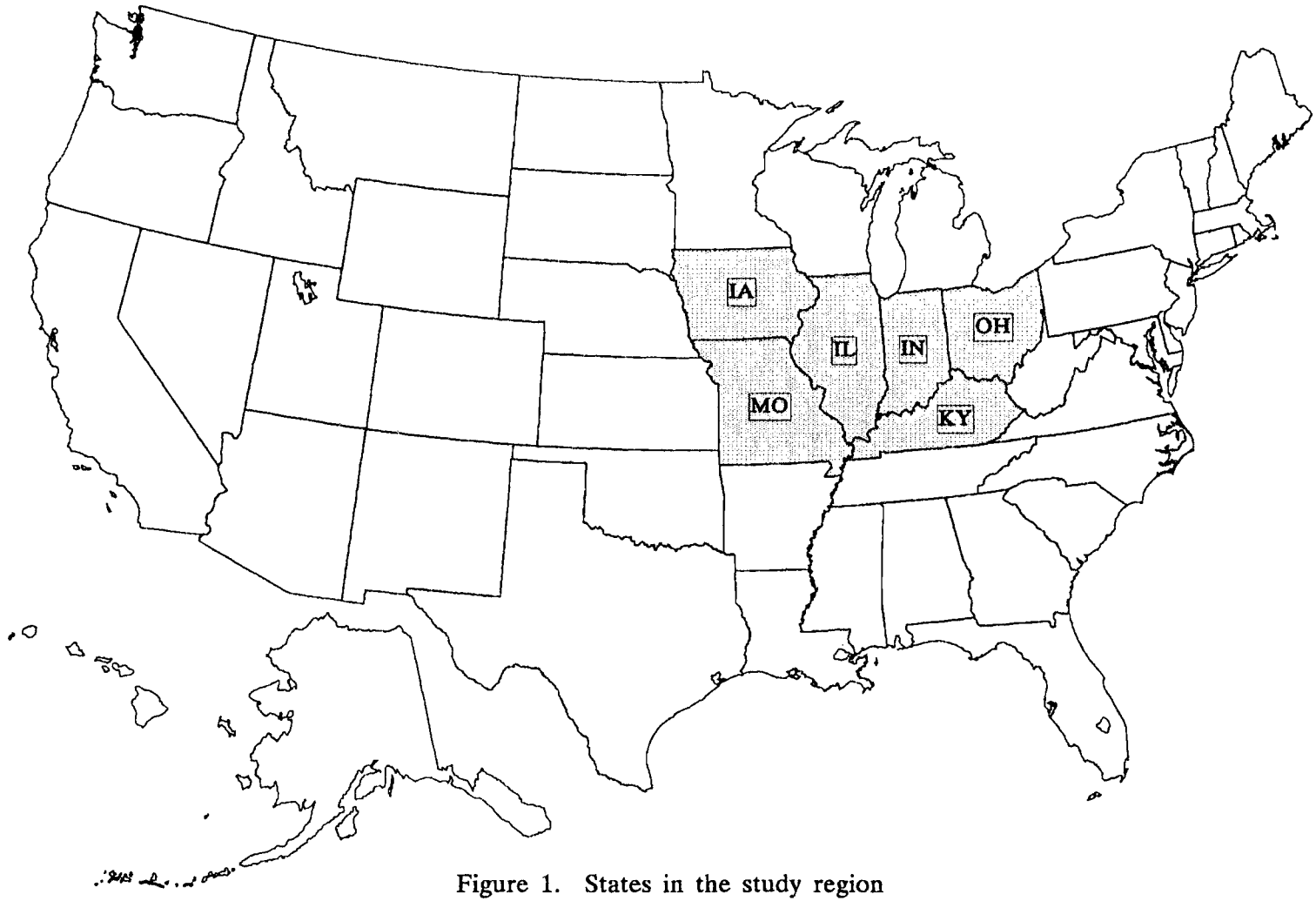

Figure 1. States in the study region

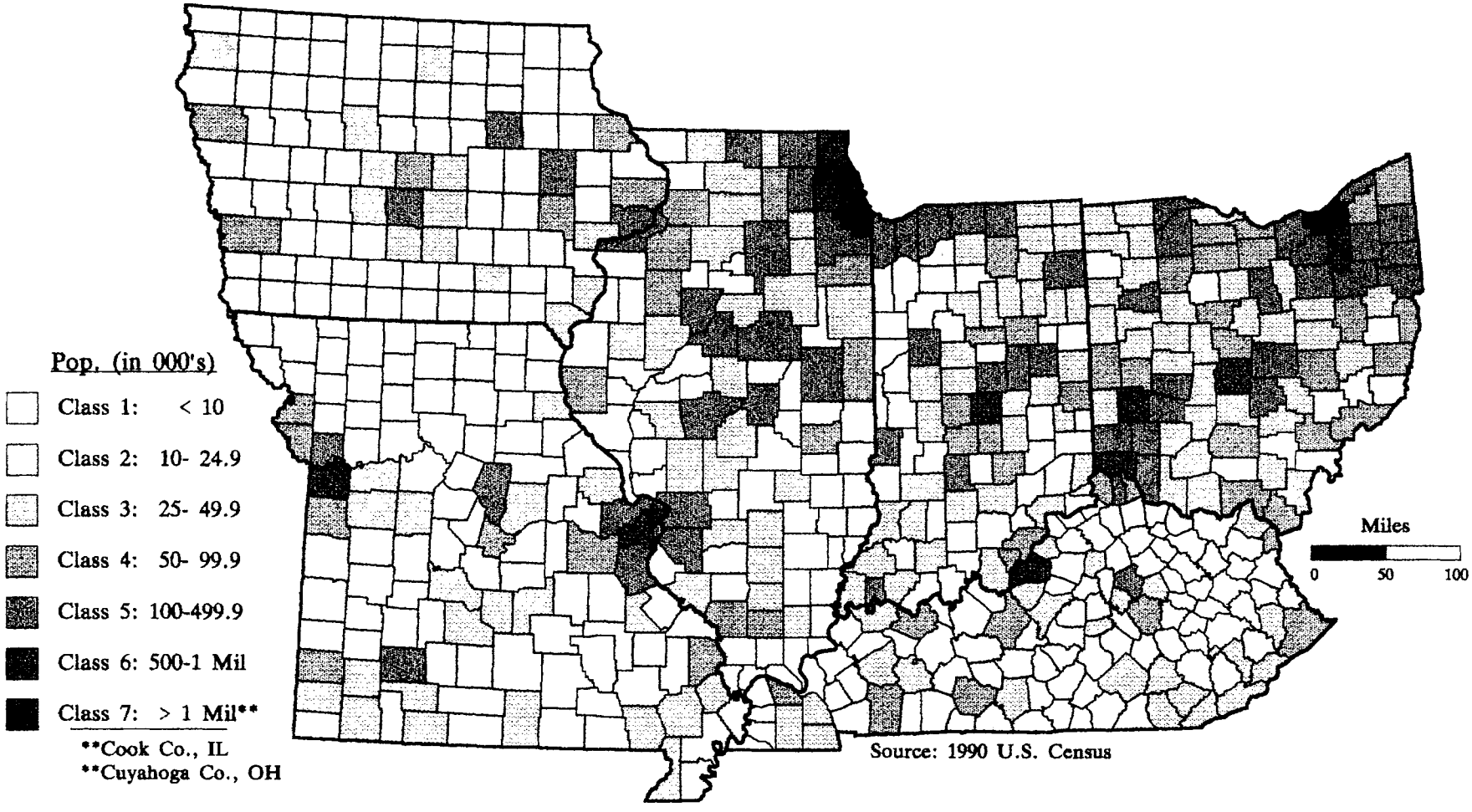

Figure 2. Population class of study counties

CHAPTER II

LITERATURE REVIEW

Introduction

The literature review will begin with an overview of sport geography's basic framework and various works. Next, the applied aspects of sport geography research will be presented, incorporating the very few pieces of geographic literature on the sport of tennis. The chapter will conclude with a look at the difficult process of building a database on the supply of tennis.

A Sports Geography Framework

As was discussed in the first chapter, the spatial study of sports has definitely emerged as a very distinctive line of inquiry within the discipline of geography. One geographer who would certainly agree with this statement, and has probably done the most to develop the subfield is John Rooney. In his own sports geography textbook and in a chapter of a book on the sociological dimensions of sport, Rooney (1974, 1975) outlined how geographers should study phenomena in the sporting world. Moreover, in another survey article on sport and recreational literature, Mitchell and Smith (1989)

credit Rooney for developing the specialty's foundation, which includes the origins and diffusion of sport, sport regions, spatial variations in sport, sport landscapes, and women in sport. Indeed, it is around this foundation that many pieces of sports geography research have been framed.

Origins and Diffusion of Sport

According to Mitchell and Smith (1989), a popular approach among sport geographers is to study the origins and diffusion of sport, including a look at both the game's origin and spread, and those of the athletes. For instance, in what was probably his first contribution to the subfield, Rooney (1969) discussed the results of his detailed investigation on the high school origins of major college football players in the United States. Later, he added to these findings in a book which featured the origins and migration patterns of basketball players as well (Rooney 1980, 1987). For both sports, Rooney discovered that there were too many schools competing for very few in-state players, a condition which made the schools become very aggressive, and in some cases criminal, in their quest to recruit talented high school athletes. In his books, Rooney (1980, 1987) called for a more spatially balanced system of recruitment in the United States, so as to reduce some of the illegal activities which were taking place. Similarly, Ojala and Kureth (1975) used collegiate and professional hockey rosters to see the diffusion trends of players and even, the game itself. They concluded that a geographic shift in

hockey was occurring away from Canada as more hockey player "resource regions" were emerging in the United States.

Sport Regions

Another "block" in the foundation of sports geography research involves the identification and description of sport regions (Mitchell and Smith 1989). Under this approach, two main strategies of investigation, which were developed by Rooney, come to mind. In the first strategy, a researcher may examine a particular geographic region or set of regions, and then take note of all the different sporting trends, preferences, and spatial patterns that are found in each of the regions (Rooney 1974, 1975). Rooney employed this strategy in a 1986 study on the sporting scene in the southern half of the United States, in which he found the Southeast to be overwhelmingly obsessed with the sport of football with its very high rate of college players per capita. Similarly, Rooney and Pillsbury surveyed the entire United States in their 1992 book, the Atlas of American Sport, dividing the country into ten distinct sport regions based on years of research (Figure 3). The second sport region strategy may incorporate a systematic focus on one particular sport to see how that sport is configured or regionalized across space (Rooney 1974, 1975). An example of a study using this strategy is Harmon's (1985) examination of the sport of bowling, in which regions of different bowling pin and ball size were delineated across the eastern United States and Canada. Harmon hoped that the

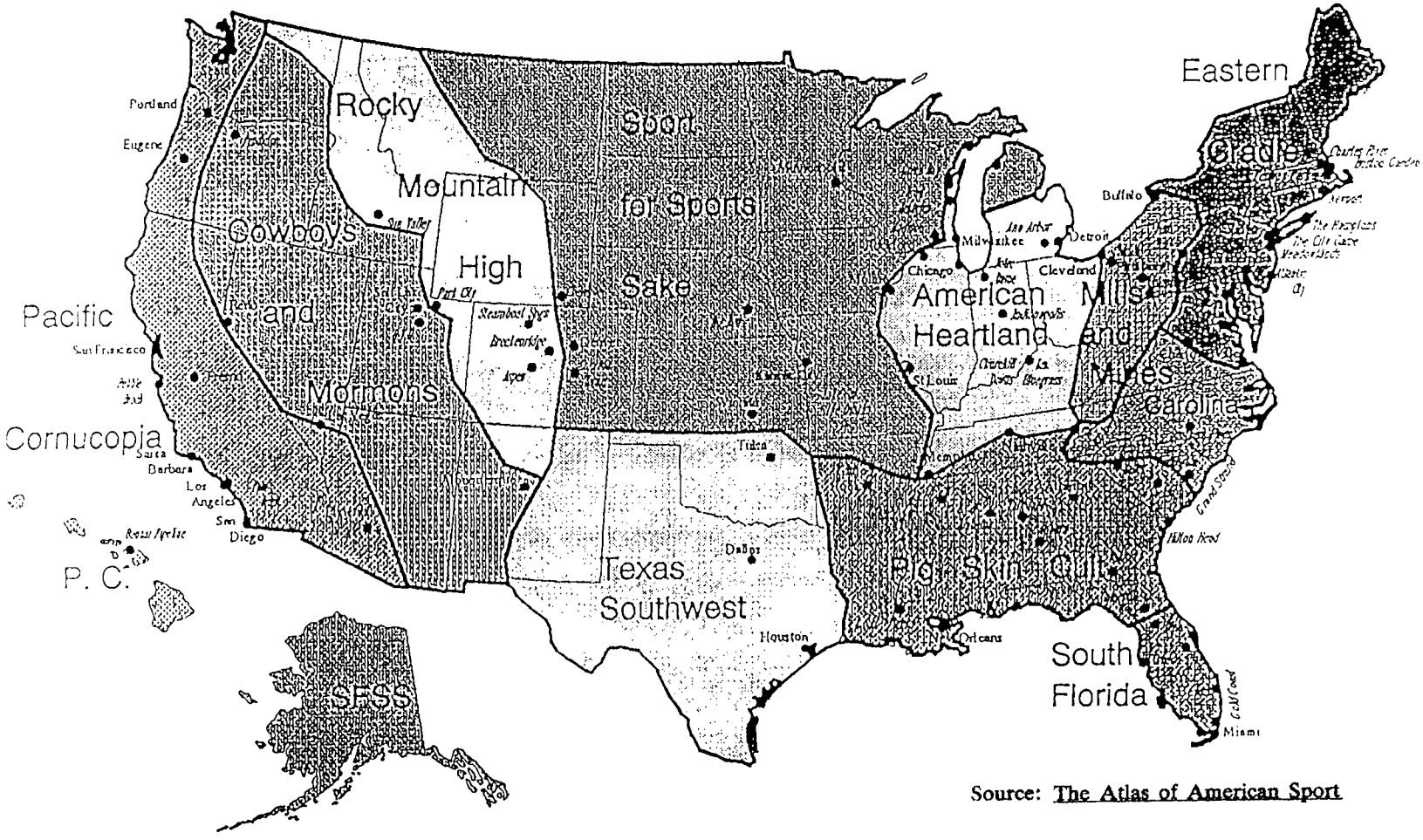

Figure 3. American Sport Regions

National Bowling Association would become aware of these different regions or types of the game, so as to ensure their survival by clustering the regions together into a bigger, more recognizable area.

Spatial Variations in Sport

Mitchell and Smith (1989) also recognized spatial variations in sport as a major research theme in sports geography. Under this perspective, researchers attempt to identify differences in sporting activities across space, and try to explain why some spatial distributions are so varied. For instance, when Adams and Rooney (1989) surveyed the per capita golf hole supply for each county in the United States, they developed regions of varying access to golf facilities. Furthermore, they attributed these variations to basic demographic and cultural differences among their golf regions. Similarly, in their study on college football radio broadcasts, Roseman and Shelley (1988) developed five classes of radio broadcasts, from smallest to largest in spatial coverage, that were found to exist in the United States. They concluded that the constraints of distance and state boundaries, as well as the migration of alumni, were all contributing to these varied patterns of radio coverage.

Sport Landscapes

Mitchell and Smith (1989) outlined another research angle of sport geographers, the study of sport landscapes, which they felt was

first exemplified in Oriard's essay on the different stadium types of major American sports. In that article, Oriard (1976) made many interesting points, including how enclosed basketball courts truly differ from outdoor baseball parks, with the former featuring urban and mechanized play while the latter, a more rural and timeless sport. In a related article, Neilson (1986) kept his focus strictly on baseball parks, tracing their development over time. He felt that post World War II baseball arenas, with their modern technology and electronic scoreboards, detached the fans from the sport place, while the opposite was true for earlier ballparks where fans were more involved with the actual game. Adams and Rooney (1984) conducted a similar analysis over time with their landscape of interest being the American golf course, whose earlier designs tended to be more space-efficient with the play of golf being the primary function. By contrast, modern golf courses were found to be anchors of extensive and lavish residential developments, a pattern which caused the authors to express concern over high costs and land requirements in these times of limited resources.

Women in Sport

The last research direction mentioned in Mitchell and Smith's (1989) article involved the geographical analysis of women's athletics. Actually, all of the other research approaches could be utilized in a geographical study on women's sports, so long as the players and spectators are female. Unfortunately, very few sports

geography studies have been done in this area, with the exception of Ojala's recent investigation on high school girls' athletics across the United States. With data supplied from the National Federation of State High School Associations, Ojala (1987) computed per capita rates of girls' participation in sport programs from 1971 to 1985. In general, he found higher rates of participation in New England, the north-central, and northwestern states than in the South. Moreover, while the sport of basketball was popular among girls in Iowa, the Dakotas, and Montana, field hockey was favored by girls in the Northeast. Ojala attributed these present spatial patterns to a variety of reasons, including community wealth and tradition, and most important, the implementation of Title IX in 1972. That act banned gender discrimination in federally funded sport programs at the college level, and produced increasing interest in female sports at the high school level.

Applied Sports Geography

Increasingly throughout academia, researchers have been working in cooperation with government and private agencies, conducting studies that address the more immediate concerns of these partners. This practice is often called applied research. In geography, much applied research is done to provide a more objective or statistically proven answer to location decisions. Certainly, sport geographers have not been immune to this research trend and in fact, have been actively engaged in it. In his essay on

the nature of sport geography studies, Bale noted that several scholars have developed statistical models to assess the locational impacts of sporting activities on surrounding areas (1988). An example of such a study is Walker's examination of the demand for professional football in various sized British cities (1986). Using regression equations, Walker found that teams in larger population centers tend to have more success and consequently, larger home crowds, which in turn, produces more revenue for owners to acquire quality athletes. Similarly, Easley (1991) studied the spatial organization of professional football in the United States, and explored the possibility of developing a semi-professional league to serve the interests of fans in smaller metropolitan areas which do not or can not support a professional football team.

Likewise, Rooney has been no stranger to applied research, as he has supplied many of his results to the business world. Much of his applied research has been conducted with an emphasis on individual over team sports. The concern here is not so much with the professional athlete's role in these games, but rather with the common citizen's interest in and access to playing opportunities. Hence, Rooney developed the Database of Golf in America as part of a business venture with the Sports and Leisure Division of the New York Times Magazine Group. This company publishes a wide variety of recreation-oriented magazines including Golf Digest, Golf World, and Tennis Magazine to name a few. Additionally, they provide supplemental publications, such as Golf Shop Operations and Tennis Buyer's Guide, to sport product and equipment retailers. This group was interested in seeing where the supply and demand for golfing

exist, and so the golf database was created. More specifically, from this database, it is possible to label an area of the country as under- or over-supplied with playing opportunities, depending on the area's share of golf courses; this is its "supply." Also, it is possible to identify its "demand" by examining an area's share of golf magazine subscribers and equipment purchases. Actually, many more factors are considered when measuring and characterizing an area of the country. However, this was just a simple example of the capabilities of the Database of Golf in America.

Through the continued financial help of the New York Times Magazine Group, the development of a similar national database for the sport of tennis has been underway at Oklahoma State University. Much like the golf database, the Database of Tennis in America was created to examine the geographic patterns of interest in tennis and access to play.

As would be expected, the creation of this tennis database has produced a variety of geographical research needs, some which have already been investigated. For instance, Rooney and Pillsbury (1992) conducted research on the birthplaces of tennis players who belong to the Association of Tennis Professionals (ATP). It was probably hoped that an investigation into the origins of these top tennis athletes would help to reveal where the game may be popular among the masses as well. What was discovered, however, was that only four metropolitan areas--Los Angeles, New York, San Francisco, and Detroit--and the southern part of Florida were accounting for the majority of these star players. This being the case, the authors did not think that the factors which were shaping the development of

professional play were closely linked with the distribution of a general interest in the sport.

In his Master's thesis on the spatial dimensions of the demand for tennis, Anderson studied the distribution of tennis magazine subscribers, United States Tennis Association (USTA) members, and other tennis-interest variables across various geographic scales in the United States (1991). Anderson was working around a basic assumption that readers of these magazines and members of this tennis organization represent a core group of people who especially enjoy and follow the sport. Accordingly, wherever they are concentrated is where a genuinely interested market for tennis can be found. He developed per capita measurements of demand to control for population differences, and found that the states of South Carolina, Georgia, Florida, California, and Hawaii all possessed a much stronger interest in the game than the national rate of interest in tennis. Anderson quickly asserted, however, that this distribution of tennis demand was not necessarily dictated by temperate climates, since he also found the winter weather states of Minnesota and Vermont to have above average rates of tennis demand.

In his county-level analysis, Anderson (1991) concluded that although some less populated areas had a strong demand for tennis, including some parts of the Corn Belt, the majority of tennis enthusiam took place in the urbanized counties of the United States. When trying to account for these variations in the spatial distribution of tennis demand, Anderson identified the significant factors to be a combination of income, climate, and age characteristics. It was his belief that some of this variation could also be explained by the

number of tennis courts in a given area, or in other words, by tennis supply.

Building A "Supply" Database

A chapter of Anderson's thesis was devoted to comparisons of tennis demand to tennis supply conditions for the Atlanta, Georgia metropolitan area. Part of his data collection procedure involved individually counting the number of tennis courts visible from aerial photographs of the city and its suburbs. Since his focus was kept to a smaller scale than a multi-state or national study on tennis supply, performing this task was not totally unimaginable.

However, if one thing can be inferred from this discussion, it is that the process of obtaining information on actual facility sites for the sport of tennis is definitely much more involved than it is for other sports. For example, in his study on the United States ski market, Martin (1990) utilized a national, annually published inventory of skiing resorts and sites when he constructed the "supply" side of his analysis. Similarly, many of the golf courses used to build the Database of Golf in America came from a National Golf Foundation list that contained all types of private and public facilities across the country. By contrast, there is no such list which is as comprehensive or as accessible for the sport of tennis. That is, there are numerous organizations, from private corporations to government agencies, which provide listings on tennis court sites.

Another problem of having to gather and use court supply

information from many different sources is that no two agencies record data in the same manner. Often, the degree of specificity will vary from list to list. For instance, while some brochures may only indicate the existence of an opportunity to play tennis, others are more detailed and give the number of courts, the types of court surfaces, and whether or not there are lights at the facilities.

These are a few of the concerns among many that are associated with the development of a database on the number and nature of tennis court sites. Another concern, the type of facility which houses the courts, is discussed in detail in the next chapter.

CHAPTER III

DATA COLLECTION AND METHODOLOGY

Data Collection

In order to measure and describe the contemporary supply of tennis courts in the study area, it is important to consider not only the number of tennis courts, but also the type of recreational facility in which those courts are located, as this can greatly affect the availability and usage of courts. Thus, one of the first tasks performed in this study was to develop a typology of tennis court facilities (Appendix A). This classification system evolved over a period of time as different lists of facilities were acquired and attempts were made to create a scheme where the labeling of a facility type would be all inclusive and mutually exclusive.

The three major types of court facilities--private, public, and college--were intended to identify who owns, maintains, and/or administers the courts, not necessarily who has access to them. Moreover, since the subcategories within the major facility types were designed to fall along a continuum from "extremely restricted" to "general public" access, it was hoped that they would more accurately describe for whom the courts were intended (and not necessarily by whom the courts were provided). It should be noted

that some of the subcategories were borrowed from the USTA classification scheme of its member organizations including clubs, schools, and independent associations.

Even though, a college facility could be considered another subcategory under private or public, it was decided to establish it as an independent, major facility type because of some important considerations. For instance, in their spatial analysis of tennis professionals, Rooney and Pillsbury (1992) acknowledged that where these players were born may not be significant in the development of high-caliber play as where these players attended college, since, as the authors found, more than 30 players participated in the professional tour as student-athletes. Thus, for future studies on the role of university tennis programs, a quick and convenient count of college tennis courts would be possible with this separated facility type.

Indeed, since numerous lists of recreational places with tennis courts were acquired for the Database of Tennis in America, developing this typology was necessary to identify and count only once each and every facility contained on all those lists. This individual identification process was done by entering the information into the computer spreadsheet programs, Microsoft Excel and Quattro Pro, and then by using the 'sort' function to check for duplicate entries.

Many recreational facilities placed in the private sector supply category came from American Business Information, Inc., a firm which processes and sells lists of individual companies for marketing campaigns. Each entry on this list contained the name, city, state, and zip code of a recreational business, as well as the business' total

number of tennis courts. Many different types of recreational enterprises, including golf and country clubs, tennis and fitness clubs, and YMCA's, appeared on this list. Additionally, reader surveys found in the Tennis Buyer's Guide magazine provided another set of facilities which were compared to and merged together with the previously obtained files. Much like entries on the American Business list, each survey return featured the name of the company, its address, zip code, and tennis court total. A very unique source of private tennis supply was the Triple A Motor Club's 1993 Hotel and Lodging Guide for each state. In these guides, each hotel was rated, and its address and number of amenities were given; and so, hotels with tennis courts were added to the Database's growing list of private sector supply. However, this study on the contemporary tennis supply in six states did not include private residential tennis courts, since theoretically, these are not open to the general public (not even for commercial purposes).

Acquiring data on the public supply of tennis courts involved contacting various government agencies. State-level agencies such as the departments of natural resources, parks, or tourism were called first in the hopes that if the state had useful information, then fewer calls would have to be made to individual city, township, or county-level recreation offices. This reasoning definitely proved worthwhile as five of the six states in the study area did provide excellent files on the public tennis court supply in their respective states. These files were not simply public tennis court totals by county or city, but rather they were inventories of public recreation sites in the state with the location and number of tennis courts per site also given.

There was one disappointment, however, as the state of Indiana did not provide the city or town nor 5-digit zip code of their specific sites but rather, only the county location. Nonetheless, although the Iowa Department of Parks and Recreation did not have such detailed information, it did provide a telephone directory of recreation departments for individual cities and towns in Iowa. This useful directory eliminated the time-consuming task of having to gather the phone numbers from numerous telephone books on microfiche files in the Oklahoma State University library.

For the state of Iowa, all cities which had a population of 15,000 or more were called and asked to provide a list of the parks in their jurisdiction which had tennis courts, and also, to provide the name, address, and court total at each of those parks. This lower population parameter was chosen so that court data could be collected from a wide range of rural and urban places. Furthermore, in their booklet on tennis court construction and financing, the USTA used this figure of 15,000 as the lowest population level in a table featuring the recommended number of courts for various-sized communities (1990-1991). From the court totals obtained through calling, estimations were made on the number of public courts for other incorporated places which were not contacted.

Entries found under the college supply label were obtained from the 1990-1991 USTA Directory of College Tennis Programs. This directory contains the name, city, zip code, and court total of all post-secondary institutions in each state.

Methodology

Raw Measures of Supply

Because many of the source documents used to construct the Database's court inventory already provided each site's 5-digit zip code (or in the case of Indiana, county fip code) and court total, aggregation procedures to produce raw measures of supply were relatively simple. The number of tennis courts were aggregated from the 5-digit zip code to the county level fips code using computer mapping programs and Atlas GIS. With these private, public, and college court totals broken down by county, it was possible to develop similar measures for other scales of comparison. That is, for each of the six states and for each of the seven population classes of counties, the total number of all major types of courts was computed.

Per Capita Measures of Supply

Tennis Supply Index. In addition to the raw measures of supply, per capita indices were also used in this study to show how tennis supply is distributed across these states and counties of varying population size. The per capita indices were developed using the formula for location quotients which Rooney uses in his research. First, all county court totals were added together. This sum represents the total number of tennis courts for the entire Midwest study region. Next, 1990 Census figures were used to calculate

simple court-to-population ratios for each county individually and for the region as a whole. Lastly, every calculated ratio was divided by the regional court-to-population ratio so that the regional rate of supply was set equal to 1 (one), where any index above one would indicate higher than average supply, while an index below one would mean less than average supply. The per capita supply amounts for each state and for each county population class were also calculated. The actual formula for location quotients is illustrated below:

$$\text{Per Capita Index (LQ)} = \frac{(t/p)}{(T/P)}$$

where t is a measure of tennis supply for a specific areal unit and p is the population of that areal unit; and T is the total regional measure of tennis supply and P is the total regional population. This measurement allows for comparisons to be made between areal units, or in the case of this study, between counties, regardless of population size.

Tennis Intensity Index. Anderson (1991) used the same methods to obtain an index of tennis demand for various scales in his spatial analysis of 1990 magazine subscription and USTA membership data. Thus, for each county, state, and population class, per capita demand indices were divided by the corresponding supply indices, again with a base indicator of regional tennis intensity set equal to 1 (one). A simple formula for the Tennis Intensity Index follows:

$$\text{Tennis Intensity Index (T.I.I.)} = \frac{\text{Tennis Demand Index } (T.D.I.)}{\text{Tennis Supply Index } (T.S.I.)}$$

where the *T.D.I.* and the *T.S.I.* are location quotients that were previously developed to measure tennis demand and supply. Another way of obtaining an index of tennis intensity, which would produce the same result, is to develop ratios featuring the number of subscribers and USTA members per court for the region and for all other scales of comparison, and then dividing those ratios by the regional rate of demand per court.

In addition to the subscription and membership indicators of demand, a second set of data reflecting interest in the game was compared to the supply measures. This data came from the Claritas Corporation, a marketing research company whose various study methods and findings were chronicled in the book, The Clustering of America (Weiss 1988). According to Weiss, this corporation uses information from marketing research surveys and the U.S. Census, and devises indicators of American consumer trends for all sorts of markets. An example of such a market is the sports marketplace, where analysts are constantly trying to assess the extent of athletic participation, equipment purchases, and contest attendance. The particular dataset from Claritas used for this study featured a county-level count of people who in 1992, responded as being frequent tennis players, or those who play the sport ten times a year or more. The decision was made to acquire this data--which

incidentally, were not featured in Anderson's study--so that comparisons could be made between the Database's "in-house" tennis supply figures and another, "outside" source's measure of tennis interest.

At any rate, with supply as the denominator with both sets of demand data, any index greater than one indicated that there was more interest in tennis than access to it. Alternatively, an index below one meant that there were too many tennis courts competing for a limited amount of tennis interest or demand in that particular area.

CHAPTER IV

PRESENTATION OF RESULTS

Introduction

The purpose of this chapter is to discuss and illustrate the geographical distribution of tennis courts across the six-state study region. The analysis will be divided into five parts. First will be an examination of the absolute or raw measurements of tennis supply. Next, the relative results of measuring supply on a per capita basis will be featured. The third section will contain an overview of some important demand measurements, while in the fourth section, per capita rates of tennis demand will be compared against per capita supply rates, so as to gauge the intensity of tennis activity. Lastly, some of these supply and demand measurements will be analyzed for a selection of the study area's more populated MSAs.

Raw Tennis Court Supply

A map analysis showed that there were very few private tennis courts in the rural counties of the study area (Figure 4). In fact, many counties were shown as not having any private courts. Some areas which were noticeably lacking in private tennis court

development included portions of Iowa, northern Missouri, eastern Kentucky, and southern Illinois. In the state of Indiana, an odd U-shaped pattern of counties with a practically nonexistent private supply was found, while the counties which this pattern surrounded, extending from the north central part of the state south to Indianapolis, showed a considerable private court supply.

Many of the same areas described as having a poor private supply fared much better in the provision of public tennis courts (Figure 5). Still, some areas of low public supply were evident, including some Class 1, 2, and 3 counties of south central Illinois and east central Kentucky. Curiously, the two northwesternmost counties of Illinois were shown as having no public tennis courts at all. It is very probable that this rolling, rural area along the Mississippi River relies heavily on private resorts for tennis supply, since it is a big tourist destination in which the scenic town of Galena, Illinois is located. Taney County, Missouri, along the Arkansas border, is the home county of another popular place for tourism, the town of Branson, which also showed a pattern of poor public supply.

The pattern of college tennis court supply can best be described by the phrase "few and far between" (Figure 6). Indeed, since many counties in the study region do not have a college, they did not have any college courts. Among those counties with colleges, it was the type of institution which best determined the degree of court supply. Counties with a major university such as Franklin in Ohio, Monroe and St. Joseph in Indiana, or Champaign in Illinois for example, exhibited a much greater supply of college courts than other counties with smaller schools. Of course, major cities with their

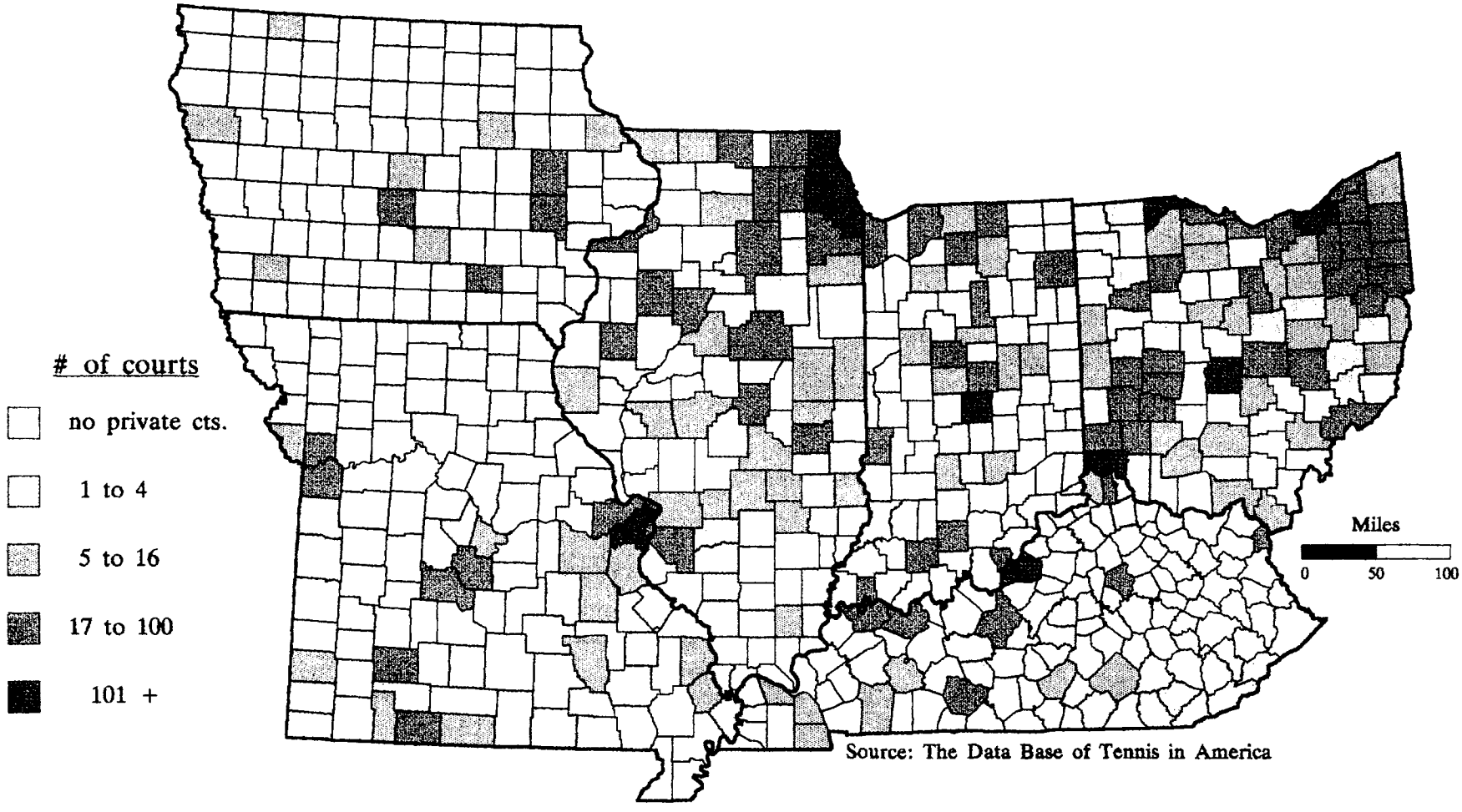

Figure 4. Private* tennis court supply per county
*does not include courts at private residences

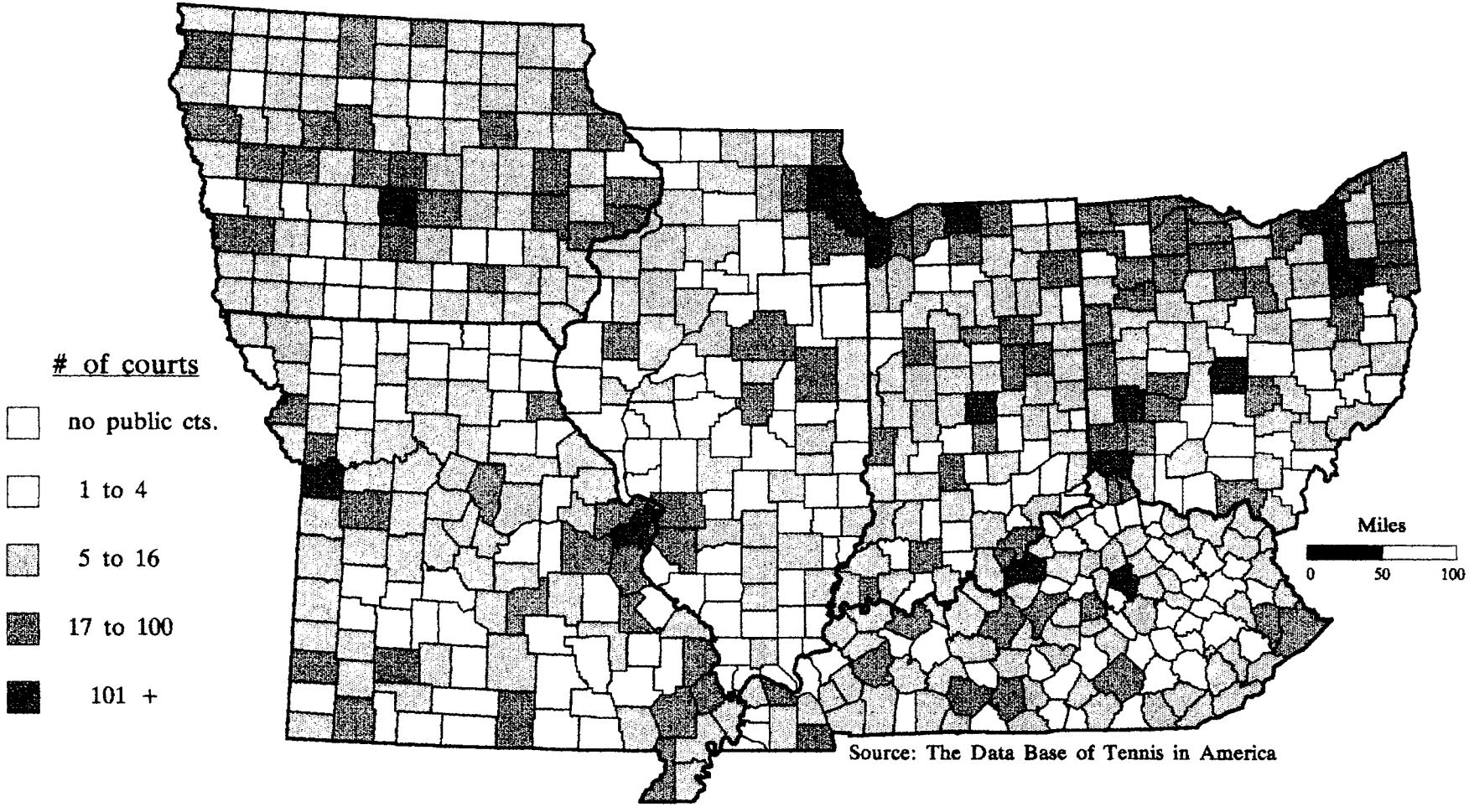

Figure 5. Public tennis court supply per county

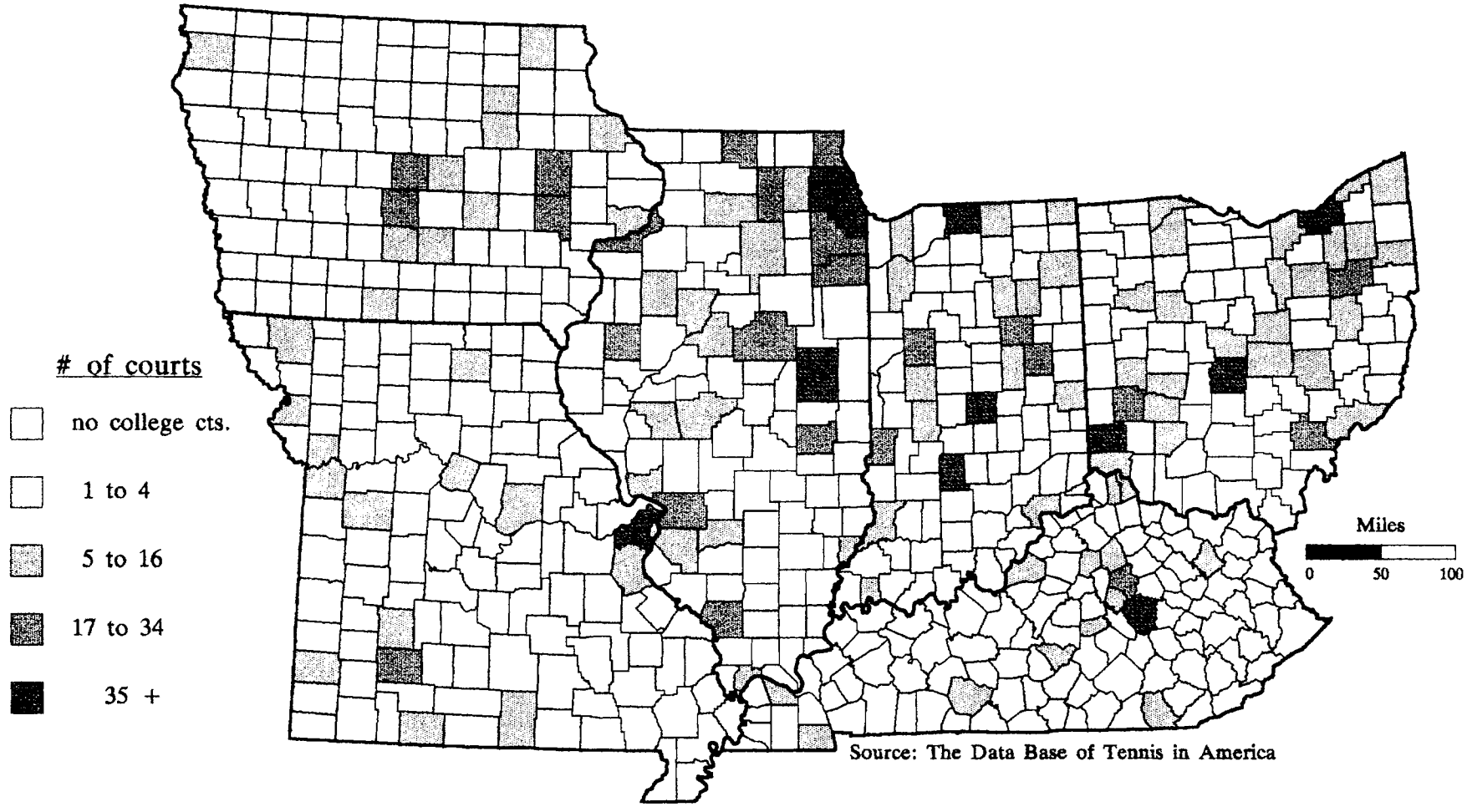

Figure 6. College tennis court supply per county

multiple institutions and campuses also displayed a great amount of college tennis courts.

The composite sketch of all types of courts resembled a population map of the study area (Figure 7). Major metropolitan areas including the cities of Chicago, Cleveland, Cincinnati, Indianapolis, Kansas City, St. Louis, and Louisville, were shown to have the greatest concentrations of tennis courts. While northern Iowa showed a consistent pattern of mediocre court supply, in many southern Iowa counties and as well, in some Class 1 counties of northern Missouri, the amount of courts did not appear to be as great or as consistently provided. In Missouri, a central corridor of fairly decent supply existed along the I-70 highway between Kansas City and St. Louis, and additionally, in the southwestern part of the state. Again, it was the Class 1 counties of east-central Kentucky which stood out as being poorly supplied, much like a stretch of counties in southeastern Indiana. Overall, however, Indiana and Ohio, and particularly the northern half of both states, stood out as being well-supplied with courts. It was difficult to discern any definite patterns of supply in the state of Illinois. Although most would expect court supply to be gradually diminishing as one looks further south and west in the state, some rural, southern counties showed considerable supply while some central Illinois counties looked weak. All of this contributed to the state's "spotty" appearance in the total distribution of courts.

In his book, Weiss (1988) described forty different types of socio-economic neighborhoods, which were developed with data from the Claritas Corporation, and mapped the distribution of each type

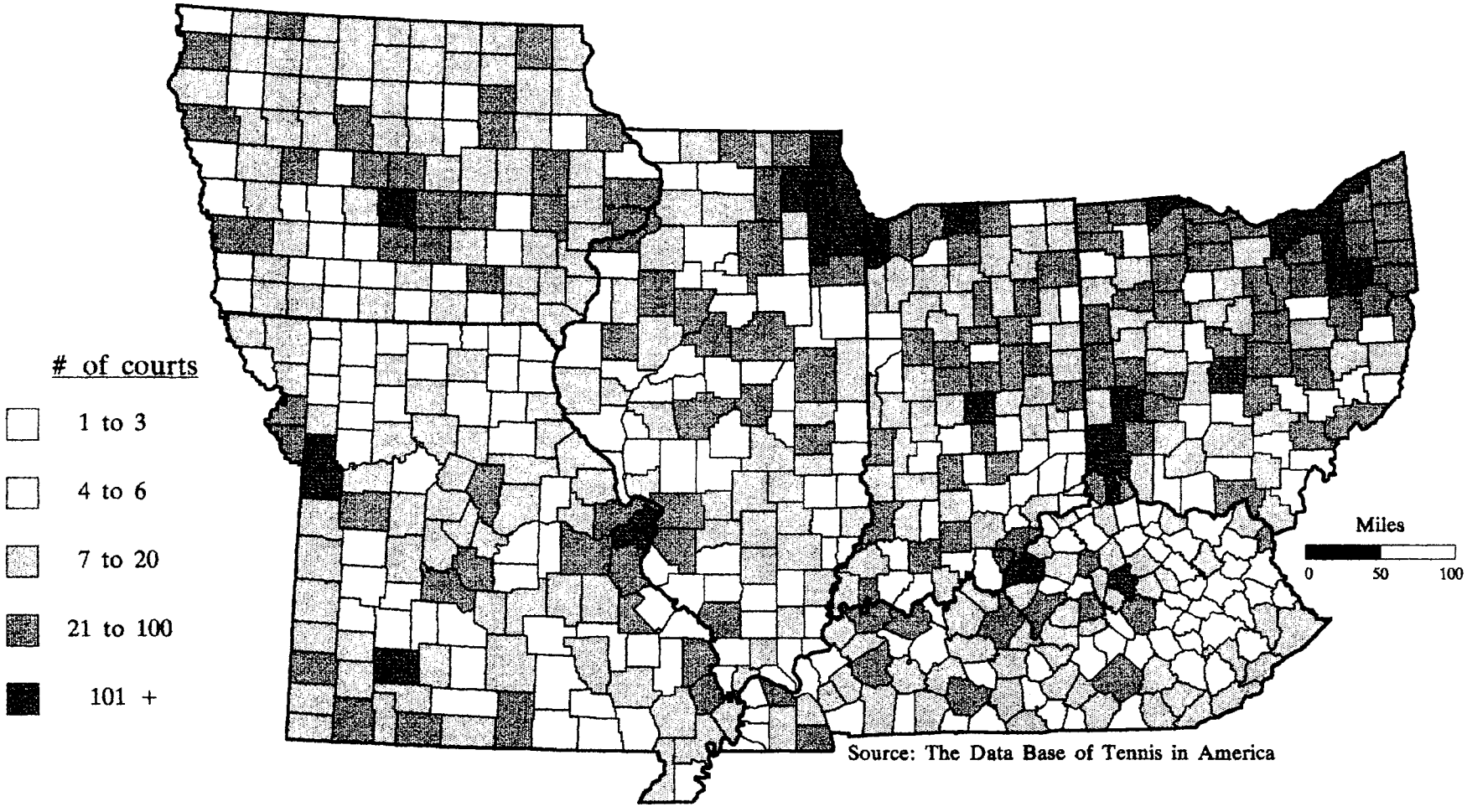

Figure 7. Total supply of tennis courts per county

across a national scale. Much of east-central Kentucky was included in the category for extremely impoverished communities called "Hard Scrabble." According to Weiss, these places are noted for their very low income levels and poor residents who typically do not consume a variety of products. It is believed, therefore, that the economic nature of these areas in Kentucky has resulted in the lack of tennis court development which was seen in Figure 7. As Weiss would probably agree, achieving recreational benefits may not be as important to these people as acquiring basic necessities.

According to the actual numbers, a total of 18,728 tennis courts were found in the entire study area. There were 6,162 private courts, accounting for nearly 33 percent of the total. Around 56 percent of the total number of courts were public tennis courts, numbering 10,431. The remaining 11 percent of the total were found at colleges, with a count of 2,135 courts.

Ohio was the state which had the greatest amount of tennis courts with a total of 5,198 (Table I). Ohio's percentage of private and public courts was well-balanced at 44 percent private and 46 percent public, with college courts accounting for the last 10 percent of the mix. The state of Illinois, in which 4,316 tennis courts were found, also showed a good balance between private and public courts, with 42 percent of the total being private, 44 percent public, and 14 percent college. In these two states, there are many urban areas, in and around which communities of great wealth are concentrated. Weiss (1988) labeled these very affluent neighborhoods "Blue Blood Estates" and described them as having very expensive tastes and interests. Indeed, the concentration of wealth around

TABLE I

PRIVATE AND PUBLIC TENNIS COURT STATISTICS
BY STATE

State	Total Population	Total # of cts.	# of PRIV. cts.	% PRIV.	# of PUBL. cts.	% PUBL.	# of COLL. cts.	% COLL.
Illinois	11,430,602	4,316	1,792	41.52	1,911	44.28	613	14.20
Indiana	5,544,159	2,446	613	25.06	1,446	59.12	387	15.82
Iowa	2,776,755	1,842	271	14.71	1,345	73.02	226	12.27
Kentucky	3,685,296	2,064	485	23.50	1,376	66.67	203	9.84
Missouri	5,117,073	2,862	705	24.63	1,953	68.24	204	7.13
Ohio	10,847,115	5,198	2,296	44.17	2,400	46.17	502	9.66
REGION	39,401,000	18,728	6,162	32.90	10,431	55.70	2,135	11.40

many Ohio and Illinois cities has probably resulted in the development of a wide range of private recreational amenities, including marinas, polo grounds, and as well, private tennis centers.

By contrast, the other four states in the study region did not yield very well-balanced private and public tennis court percentages. In Iowa for instance, only 15 percent of the total number of courts were private, compared to 73 percent of its 1,842 courts being public. This low percentage of private courts may be related to Iowa's level of urbanization, which is not as extensive as the urbanization in Ohio and Illinois. Thus, Iowa probably lacks the great concentration of wealthy communities which is needed to support large numbers of private tennis clubs and other facilities. Similarly, in Indiana, Kentucky, and Missouri, the majority of tennis courts were public ones.

Among the population classes of counties, it was Class 5 which had the greatest number of tennis courts, with nearly 5,000 courts (Table II). The second greatest number, approximately 4,400 courts, was found in the primarily suburban counties of Class 6, which ranges in population from half a million to one million people. However, counties in the Class 6 range had a greater percentage of private courts at 43 percent than did the counties of Class 5, where only 38 percent of the total number of courts were private. Compared to Class 6 counties, the rural counties of Class 1, with populations of less than 10,000, were overwhelmingly public-supplied areas. Nearly 83 percent of the tennis courts in Class 1 counties were public. Table II shows that the percentage of private courts increased with each successive population class up to Class 6,

TABLE II

PRIVATE AND PUBLIC TENNIS COURT STATISTICS
BY POPULATION CLASS OF COUNTY

Pop. Class	Total Population	Total # of cts.	# of PRIV. cts.	% PRIV.	# of PUBL. cts.	% PUBL.	# of COLL. cts.	% COLL.
Class 1	667,106	374	33	8.82	312	83.42	29	7.75
Class 2	3,964,966	1,930	246	12.75	1,525	79.02	159	8.24
Class 3	5,260,275	2,372	557	23.48	1,542	65.01	273	11.51
Class 4	4,521,944	2,160	696	32.22	1,099	50.88	365	16.90
Class 5	11,166,097	5,002	1,875	37.49	2,360	47.18	767	15.33
Class 6	7,303,405	4,357	1,891	43.40	2,129	48.86	337	7.73
Class 7 (combined)	6,517,207	2,533	864	34.11	1,464	57.80	205	8.09
7-Cook Co., IL	5,105,067	1,818	616	33.88	1,034	56.88	168	9.24
7-Cuyahoga Co., OH	1,412,140	715	248	34.69	430	60.14	37	5.17
REGION	39,401,000	18,728	6,162	32.90	10,431	55.70	2,135	11.40

which had the highest percentage of private tennis supply. When the two Class 7 counties of a million or more people were analyzed both aggregately as one population class and separately as individual counties, they did not follow this general trend of increasing population size and private supply.

Per Capita Tennis Court Supply

For the six-state study region as a whole, with a total 1990 population of 39,401,000, there was one tennis court for every 2,104 people. Since this regional court-to-population ratio can be converted into an index with a value of 1 (one) using the procedure described in Chapter III, it is possible to develop similar supply indices and to make comparisons between the individual counties, six states, and seven population classes. If, for instance, a particular areal unit is found to have a rate of one tennis court for every 4,208 people, then its relative supply index would be 0.50.

A quick glimpse at the map reveals that many of the six states' rural areas were over-supplied with tennis courts relative to the entire region's rate of supply (Figure 8). For instance, many counties in northern Iowa, as well as central and southern Missouri, were exhibiting very high per capita indices of tennis supply. These places were described earlier as having a fair amount of courts on an absolute basis. An interesting showing was the state of Illinois' difficulty keeping up with the regional supply average, even in some suburban counties around the Chicago area. That is, most Illinois

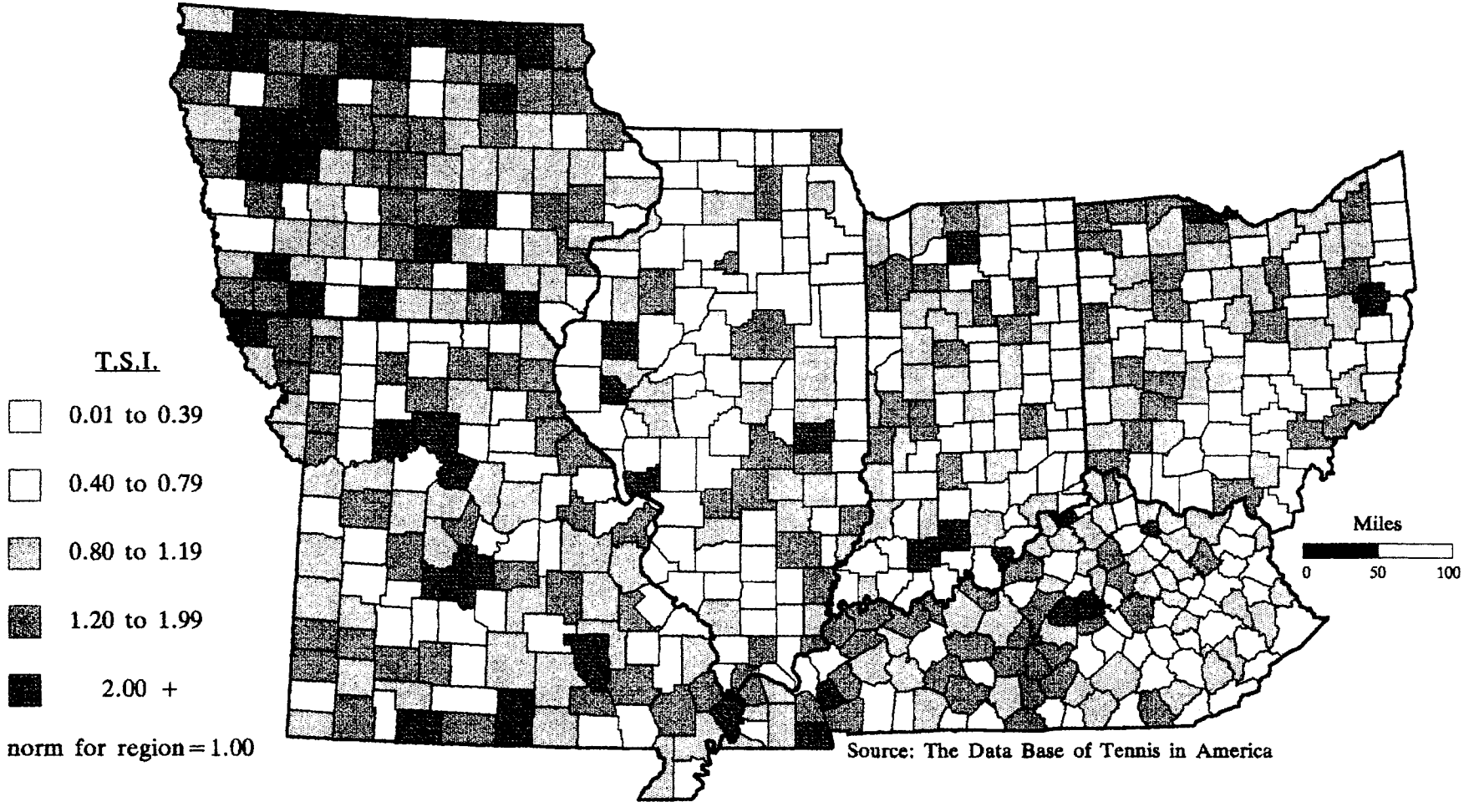

Figure 8. Tennis Supply Index per county

counties were shown as having very low tennis supply indices, ranging from only 0.01 to 0.79 times the regional norm. By contrast, many Ohio counties, and particularly those around the major cities of Cleveland and Cincinnati, showed more similarity to the regional rate of court supply than their counterparts in Illinois. In Indiana and Kentucky, the eastern to southeastern parts of both states displayed low per capita rates of supply, indicating that these areas were relatively under-supplied with courts, especially in comparison to the two states' western counties.

From an examination of the states, it was found that Iowa had the best rate of tennis supply at nearly one and one half times the regional rate, with its one court per 1,507 people (Table III). This finding is not believed to be the result of court estimations being too generous. Rather, Iowa's inclusion in the "Sports for Sport's Sake" region may help explain the high tennis supply index. According to Rooney and Pillsbury (1992), this particular sport region is defined by its emphasis on mass participation in athletics. A consequence of this "sports-for-all" attitude has been the large-scale development of affordable, recreational facilities. With a fairly decent 1.18 tennis supply index, it may be that Missouri shared this philosophy on recreation and facility provision, as it is also a "Sports for Sport's Sake" state. However, it is more likely that central Missouri's many resort areas contributed to the above average supply rating.

The lowest rate of supply (0.80) belonged to Illinois, where one court served well over 2,600 people. Although some might suspect the large population of Cook County to be affecting this per capita ratio, this did not appear to be the case. Even without the

TABLE III

PER CAPITA TENNIS SUPPLY STATISTICS
BY STATE

State	Total Population	Total # of courts	Population per court	T.S.I.	Priv. T.S.I.	Publ. T.S.I.	Coll. T.S.I.
Illinois	11,430,602	4,316	2,648.42	0.80	1.00	0.63	0.99
Indiana	5,544,159	2,446	2,266.62	0.93	0.71	0.99	1.29
Iowa	2,776,755	1,842	1,507.47	1.40	0.62	1.83	1.50
Kentucky	3,685,296	2,064	1,785.51	1.18	0.84	1.41	1.02
Missouri	5,117,073	2,862	1,787.94	1.18	0.88	1.44	0.74
Ohio	10,847,115	5,198	2,086.79	1.01	1.35	0.84	0.85
REGION	39,401,000	18,728	2,103.86	1.00	1.00	1.00	1.00

county's statistics, Illinois had the lowest rate of supply at 0.83. Like Iowa, perhaps this relative supply rate can be attributed to the sport region in which Illinois is located. That is, since most of Illinois is in the "American Heartland" sport region, which Rooney and Pillsbury (1992) characterize as having above average participation in football, baseball, and especially basketball, perhaps the provision of tennis courts was not a top priority in many Illinois communities. However, despite its affinity for these very traditional sports, the "Heartland" region was also found to have high rates of participation in minor sports as well. Because of this, the authors believed the region was actually a very well-balanced sporting area, which may be why the rates of tennis supply in Ohio and Indiana (most of which also lie within this sport region) were on par with the regional supply rate. In fact, one tennis court served approximately 2,100 people in Ohio. Another state in the "Heartland" region is Kentucky, whose above average rate of tennis supply (1.18) also suggests that within the sport region, there is much variation in recreational priorities.

County Population Class 6, which includes only ten counties, had the highest rate of tennis supply (Table IV). With an index of 1.26, Class 6 counties served approximately 1700 people with one tennis court. At the other end of the spectrum, there was Class 7's Cook County, Illinois, in which the city of Chicago is located, with a below average index of 0.75, or one court for 2,800 people. In the primarily rural counties of Class 1, there was one court for nearly 1,800 people, resulting in an above average index of 1.18. The other four population classes as well as the Class 7 county of Cuyahoga in

TABLE IV

PER CAPITA TENNIS SUPPLY STATISTICS
BY POPULATION CLASS OF COUNTY

Pop. Class	Total Population	Total # of courts	Population per court	T.S.I.	Priv. T.S.I.	Publ. T.S.I.	Coll. T.S.I.
Class 1	667,106	374	1,783.71	1.18	0.32	1.77	0.80
Class 2	3,964,966	1,930	2,054.39	1.02	0.40	1.45	0.74
Class 3	5,260,275	2,372	2,217.65	0.95	0.68	1.11	0.96
Class 4	4,521,944	2,160	2,093.49	1.01	0.98	0.92	1.49
Class 5	11,166,097	5,002	2,232.33	0.94	1.07	0.80	1.27
Class 6	7,303,405	4,357	1,676.25	1.26	1.66	1.10	0.85
Class 7 (combined)	6,517,207	2,533	2,572.92	0.82	0.85	0.85	0.58
7-Cook Co., IL	5,105,067	1,818	2,808.07	0.75	0.77	0.77	0.61
7-Cuyahoga Co., OH	1,412,140	715	1,975.02	1.07	1.12	1.15	0.48
REGION	39,401,000	18,728	2,103.86	1.00	1.00	1.00	1.00

Ohio, home of the city of Cleveland, all possessed tennis supply indices which mirrored the regional rate of supply.

A Review of Tennis Demand

Before comparing tennis supply to tennis demand, it is important to review some previously calculated demand measurements and to explain how those measurements were obtained. Anderson (1991) reported that the publishers of Tennis Magazine and officials at the USTA currently have a contract whereby members of the USTA receive a complimentary subscription to the magazine as one of many membership benefits. Essentially then, USTA members can be considered a subset of the magazine's total subscriber population. However, as Anderson also explained in his thesis, magazine circulation and USTA membership data were provided to him as separate datasets so as to ensure that no overlap would occur when measuring. And while Anderson analyzed them separately as two individual measures of demand, in this study, the subscription and membership data were combined to produce a single measurement of demand.

As was described in Chapter III, the combined subscriber-membership measurement is the first of two demand indicators used for this study, with the other being figures reported by the Claritas Corporation on frequent tennis play. These two demand measures are actually describing two different types of interest in the game, the former being an interest of consumption, the latter an interest

through participation. It should be noted that any heading with a "#1" notation after it refers to indices developed using the subscription and membership data, while a heading proceeded by a "#2" refers to those developed using Claritas figures.

In this study region of nearly 40 million people, there were well over 95,000 Tennis Magazine subscribers and/or USTA members in 1990. That meant approximately one in every 412 people followed the sport in this way. Claritas indicators of tennis demand, by contrast, reflected a more substantial amount of interest in the game. Some 1.5 million Midwesterners, or one in 26 people, qualified as frequent tennis players, or those who play the sport ten or more times a year.

Tennis Demand Index #1

Figure 9 shows that the distribution of Tennis Magazine subscribers and USTA members could also be described as baring a resemblance to the study area's population distribution. Again, many metropolitan areas and some college towns as well, displayed the heaviest concentrations of these particular followers of the game. A strong showing was found in the state of Ohio, where all but seven counties featured moderate to heavy numbers of subscribers and association members.

On a per capita basis, many counties in the region fared well in approximating the regional rate of one subscriber in 412 people (Figure 10). That is, many counties, especially some Class 2 counties

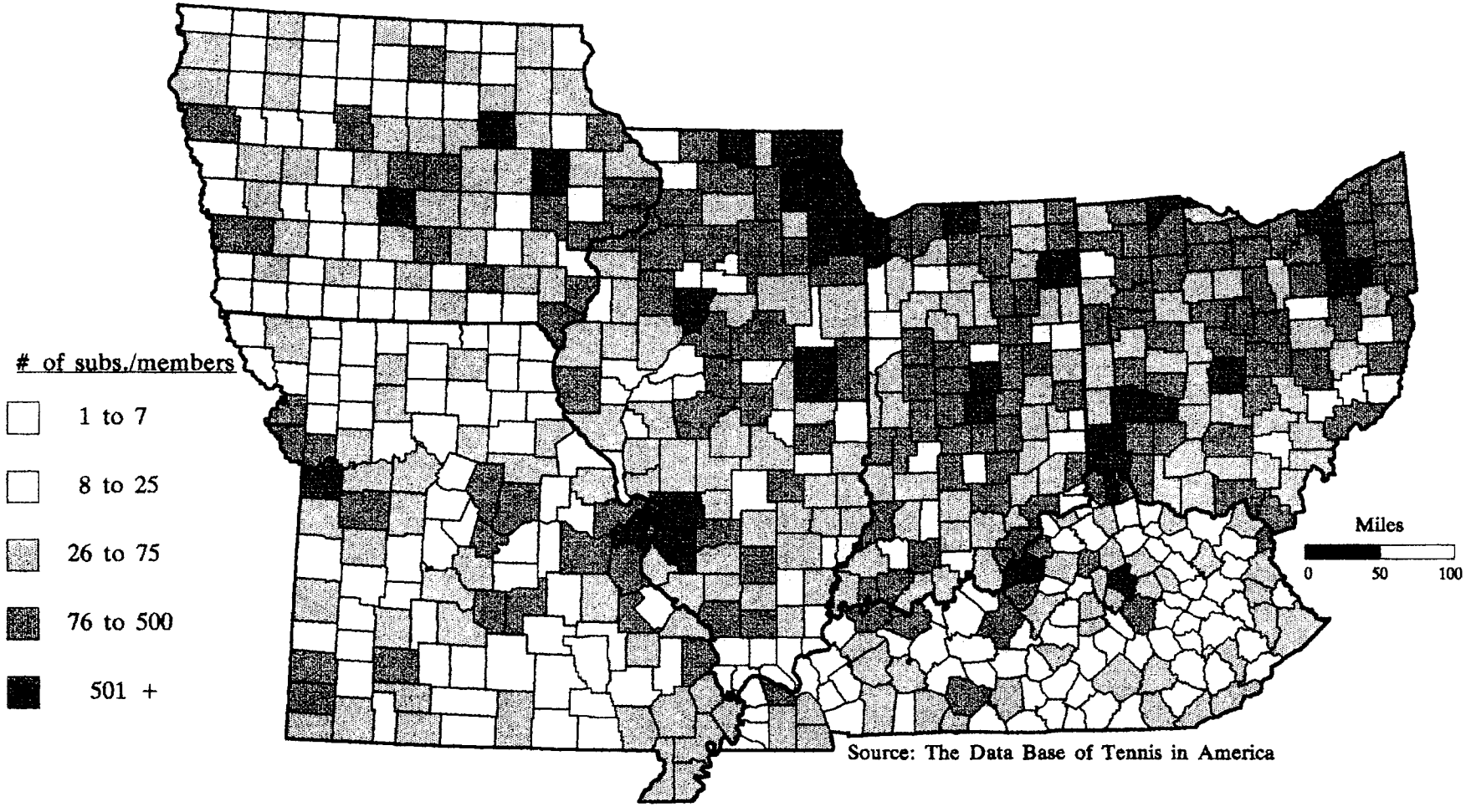

Figure 9. TENNIS Magazine subscribers & USTA members per county

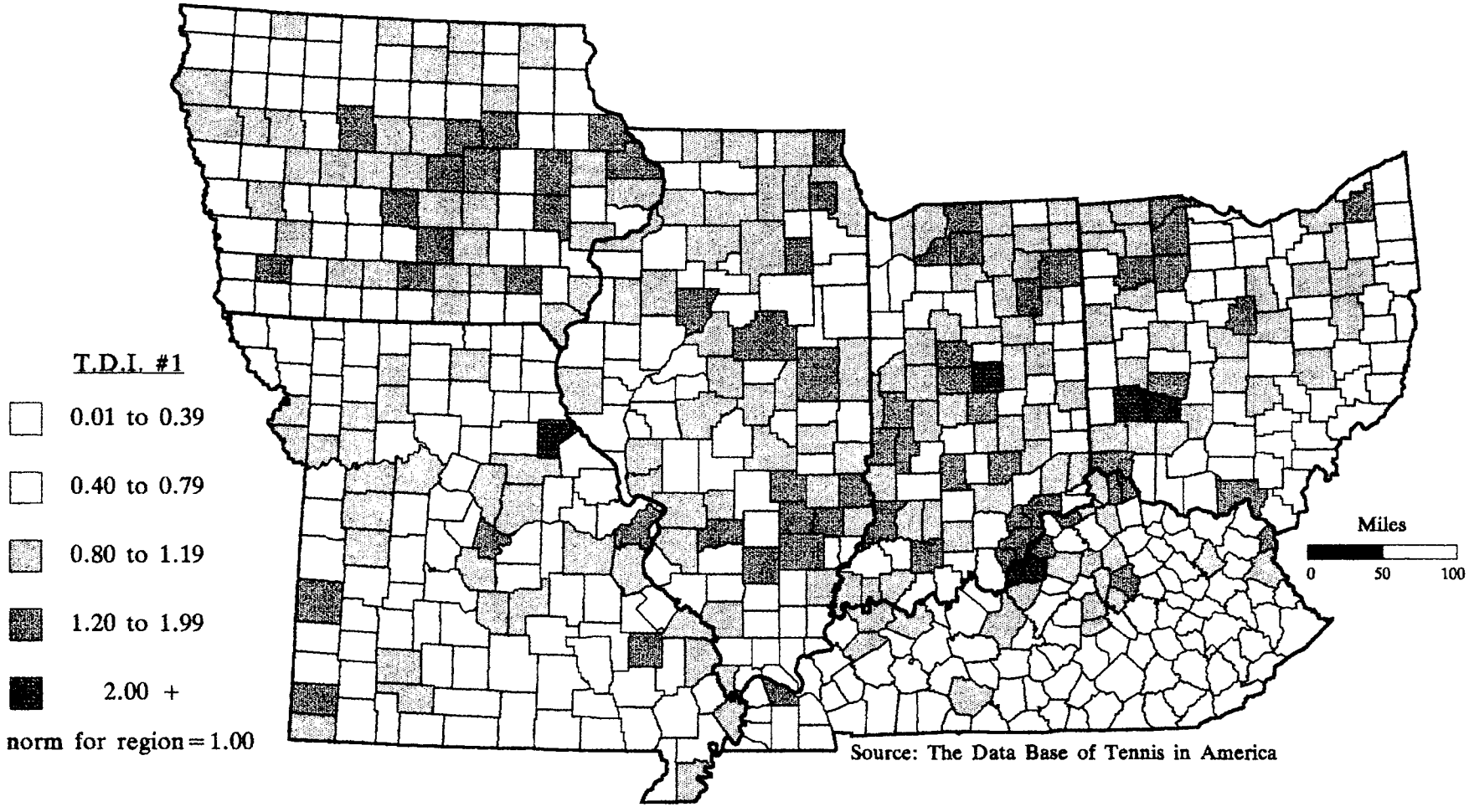

Figure 10. Tennis Demand Index per county

in central Iowa and Missouri, some Class 3, 4, and 5 counties in north central Illinois, and some Class 3 counties in northeastern Indiana, all had tennis demand indices which fell into the range around 1.00. By contrast, there were a handful of counties which had dramatically higher rates of tennis demand. These counties, including Ohio's Green and Montgomery of the Dayton area, Indiana's Hamilton of the Indianapolis area, and Kentucky's Jefferson, home of the city of Louisville, all displayed demand rates which were two or more times the regional index.

When analyzing data at the state-level, it was found that the demand indices reflecting subscription and membership patterns were not very drastic variations from the regional rate of demand (Table V). For instance, Indiana's 1.13 index was found to be the highest rate of tennis demand among the states. This may be due, in part, to the fact that one of the USTA's regional divisions, the Western Tennis Association, is headquartered in Indianapolis. Missouri possessed the lowest tennis demand index at 0.85, or one "consumer" of tennis in 485 people. While the rates for Ohio and Iowa at 1.05 and 1.01 respectively, indicated a slightly above average proportion of those who follow the game, figures for Illinois (0.96) and Kentucky (0.99) fell just shy of the region's norm.

Per capita demand indices by population class showed more variation from the regional rate than did those by state (Table VI). In Class 6 counties, for example, only 279 people were needed to produce one magazine subscriber and/or association member, resulting in the highest rate of tennis "consumption" at 1.48 times the regional norm. Residents of rural Class 1 counties, conversely,

TABLE V

TENNIS DEMAND STATISTICS
BY STATE

State	Total Population	Total # of Ten. Mag. & USTA subs.	Ten. Mag. & USTA subs. per capita	T.D.I. # 1	Total # of Claritas freq. plyrs.	Claritas freq. plyrs. per capita	T.D.I. # 2
Illinois	11,430,602	26,494	431.44	0.96	473,602	24.14	1.08
Indiana	5,544,159	15,122	366.63	1.13	201,102	27.57	0.95
Iowa	2,776,755	6,826	406.79	1.01	93,053	29.84	0.88
Kentucky	3,685,296	8,866	415.67	0.99	133,093	27.69	0.94
Missouri	5,117,073	10,551	484.98	0.85	191,003	26.79	0.98
Ohio	10,847,115	27,662	392.13	1.05	416,081	26.07	1.00
REGION	39,401,000	95,521	412.49	1.00	1,507,934	26.13	1.00

TABLE VI

TENNIS DEMAND STATISTICS
BY POPULATION CLASS OF COUNTY

Pop. Class	Total Population	Total # of Ten. Mag. & USTA subs.	Ten. Mag. & USTA subs. per capita	T.D.I. # 1	Total # of Claritas freq. plyrs.	Claritas freq. plyrs. per capita	T.D.I. # 2
Class 1	667,106	739	902.71	0.46	18,266	36.52	0.72
Class 2	3,964,966	6,277	631.67	0.65	110,443	35.90	0.73
Class 3	5,260,275	10,321	509.67	0.81	161,758	32.51	0.80
Class 4	4,521,944	10,461	432.27	0.95	162,566	27.82	0.94
Class 5	11,166,097	28,638	389.90	1.06	452,224	24.69	1.06
Class 6	7,303,405	26,196	278.80	1.48	327,495	22.30	1.17
Class 7 (combined)	6,517,207	12,889	505.64	0.82	275,182	23.68	1.10
7-Cook Co., IL	5,105,067	10,167	502.12	0.82	219,007	23.31	1.12
7-Cuyahoga Co., OH	1,412,140	2,722	518.79	0.80	56,175	25.14	1.04
REGION	39,401,000	95,521	412.49	1.00	1,507,934	26.13	1.00

showed the least interest in following the game, with its index of 0.46. In these counties, it would take over 900 people to generate one magazine subscription/membership. In fact, only two population classes really approximated the regional demand index, with Class 4's below the average rate of 0.95 and Class 5's above average rate of 1.06. The remaining population classes, including Class 2 (0.65), Class 3 (0.81), and the Class 7 counties of Cook in Illinois (0.82) and Cuyahoga in Ohio (0.80), all had indices which were below the regional norm. An intriguing trend despite some of these low-interest findings was that the rate of demand did increase with each successive population class up to County Class 6, which had the highest rate. This pattern is consistent with Anderson's (1991) finding that the more urban counties, especially suburban ones, were accounting for the highest rates of tennis demand.

Tennis Demand Index #2

A visual analysis of the frequent tennis player distribution, again, revealed a pattern that was consistent with the population structure of the study area, where major cities and their surrounding counties accounted for the greatest amount of players (Figure 11). In comparison to the distribution of tennis "consumers" (see Figure 9), counties in southeastern Kentucky and southwestern Missouri showed more strength in the demand for tennis when it came to actually playing the game, while some southeastern Illinois counties were shown as having less interest in participation. Some areas that

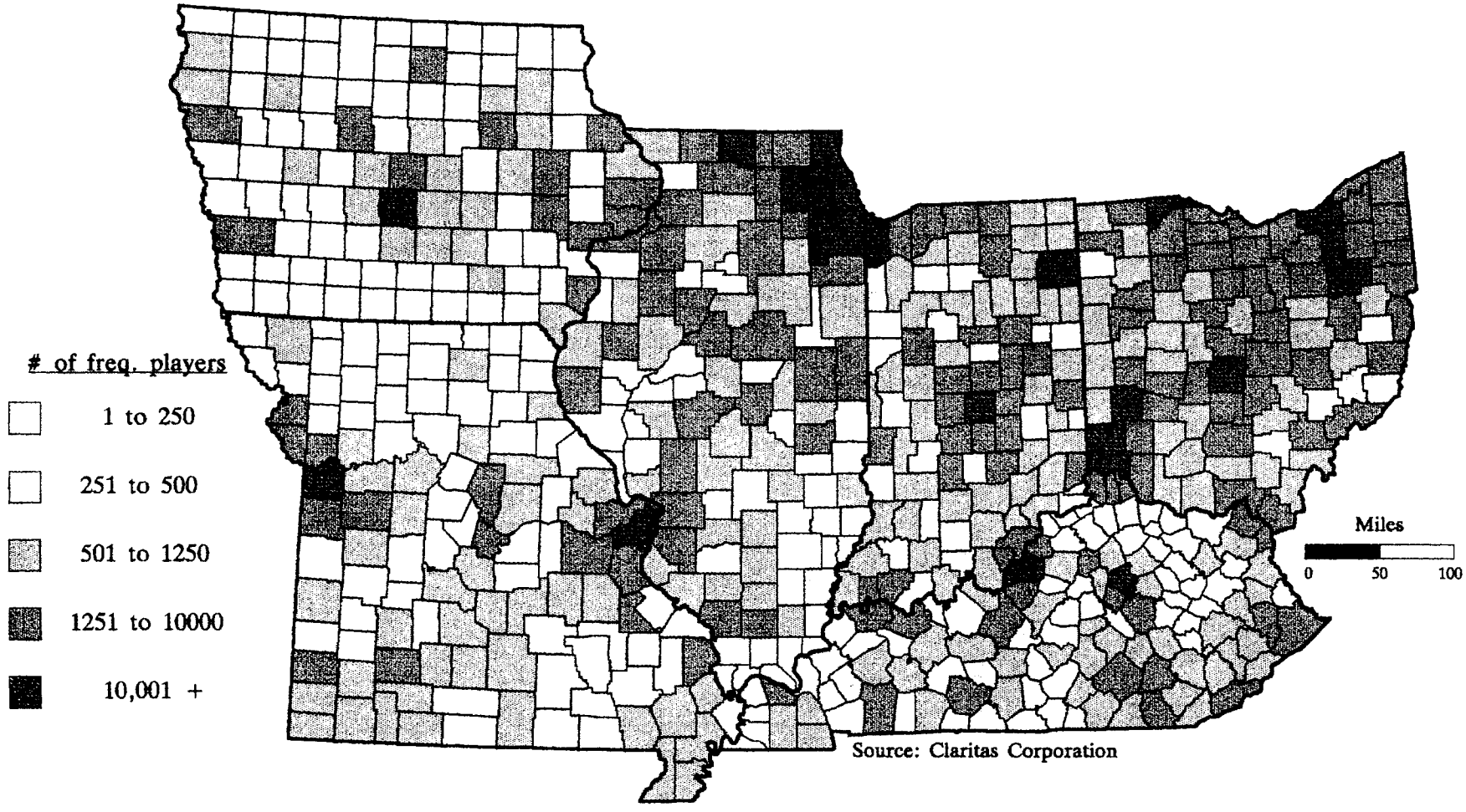

Figure 11. Frequent tennis players* per county
*those who play tennis 10x/year or more

also were not particularly high in the number of frequent players included southern Iowa, northern Missouri, and north central Kentucky adjacent to the Ohio border.

The relative distribution of Claritas data shows most counties did not vary much from the entire region's production of one frequent player in every 26 people (Figure 12). Indeed, even counties in or around major metropolitan areas had indices falling around the 1.00 rating. Of course, there were a few noticeable exceptions where much higher than average demand indices were displayed. DuPage County, Illinois, a suburban Chicago county, was one of those exceptions, as were the two Iowa counties of Johnson and Story, in which the respective campuses of the University of Iowa and Iowa State are located.

The actual numbers for the states indicated that the highest and lowest tennis demand indices hovered even closer around the regional rate of 1.00 when Claritas figures were considered (see again Table V). However, unlike the magazine subscription data, it was not Indiana and Missouri in which these Claritas "extremes" were found, but rather in Illinois with the leading index of 1.08, and in Iowa with its index of 0.88. Indeed, when it came to actual tennis participation, Indiana (0.95) and Missouri (0.98), as well Kentucky (0.94) were just barely under the regional average. Perhaps the increased rate of demand in Missouri, which had the lowest rate of tennis "consumption," is a reflection of its "Sport for Sport's Sake" mentality that actual participation supersedes all other means of involvement in athletics. In Ohio, according to Claritas measures, the rate of tennis demand was well in-step with the entire region, as

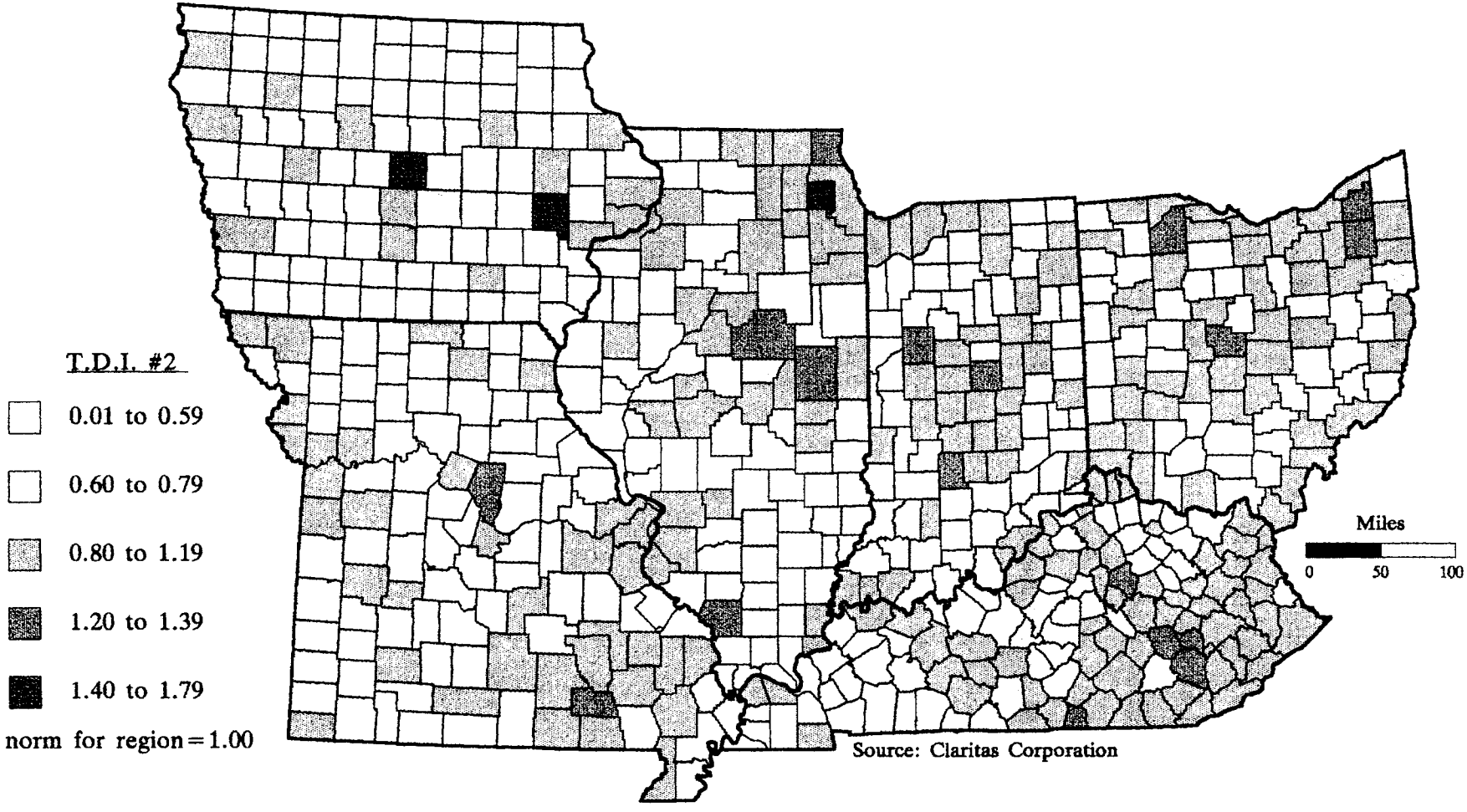

Figure 12. Claritas demand index of frequent tennis play per county

here too, one in 26 people played tennis frequently, yielding a 1.00 demand index.

As was the case with the states, the population classes' demand indices tended to be more closely centered around the regional norm with the use of Claritas data (see again Table VI). For instance, Claritas' highest index of tennis demand, which again belonged to Class 6, was only 1.17. Class 1 counties, although they still possessed the lowest index of tennis participation, produced a rate of almost three-fourths the regional norm, compared to a rate of under half the region's with subscriber data. Indeed, the use of Claritas figures raised the demand indices of the two Class 7 counties to slightly above average rates from their much lower interest showings of around 80 percent before. Similar to the indices reflecting subscriber and membership patterns, the trend of increasing rates of demand with each population class was also evident using Claritas frequent player data. That is, the indices of 0.73, 0.80, 0.94, and 1.06 for Classes 2, 3, 4, and 5 respectively, all were leading up to Class 6's (previously reported) highest index of frequent tennis play (1.17).

Thus, it seemed that the more urban, or perhaps, more suburban a county became, the more likely there was "consumption of" and "participation in" the sport of tennis. As Rooney and Pillsbury (1992) have suggested in relation to this trend, the game of tennis tends to accomodate the busy suburban lifestyle more easily than golf, for example, because of the faster pace and more instant sense of gratification. Also, the authors felt that suburban tennis leagues often serve as important social scenes for many young professionals.

Tennis Supply vs. Tennis Demand

Based upon the raw totals of both tennis supply and demand numbers, one court served approximately five magazine subscribers and/or USTA members in the study area during this early 1990's time period. Of course, with so many more people found to be actually playing the game than merely following it, the regional ratio of demand to supply swelled to about 81 frequent players per court with the substitution of Claritas demand data.

Tennis Intensity Index #1

It is clear from the county-level map of subscribers and USTA members to courts that major portions of Illinois and Indiana were under-supplied with courts relative to the region's rate of intensity. (Figure 13). A pattern of very high intensity indices extended from the eastern edge of Illinois in a letter C-like formation on through to some southwestern counties around St. Louis. In Indiana, these very high intensity indices seemed to be concentrated in the central to southeastern part of the state. In the state of Ohio, higher intensity ratings could be found in some southern counties, especially those just east of Cincinnati. For the most part, the states of Iowa, Missouri, and Kentucky were shown as having low tennis intensity. However, there were a few standout counties in these states where demand was greatly exceeding supply. They included Bullitt County in the Louisville area; two rural counties in eastern Kentucky;

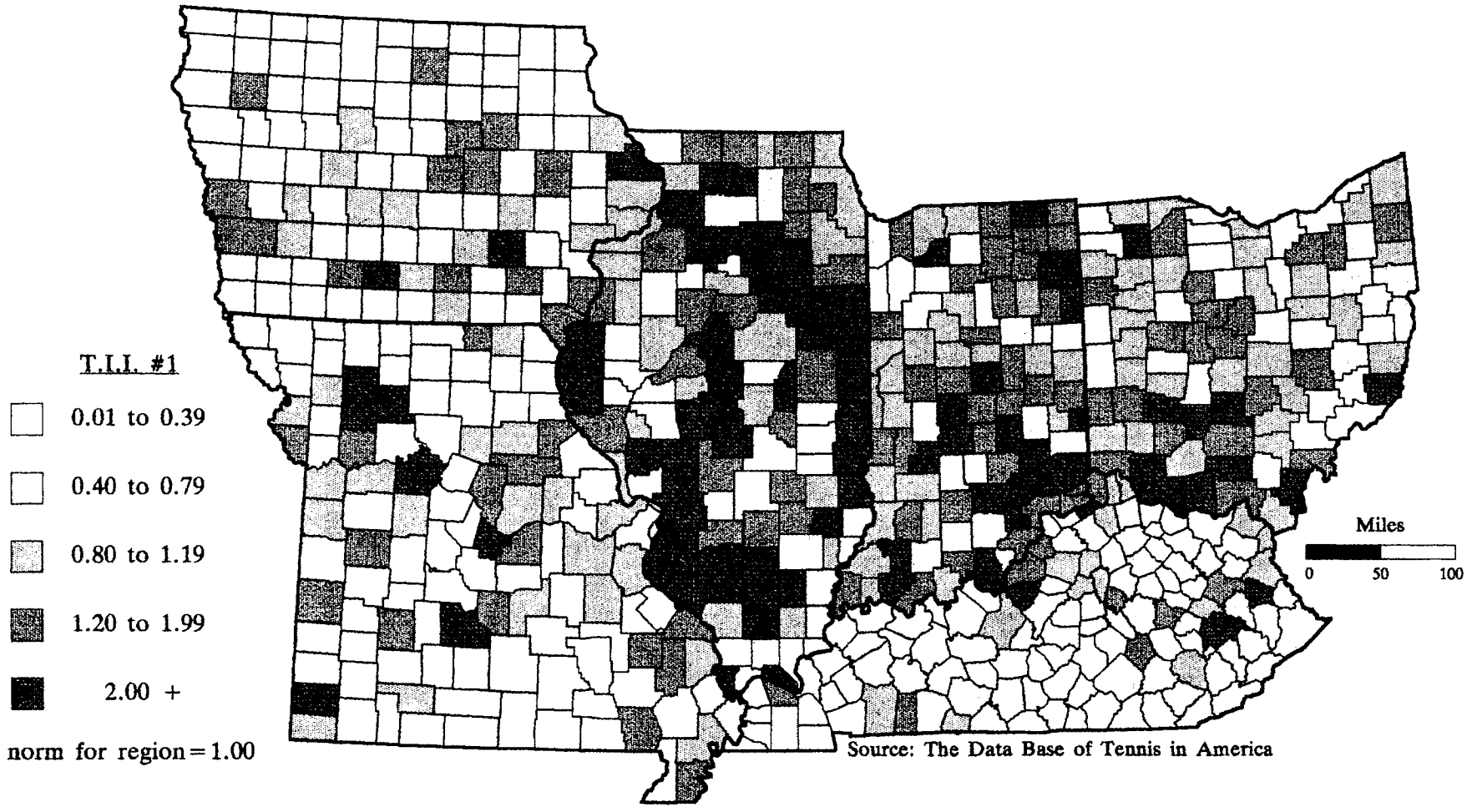

Figure 13. Tennis Intensity Index #1 * per county
*with the DBTA T.D.I. as the demand measure

Newton County in the Joplin, Missouri area; and some rural counties in central Iowa and Missouri.

Indeed, the statistics do confirm that Indiana and Illinois were the states which produced the two highest rates of tennis intensity with their respective indices of 1.21 and 1.20 (Table VII). These indices mean that magazine and membership demand was exceeding court supply at a rate of nearly 20 percent the regional norm. Iowa and Missouri both possessed below average intensity indices that were about 75 percent of the regional rate, suggesting that these two states were relatively over-supplied with courts given their share of magazine subscribers and USTA members. While Kentucky, whose T.I.I. #1 was 0.84, exhibited this same trait of court surplus, Ohio showed a near-perfect balance between tennis "consumers" and tennis courts with its rate of 1.04.

A resounding over-abundance of tennis courts was found for the Class 1 counties with subscription and membership data as the demand variable (Table VIII). With a rather low index of 0.39, the counties of Population Class 1 simply were not generating enough subscriptions and/or memberships to tap into their supply of tennis courts. As would be expected based on many previously discussed findings, it was the Class 6 counties which had the highest T.I.I. #1 at 1.18. Not too far behind Class 6 in the intensity of tennis activity were the Class 5 counties (1.12), and Cook County, Illinois (1.10). All three of these areas could have used a few more courts to serve their respective shares of tennis "consumers." While Class 4 with its intensity rating of 0.95 showed a slight imbalance in favor of supply, more imbalanced relationships were found to exist in the counties of

TABLE VII

TENNIS INTENSITY STATISTICS
BY STATE

State	Total # of Courts	Total # of Ten. Mag. & USTA subs.	Ten. Mag. & USTA subs. per court	T.I.I. # 1	Total # of Claritas freq. plyrs.	Claritas freq. plyrs. per court	T.I.I. # 2
Illinois	4,316	26,494	6.14	1.20	473,602	109.73	1.36
Indiana	2,446	15,122	6.18	1.21	201,102	82.22	1.02
Iowa	1,842	6,826	3.71	0.73	93,053	50.52	0.63
Kentucky	2,064	8,866	4.30	0.84	133,093	64.48	0.80
Missouri	2,862	10,551	3.69	0.72	191,003	66.74	0.83
Ohio	5,198	27,662	5.32	1.04	416,081	80.05	0.99
REGION	18,728	95,521	5.10	1.00	1,507,934	80.52	1.00

TABLE VIII

TENNIS INTENSITY STATISTICS
BY POPULATION CLASS OF COUNTY

Pop. Class	Total # of Courts	Total # of Ten. Mag. & USTA subs.	Ten. Mag. & USTA subs. per court	T.I.I. # 1	Total # of Claritas freq. plyrs.	Claritas freq. plyrs. per court	T.I.I. # 2
Class 1	374	739	1.98	0.39	18,266	48.84	0.61
Class 2	1,930	6,277	3.25	0.64	110,443	57.22	0.71
Class 3	2,372	10,321	4.35	0.85	161,758	68.19	0.85
Class 4	2,160	10,461	4.84	0.95	162,566	75.26	0.93
Class 5	5,002	28,638	5.73	1.12	452,224	90.14	1.12
Class 6	4,357	26,196	6.01	1.18	327,495	75.17	0.93
Class 7 (combined)	2,533	12,889	5.09	1.00	275,182	108.64	1.35
7-Cook Co., IL	1,818	10,167	5.59	1.10	219,007	120.47	1.50
7-Cuyahoga Co., OH	715	2,722	3.81	0.75	56,175	78.57	0.98
REGION	18,728	95,521	5.10	1.00	1,507,934	80.52	1.00

the remaining population groups. That is, the below average indices of Class 2 (0.64), Class 3 (0.85), and Cuyahoga County, Ohio (0.75) indicated an excess of tennis courts.

Tennis Intensity Index #2

The distribution of frequent players to courts did resemble the first tennis intensity map in many ways (Figure 14). For instance, the C-shaped pattern of Illinois counties with high intensity indices also emerged with the use of Claritas demand data. Again, south-eastern Indiana and southern Ohio were quite prominent in the intensity of tennis activity. But despite these similarities, there were some strikingly different patterns between the maps as a result of replacing tennis "consumption" with tennis "participation." For example, instead of only two eastern Kentucky counties being shown with high intensity indices, the entire southeastern part of the state exhibited signs of tennis court deficiency when compared to frequent players. Moreover, in northern and southern Missouri, many more counties were displaying above average rates of tennis intensity, and in Iowa, it appeared as though the use of Claritas data gave the state a more consistent pattern of low intensity indices. Interesting contrasts could be seen in the areas around major cities, as well. In Chicago, Cleveland, and Kansas City area counties for example, it looked like the use of Claritas data raised intensity indices, while counties in the Cincinnati, Des Moines, and Louisville areas showed rates of tennis intensity that actually dropped.

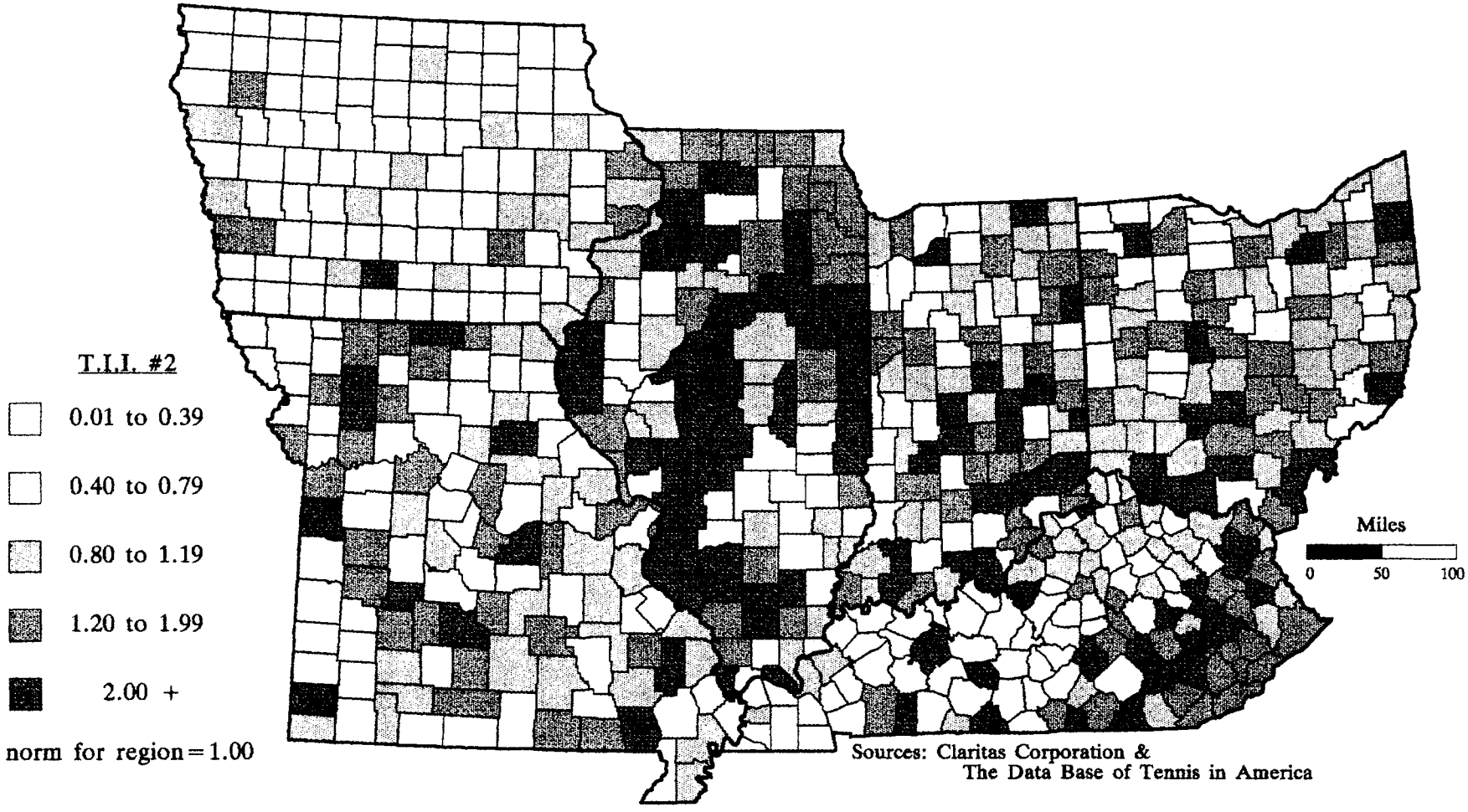

Figure 14. Tennis Intensity Index #2 * per county
*with the Claritas index of frequent tennis play as the demand measure

Again, the numbers reveal that it was Illinois which most needed tennis courts with its above average T.I.I. #2 of 1.36 (see again Table VII). There were almost 110 frequent players per court in Illinois compared to the region's 81 per court. If only it were possible or feasible to move tennis courts physically from one place to another, then Iowa would have been in a prime position to help out its neighbor across the Mississippi River. That is, Iowa had a more than plentiful stock of courts for its share of frequent tennis players, as evident by its low index of 0.63. While still showing a surplus of courts, at least Kentucky and Missouri produced higher rates of tennis intensity than did Iowa with their respective indices of 0.80 and 0.83. Finally, it was in Indiana (1.02) and Ohio (0.99) where exceptional balances between frequent players and tennis courts could be found. Thus, it appeared that for both sets of demand data, the state of Ohio stood out as best being able to keep tennis supply in sync with tennis demand.

Class 7's Cook County, Illinois yielded the highest intensity index at 1.50, making Chicago's home county the most deficient in providing courts for its frequent players (see again Table VIII). This is in stark contrast to the county's Class 7 partner, Cuyahoga in Ohio. Indeed, the home county of Cleveland showed a relatively well-balanced ratio of frequent players to courts with its T.I.I. #2 of 0.98. Among the other county population classes, only Class 5 (1.12) had an above average index of tennis intensity, or rather, a (slim) need for more courts. Both Class 6 and Class 4 showed a slight imbalance favoring supply, as they shared the same below average index of 0.93. In a predictable showing, it was the rural counties of Class 1

which were relatively over-supplied with tennis courts at 0.61, while similar yet less drastic patterns of court surplus were exhibited in the counties of Class 2 (0.71) and Class 3 (0.85).

An Analysis of Several Midwestern MSAs

The purpose of this section is to examine the tennis market for various Metropolitan Statistical Areas (M.S.A.) and Consolidated MSAs in the six-state region. This has been done by comparing the supply and demand amounts between an area's central city county, or the county in which the main city is located, and its collar counties. In this region, only two central city counties fell into the Class 7 range of million or more people. Thus, in order to have a reasonable amount of cities for analysis, all MSAs with Class 6 central city counties will also be included, as will the St. Louis MSA with its Class 5 central city county. This makes a total of nine study cities (Table IX). Because it is believed that the Claritas Corporation's data on frequent players more accurately reflect a general interest in the game, they will serve as the only demand variables.

With the exception of Will County, Illinois, the general trend in the Chicago - Gary CMSA was that the greater a county's population, the greater the number of tennis courts. On a per capita basis, this area showed the expected pattern of suburban counties having better rates of tennis supply than the central city county, with DuPage and Lake County's above average, respective rates of 1.14 and 1.43. However, even Cook County's below average supply index

TABLE IX

TENNIS INTENSITY STATISTICS
FOR SELECTED (C.)MSAs

CHICAGO, IL - (GARY, IN) *TOTAL POP. = 7,937,452*

County - Pop. Class	Total Population	Total # of Courts	T.S.I.	Total # of freq. plyrs.	freq. plyrs. per court	T.I.I. # 2
*Cook - 7	5,105,067	1,818	0.75	219,007	120.47	1.50
DuPage - 6	781,666	424	1.14	43,289	102.10	1.27
Lake - 6	516,418	352	1.43	26,182	74.38	0.92
(*)Lake, IN - 5	475,594	209	0.92	16,879	80.76	1.00
Will - 5	357,313	105	0.62	15,468	147.31	1.83
Kane - 5	317,471	106	0.70	13,496	127.32	1.58
McHenry - 5	183,241	57	0.65	8,504	149.19	1.85
Porter, IN - 5	128,932	39	0.64	5,431	139.26	1.73
Kendall - 3	39,413	7	0.37	1,814	259.14	3.22
Grundy - 3	32,337	3	0.20	958	319.33	3.97
MSA Total	**7,937,452**	**3,120**	**0.83**	**351,028**	**112.51**	**1.40**
(Kenosha = county in Wisc.)						

CLEVELAND, OH *TOTAL POP. = 2,759,823*

*Cuyahoga - 7	1,412,140	715	1.07	56,175	78.57	0.98
Summit - 6	514,990	200	0.82	21,491	107.46	1.33
Lorain - 5	271,126	115	0.89	9,834	85.51	1.06
Lake - 5	215,499	112	1.09	8,489	75.79	0.94
Portage - 5	142,585	71	1.05	6,784	95.55	1.19
Medina - 5	122,354	27	0.46	5,440	201.48	2.50
Geauga - 4	81,129	71	1.84	4,208	59.27	0.74
MSA Total	**2,759,823**	**1,311**	**1.00**	**112,421**	**85.75**	**1.06**

ST. LOUIS, MO *TOTAL POP. = 2,444,099*

St. Louis Co. - 6	993,529	905	1.92	45,722	50.52	0.63
*St. Louis City - 5	396,685	117	0.62	15,471	132.23	1.64
St. Clair, IL - 5	262,852	59	0.47	9,841	166.80	2.07
Madison, IL - 5	249,238	55	0.46	9,720	176.73	2.19
St. Charles - 5	212,907	66	0.65	9,300	140.91	1.75
Jefferson - 5	171,380	73	0.90	6,416	87.89	1.09
Franklin - 4	80,603	38	0.99	2,892	76.11	0.95
Clinton, IL - 3	33,944	17	1.05	993	58.41	0.73
Monroe, IL - 2	22,422	1	0.09	839	839.00	10.42
Jersey, IL - 2	20,539	20	2.05	601	30.05	0.37
MSA Total	**2,444,099**	**1,351**	**1.16**	**101,795**	**75.35**	**0.94**

TABLE IX (Continued)

CINCINNATI, OH *TOTAL POP. = 1,744,124*

County - Pop. Class	Total Population	Total # of Courts	T.S.I.	Total # of freq. plyrs.	freq. plyrs. per court	T.I.I. # 2
*Hamilton - 6	866,228	578	1.40	37,161	64.29	0.80
Butler - 5	291,479	158	1.14	12,504	79.14	0.98
Clermont - 5	150,187	10	0.14	5,857	585.70	7.27
Kenton, KY - 5	142,031	126	1.87	5,705	45.28	0.56
Warren - 5	113,909	65	1.20	4,665	71.77	0.89
Campbell, KY - 4	83,866	46	1.15	3,205	69.67	0.87
Boone, KY - 4	57,589	24	0.88	2,201	91.71	1.14
Dearborn, IN - 3	38,835	6	0.32	1,499	249.83	3.10
MSA Total	**1,744,124**	**1,013**	**1.22**	**72,797**	**71.86**	**0.89**

COLUMBUS, OH *TOTAL POP. = 1,377,419*

*Franklin - 6	961,437	500	1.09	43,870	87.74	1.09
Licking - 5	128,300	42	0.69	4,353	103.64	1.29
Fairfield - 5	103,461	33	0.67	4,116	124.73	1.55
Delaware - 4	66,929	22	0.69	3,367	153.05	1.90
Pickaway - 3	48,255	4	0.17	1,788	447.00	5.55
Madison - 3	37,068	15	0.85	1,287	85.80	1.07
Union - 3	31,969	6	0.39	1,072	178.67	2.22
MSA Total	**1,377,419**	**622**	**0.95**	**59,853**	**96.23**	**1.20**

INDIANAPOLIS IN *TOTAL POP. = 1,249,822*

*Marion - 6	797,159	418	1.10	32,333	77.35	0.96
Hamilton - 5	108,936	24	0.46	5,651	235.46	2.92
Johnson - 4	88,109	25	0.60	3,505	140.20	1.74
Hendricks - 4	75,717	14	0.39	3,248	232.00	2.88
Morgan - 4	55,920	5	0.19	2,246	449.20	5.58
Hancock - 3	45,527	9	0.42	2,060	228.89	2.84
Shelby - 3	40,307	4	0.21	1,368	342.00	4.25
Boone - 3	38,147	21	1.16	1,741	82.90	1.03
MSA Total	**1,249,822**	**520**	**0.88**	**52,152**	**100.29**	**1.25**

TABLE IX (Continued)

KANSAS CITY, MO *TOTAL POP. = 961,396*

County - Pop. Class	Total Population	Total # of Courts	T.S.I.	Total # of freq. plyrs.	freq. plyrs. per court	T.I.I. # 2
*Jackson - 6	633,232	266	0.88	26,425	99.34	1.23
Clay - 5	153,411	109	1.49	6,342	58.18	0.72
Cass - 4	63,808	14	0.46	2,314	165.29	2.05
Platte - 4	57,867	22	0.80	2,640	120.00	1.49
Lafayette - 3	31,107	15	1.01	776	51.73	0.64
Ray - 2	21,971	6	0.57	685	114.17	1.42
MSA Total	**961,396**	**432**	**0.95**	**39,182**	**90.70**	**1.13**
(Leavenworth,	Wyandotte,	Johnson,	Miami	=	counties	in Kansas)

LOUISVILLE, KY *TOTAL POP. = 952,662*

*Jefferson - 6	664,937	426	1.35	27,748	65.14	0.81
Clark, IN - 4	87,777	29	0.69	3,047	105.07	1.30
Floyd, IN - 4	64,404	68	2.22	2,462	36.21	0.45
Bullitt - 3	47,567	10	0.44	1,837	183.70	2.28
Oldham - 3	33,263	13	0.82	1,323	101.77	1.26
Harrison, IN - 3	29,890	5	0.35	898	179.60	2.23
Shelby - 2	24,824	9	0.76	784	87.11	1.08
MSA Total	**952,662**	**560**	**1.24**	**38,099**	**68.03**	**0.84**

DAYTON - (SPRINGFIELD), OH *TOTAL POP. = 951,270*

*Montgomery - 6	573,809	288	1.06	23,274	80.81	1.00
(*)Clark - 5	147,548	95	1.35	5,409	56.94	0.71
Green - 5	136,731	88	1.35	6,346	72.11	0.90
Miami - 4	93,182	55	1.24	3,707	67.40	0.84
MSA Total	**951,270**	**526**	**1.16**	**38,736**	**73.64**	**0.91**

of 0.75 was better than some Class 5 counties further out in the CMSA. Many of these low supply rates, accordingly, led to high rates of tennis intensity, as frequent players greatly outnumbered courts. Although DuPage County had better than average supply, there still did not appear to be enough courts for its share of Claritas frequent players.

In the Cleveland CMSA, again the raw distribution of courts basically followed the population distribution of the area, except for Medina County to the south and west. However, the area's relative distribution of courts was much different than in the Chicago area. Here, the central city county and some Class 5 counties, namely Lake and Portage, possessed supply indices which were only slightly above the regional rate, as opposed to the well below average showings of their Chicago area counterparts. The low supply of courts in Medina County definitely contributed to its extremely high intensity index, while the same was true but to lesser degree in Summit County. Interestingly, Portage County could have used a few more tennis courts to better serve its share of frequent players despite its near regional rate of supply.

It seemed as though the population distribution of the St. Louis MSA did not really dictate the raw distribution of tennis courts. Indeed, there were several instances of less populated counties having more courts. Relatively speaking, the city of St. Louis had a poor rate of supply at 0.62, while the more suburban St. Louis County had a very high supply index nearly twice that of the region. Among the moderately populated counties, the Missouri side of the river yielded higher supply indices than the Illinois' counties of

St. Clair and Madison, whose rates of supply were under half the region's and whose intensity rates were double. An interesting contrast existed between two Illinois Class 2 counties, the abundantly-supplied Jersey county to the north, and Monroe County to the south where only one tennis court was found.

In the Cincinnati CMSA, as with the St. Louis area, a greater population did not necessarily translate into a greater number of courts. It is most likely that population, coupled with distance from the city had much to do with supply. For example, the easternmost county of Clermont (Class 5) and the westernmost county of Dearborn in Indiana (Class 3) both had very low tennis court totals and consequently, poor supply rates. Moreover, the top two rates of tennis supply belonged to counties in the heart of the C.M.S.A. including Kenton County, Kentucky (1.87) and the central city county of Hamilton, itself (1.40). In relation to Claritas frequent players, only one county really approximated the regional rate of intensity, that being Butler County with an index of 0.98.

The Columbus, Ohio and Indianapolis, Indiana MSAs were very much alike in many ways. First, these areas are comparable in population size and are located in the center of their states. Secondly, both central city counties showed above average rates of tennis supply around 1.10 times the regional norm, while most of their encircling, collar counties possessed rather below average supply indices. The tennis intensity index for Columbus' central city county, Franklin, was slightly above average at 1.09, and it was one of the lowest rates of players to courts for its area. As for the Indianapolis area, although intensity indices were higher than in Columbus, the

central city county of Marion shared the similar distinction of having a near average rate of intensity being one of the lowest within its MSA.

Of course, the Kansas City MSA is not quite complete without data from many of its suburban counties in state of Kansas. However, even without tennis market statistics from such places as Overland Park and Shawnee, some interesting differences could be seen between counties in Missouri. For instance, the central city county of Jackson had a much lower rate of supply at 0.88 than the neighboring Class 5 county to the north, Clay, with its strong 1.49 supply index. The outlying, Class 3 county of Lafayette, which had a near perfect 1.01 rating, almost matched the region's per capita supply of courts. However, this county's low rate of frequent players resulted in a below average tennis intensity index, while all other counties, except Clay, were exhibiting very high rates of tennis intensity.

In the Louisville MSA, the central city county of Jefferson had the greatest number of courts and a considerable rate of supply (1.35). Nonetheless, Floyd County, Indiana, a Class 4 county just across the Ohio river, greatly surpassed Jefferson's index, supplying tennis courts at a rate over two times the region's. The remaining five counties of the area had supply indices which only reached about 80 percent of the region's norm. Naturally, this led to some high rates of tennis intensity, ranging from 1.26 to 2.28. Not surprisingly, Jefferson and Floyd counties exhibited below average rates of intensity, while the primarily rural Shelby County showed a good balance of players to courts with its index of 1.08.

The final MSA was yet another urban area in the state of Ohio. Here, the raw distribution of courts did correspond perfectly with the population structure of the area, where the greater the size meant the greater the court amounts. Montgomery County, home of the city of Dayton, kept pace nicely with the regional rate of tennis court supply with its index of 1.06. However, it was the lowest supply index of the four counties in the region. To the east and northeast of Montgomery were the respective Class 5 counties of Greene and Clark. Both had an impressive 1.35 supply index, but below average intensity indices, or possibly too many courts for their shares of frequent players. This was not the case in Montgomery, as its player to court ratio was almost exactly the same as the region's.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The objective of this study was to measure the contemporary supply of tennis courts for a six-state region in parts of the Midwest. In doing so, comparisons were made between tennis court supply and many other variables, including population size and different types of interest in the game. Indeed, this study has produced a variety of spatial patterns from which several conclusions can be drawn.

At the state-level of analysis, it was Ohio which really set the standards in tennis court supply, standards which the other five states could not quite attain. For instance, on an absolute basis, the state of Ohio not only had the most tennis courts, but also an excellent balance between private and public facilities. In relative terms, Ohio's rate of court supply virtually matched the regional supply norm, which in turn helped to give the state near perfect rates of tennis intensity, or the right amount of supply for its shares of demand. The other states may have had one of the previous "ideal" conditions going for them, but not all conditions like Ohio did.

Iowa, Kentucky, and Missouri all had strong, above average

rates of tennis supply. Interestingly, for each of the three states, around 70 to 80 percent of the counties were in the Class 1 or Class 2 range. These high proportions of rural counties were much greater than those in Illinois, Indiana, and Ohio where coincidentally, lower supply indices were found. This state-level data seemed to support the first hypothesis: as a county increases in population, its per capita index of supply will decrease. However, the data by population class did not corroborate this finding very well at all.

Indeed, the most rural population range, Class 1, did have one of the highest per capita supply rates among the population classes. However, the supply indices did not really decrease with each successive or larger population class as the first hypothesis would suggest. In fact, Classes 2, 3, 4, and 5 showed indices which wavered back and forth between slightly above average and slightly below average rates of supply. Furthermore, it was the highly populated Class 6 counties which yielded the greatest rate of court supply. These findings, therefore, did not make a very good case for the notion that rates of tennis supply will decrease as population increases. It should be noted, though, that the Class 7 county of Cook in Illinois was really under-supplied with all types of tennis courts. Thus, when compared to Cook's dismal supply showing, both rural and urban counties appeared to be better served with places to play the game.

The second hypothesis of this study said that as a county's demand for tennis increases, per capita rates of court supply will increase. This hypothesized pattern also did not appear to be strongly substantiated by the data. For instance, both sets of tennis-

interest data showed one of the few distinct trends in this study, that being, an increasing rate of demand with each population class, from the lowest rate for Class 1 counties to the highest for Class 6. The respective supply indices, however, did not correspond as expected. That is, the population classes' rates of tennis supply did not steadily increase as did their rates of demand. Rather, supply indices tended to fluctuate, as was previously described about Classes 2, 3, 4, and 5. Moreover, the Class 1 range had a high index of supply despite showing very low rates of interest in the game.

In the third hypothesis, it was proposed that as a county's interest in tennis increases, the rate of private court supply will increase. Unlike the first two hypotheses, this expected relationship between tennis demand and private court development did appear to have some validity to it. At the population class-level of analysis, increasing rates of demand up to Class 6 were accompanied by increasing percentages of private courts, and also by increasing private supply indices. It is especially noteworthy that the Class 6 counties had the greatest rates of demand and private court supply since in this particular study region, these counties often served as the urban center of an MSA. Data for the two Class 7 counties, however, did not quite fit the expected pattern. That is, although Cook County showed higher rates of demand than Cuyahoga County, Chicago's home county had a much lower rate of private supply. Perhaps the Cleveland area, with its smaller population, had a more manageable level of urbanization which was sufficient enough to attract and sustain private facility development.

Unfortunately, an analysis of several MSAs did not produce

very convincing evidence to support the fourth hypothesis, which stated that central city counties will have lower rates of supply than surrounding counties. Only three of the nine areas, for example, showed the expected pattern of central city counties being relatively under-supplied with courts, especially in comparison to some adjacent, suburban counties. Chicago, St. Louis, and Kansas City were the areas exhibiting this supply pattern. By contrast, the central city county of the Cincinnati and Louisville areas had very high, above average rates of supply. In the other four areas, including Cleveland, Columbus, Indianapolis, and Dayton, the central city county had supply rates which were not too far above the regional norm, while the suburban or collar counties were the places that were struggling to maintain appropriate amounts of court supply. These varied patterns of court supply, therefore, did not really support the notion that central city counties are worse than surrounding counties at providing suitable amounts of tennis courts. Of course, it is acknowledged that many of this region's central city counties are also home to some suburban communities. This is a circumstance which definitely would have contributed to the higher rates of supply.

Recommendations

Indeed, many of the expected supply patterns were not overwhelmingly confirmed by the data from this Midwest study region. Perhaps the hypothesized relationships were occurring, but not independently of one another, and as a consequence, the individual

predictions were offset by all the interactions. If this is true, then for future studies on tennis market conditions, statistical tests should be performed in order to gauge the individual strength of each hypothesis. These tests would help determine which factors were significantly affecting all other expected patterns of tennis supply.

Before making any further study recommendations, it is important to consider the sport of tennis in relation to another popular individual sport. In golf, for example, each place of play, the 9 or 18 hole golf course, has its own design, character, and challenges. Indeed, a course's reputation or perceived difficulty can attract players from great distances. By contrast, the standard 120' by 60' tennis court usually does not have that same appeal to draw even the most enthusiastic players from other towns in a county. Hence for future studies, it would probably be best to examine the tennis market at a scale smaller than the county-level one featured here, in order to see more localized trends in tennis supply, demand, and intensity. Indeed, a study by zip code, for example, would have more clearly differentiated between suburban tennis market patterns and those of the city.

As for data gathering, many recommendations come to mind. First, calls should be made to city park and recreation departments (or as local an agency as possible) in addition to state-level agencies. This is suggested so that there may be some verification of the recreation places reported in state inventories as having tennis courts. Perhaps it is the case that some places no longer have courts, or that some courts are so worn down that local recreation providers would no longer consider them useable. Of course, with information

from local sources, it would be possible, then, to conduct the previously suggested small-scale analysis. However, it is important to note that all the calling and/or mailing involved to many cities and towns in one state alone would be very costly.

In addition to asking for simply the number of courts, another recommendation is to collect comprehensive data on court condition and usage. These variables will often influence a player's decision to use a certain court or set of courts. Furthermore, one should inquire as to if tennis courts are lighted or are indoors, since these two particular amenities serve to extend court availability. Then, when entering lighted or indoor tennis facilities into a database, their court totals should be weighted somehow to reflect this greater availability or opportunity to play.

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APPENDICES

APPENDIX A

TYPES OF TENNIS FACILITIES

PRIVATE SECTOR FACILITIES

CCLU= Club or Commercial facilities - Local Use

ie: intended for local residents who pay fees to be members or clients of these organizations or businesses

eg:
golf or country clubs
tennis or racquet clubs (leagues, etc.)
general athletic or fitness clubs

HROL= Hotels, Resorts, and Other Lodging facilities

ie: intended for the non-local, tennis-playing traveler

also:
lodges and (RV) campgrounds

QPUB= Quasi-PUBlic courts

ie: provided by local private groups for community use or enhancement

eg:
YMCA's
boy's & girl's camps
churches, etc.

SCHL= SCHooL playground courts

ie: located at all types of privately-funded schools up to the high school level

eg:
elementary schools
middle or junior high schools
high schools

UNAC= UNACcessible courts

ie: intended only for those who reside, attend, or work at these places

eg:
private residences (homes, apts, condos)
academies (private boarding schools, etc.)
employee or workplace gyms
hospitals or treatment centers

UNAC-T= UNACcessible Tennis academies or schools

PUBLIC SECTOR FACILITIES

PR __ __= Parks & Recreation department courts
ie: found at various levels of government

PRMC= Parks & Rec - Municipal, (township), or County
PRFE= Parks & Rec - FEderal
PRST= Parks or Resorts - STate
(to include and account for resorts in state owned and operated recreational sites)

SCHL= SCHooL playground courts
ie: located at all types of publicly-funded schools up to the high school level
eg:
elementary schools
middle or junior high schools
high schools

UNAC= UNACcessible courts
ie: although taxpayer money may be used to to finance these places, they are NOT intended for the general public's use
eg:
military bases
correctional facilities
hospitals or treatment centers

COLLEGE LEVEL FACILITIES

COLL= COLLege - university courts

ie: found at more academic-oriented, four and two year institutions

eg:

small colleges & major universities

junior or community colleges

OTHR= OTHeR (post secondary-ed.) school courts

ie: found at places which also provide instruction after high school

eg:

vo-tech schools

trade or art schools

technology institutes

APPENDIX B

COUNTY LEVEL DATA FOR EACH POPULATION CLASS

Class 1 Counties:
< 10,000

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
IL					
Brown	5,836	105	7	15.00	0.19
Calhoun	5,322	118	1	118.00	1.47
Edwards	7,440	168	2	84.00	1.04
Gallatin	6,909	216	3	72.00	0.89
Hamilton	8,499	189	1	189.00	2.35
Hardin	5,189	178	3	59.33	0.74
Henderson	8,096	126	1	126.00	1.56
Pope	4,373	84	1	84.00	1.04
Pulaski	7,523	185	7	26.43	0.33
Putnam	5,730	172	4	43.00	0.53
Schuyler	7,498	149	4	37.25	0.46
Scott	5,644	134	2	67.00	0.83
Stark	6,534	158	2	79.00	0.98
IN					
Benton	9,441	210	2	105.00	1.30
Crawford	9,914	267	1	267.00	3.32
Ohio	5,315	160	1	160.00	1.99
Switzerland	7,738	196	2	98.00	1.22
Union	6,976	171	1	171.00	2.12
Warren	8,176	210	2	105.00	1.30
IA					
Adair	8,409	187	4	46.75	0.58
Adams	4,866	101	2	50.50	0.63
Audubon	7,334	114	2	57.00	0.71
Clarke	8,287	229	1	229.00	2.84
Davis	8,312	204	5	40.80	0.51
Decatur	8,338	247	16	15.44	0.19
Fremont	8,226	186	5	37.20	0.46
Howard	9,809	153	13	11.77	0.15
Ida	8,365	206	10	20.60	0.26
Lucas	9,070	202	7	28.86	0.36
Monroe	8,114	146	2	73.00	0.91
Osceola	7,267	145	7	20.71	0.26
Pocahontas	9,525	215	11	19.55	0.24
Ringgold	5,420	116	2	58.00	0.72
Taylor	7,114	166	7	23.71	0.29
Van Buren	7,676	204	8	25.50	0.32
Wayne	7,067	190	4	47.50	0.59
Worth	7,991	137	17	8.06	0.10

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
KY					
Ballard	7,902	253	6	42.17	0.52
Bath	9,692	299	4	74.75	0.93
Bracken	7,766	200	3	66.67	0.83
Carlisle	5,238	137	2	68.50	0.85
Carroll	9,292	257	12	21.42	0.27
Clinton	9,135	463	1	463.00	5.75
Crittenden	9,196	273	3	91.00	1.13
Cumberland	6,784	212	2	106.00	1.32
Elliott	6,455	282	1	282.00	3.50
Fulton	8,271	171	4	42.75	0.53
Gallatin	5,393	175	1	175.00	2.17
Hancock	7,864	205	6	34.17	0.42
Hickman	5,566	126	2	63.00	0.78
Lee	7,422	339	4	84.75	1.05
Livingston	9,062	276	3	92.00	1.14
Lyon	6,624	173	8	21.63	0.27
McLean	9,628	240	4	60.00	0.75
Menifee	5,092	228	1	228.00	2.83
Metcalfe	8,963	318	6	53.00	0.66
Nicholas	6,725	181	2	90.50	1.12
Owen	9,035	282	4	70.50	0.88
Owsley	5,036	263	1	263.00	3.27
Robertson	2,124	82	3	27.33	0.34
Spencer	6,801	178	3	59.33	0.74
Trimble	6,090	195	3	65.00	0.81
Wolfe	6,503	299	1	299.00	3.71
MO					
Atchison	7,457	285	8	35.63	0.44
Caldwell	8,380	209	1	209.00	2.60
Carter	5,515	273	5	54.60	0.68
Chariton	9,202	201	9	22.33	0.28
Clark	7,547	221	3	73.67	0.91
Dade	7,449	166	7	23.71	0.29
Daviess	7,865	193	1	193.00	2.40
De Kalb	9,967	229	2	114.50	1.42
Gentry	6,848	136	4	34.00	0.42
Harrison	8,469	235	2	117.50	1.46
Hickory	7,335	252	1	252.00	3.13
Holt	6,034	153	3	51.00	0.63
Howard	9,631	304	15	20.27	0.25
Knox	4,482	59	4	14.75	0.18
Maries	7,976	246	5	49.20	0.61
Mercer	3,723	113	1	113.00	1.40
Monroe	9,104	227	1	227.00	2.82

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
MO					
Oregon	9,470	432	4	108.00	1.34
Ozark	8,598	198	8	24.75	0.31
Putnam	5,079	170	1	170.00	2.11
Ralls	8,476	182	8	22.75	0.28
Reynolds	6,661	244	9	27.11	0.34
St. Clair	8,457	277	2	138.50	1.72
Schuyler	4,236	97	1	97.00	1.20
Scotland	4,822	81	1	81.00	1.01
Shannon	7,613	270	4	67.50	0.84
Shelby	6,942	173	2	86.50	1.07
Sullivan	6,326	141	1	141.00	1.75
Worth	2,440	48	1	48.00	0.60

Class 2 Counties:
10,000 - 24,999

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
IL					
Alexander	10,626	278	1	278.00	3.45
Bond	14,991	474	10	47.40	0.59
Carroll	16,805	413	4	103.25	1.28
Cass	13,437	351	6	58.50	0.73
Clark	15,921	366	1	366.00	4.55
Clay	14,460	338	8	42.25	0.52
Crawford	19,464	516	5	103.20	1.28
Cumberland	10,670	316	8	39.50	0.49
De Witt	16,516	464	6	77.33	0.96
Douglas	19,464	630	9	70.00	0.87
Edgar	19,595	481	1	481.00	5.97
Fayette	20,893	497	15	33.13	0.41
Ford	14,275	356	1	356.00	4.42
Greene	15,317	323	2	161.50	2.01
Hancock	21,373	550	1	550.00	6.83
Jasper	10,609	190	6	31.67	0.39
Jersey	20,539	601	20	30.05	0.37
Jo Daviess	21,821	536	6	89.33	1.11
Johnson	11,347	310	10	31.00	0.39
Lawrence	15,972	318	15	21.20	0.26
Marshall	12,846	331	4	82.75	1.03
Mason	16,269	457	2	228.50	2.84
Massac	14,752	380	1	380.00	4.72
Menard	11,164	396	2	198.00	2.46
Mercer	17,290	398	5	79.60	0.99
Monroe	22,422	839	1	839.00	10.42
Moultrie	13,930	342	2	171.00	2.12
Perry	21,412	593	1	593.00	7.36
Piatt	15,548	564	2	282.00	3.50
Pike	17,577	425	4	106.25	1.32
Richland	16,545	413	5	82.60	1.03
Shelby	22,261	564	15	37.60	0.47
Union	17,619	481	4	120.25	1.49
Wabash	13,111	404	6	67.33	0.84
Warren	19,181	501	8	62.63	0.78
Washington	14,965	409	2	204.50	2.54
Wayne	17,241	417	16	26.06	0.32
White	16,522	438	12	36.50	0.45

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
IN					
Blackford	14,067	461	6	76.83	0.95
Brown	14,080	478	4	119.50	1.48
Carroll	18,809	469	9	52.11	0.65
Clay	24,705	732	11	66.55	0.83
Decatur	23,645	618	4	154.50	1.92
Fountain	17,808	528	6	88.00	1.09
Franklin	19,580	542	6	90.33	1.12
Fulton	18,840	470	7	67.14	0.83
Jasper	24,960	555	15	37.00	0.46
Jay	21,512	495	8	61.88	0.77
Jennings	23,661	581	2	290.50	3.61
Martin	10,369	356	4	89.00	1.11
Newton	13,551	365	9	40.56	0.50
Orange	18,409	424	21	20.19	0.25
Owen	17,281	465	2	232.50	2.89
Parke	15,410	415	9	46.11	0.57
Perry	19,107	514	7	73.43	0.91
Pike	12,509	317	1	317.00	3.94
Pulaski	12,643	311	10	31.10	0.39
Ripley	24,616	653	3	217.67	2.70
Rush	18,129	354	13	27.23	0.34
Scott	20,991	581	4	145.25	1.80
Spencer	19,490	456	3	152.00	1.89
Starke	22,747	541	2	270.50	3.36
Sullivan	18,993	459	8	57.38	0.71
Tipton	16,119	440	4	110.00	1.37
Vermillion	16,773	510	9	56.67	0.70
Washington	23,717	573	11	52.09	0.65
White	23,265	599	12	49.92	0.62
IA					
Allamakee	13,855	313	11	28.45	0.35
Appanoose	13,743	418	7	59.71	0.74
Benton	22,429	569	9	63.22	0.79
Bremer	22,813	552	24	23.00	0.29
Buchanan	20,844	528	11	48.00	0.60
Buena Vista	19,965	662	15	44.13	0.55
Butler	15,731	325	6	54.17	0.67
Calhoun	11,508	269	20	13.45	0.17
Carroll	21,423	668	24	27.83	0.35
Cass	15,128	313	7	44.71	0.56
Cedar	17,381	427	13	32.85	0.41
Cherokee	14,098	335	3	111.67	1.39
Chickasaw	13,295	306	10	30.60	0.38
Clay	17,585	370	15	24.67	0.31

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
IA					
Clayton	19,054	461	18	25.61	0.32
Crawford	16,775	347	17	20.41	0.25
Delaware	18,035	436	6	72.67	0.90
Dickinson	14,909	413	27	15.30	0.19
Emmet	11,569	307	11	27.91	0.35
Fayette	21,843	545	17	32.06	0.40
Floyd	17,058	459	16	28.69	0.36
Franklin	11,364	204	4	51.00	0.63
Greene	10,045	212	5	42.40	0.53
Grundy	12,029	324	6	54.00	0.67
Guthrie	10,935	239	5	47.80	0.59
Hamilton	16,071	489	12	40.75	0.51
Hancock	12,638	227	13	17.46	0.22
Hardin	19,094	588	14	42.00	0.52
Harrison	14,730	287	4	71.75	0.89
Henry	19,226	442	8	55.25	0.69
Humboldt	10,756	235	4	58.75	0.73
Iowa	14,630	325	5	65.00	0.81
Jackson	19,950	506	4	126.50	1.57
Jefferson	16,310	490	8	61.25	0.76
Jones	19,444	447	11	40.64	0.50
Keokuk	11,624	236	2	118.00	1.47
Kossuth	18,591	392	18	21.78	0.27
Louisa	11,592	222	7	31.71	0.39
Lyon	11,952	186	6	31.00	0.39
Madison	12,483	297	6	49.50	0.61
Mahaska	21,522	512	9	56.89	0.71
Mills	13,202	335	6	55.83	0.69
Mitchell	10,928	196	11	17.82	0.22
Monona	10,034	215	6	35.83	0.44
Montgomery	12,076	306	16	19.13	0.24
OBrien	15,444	331	15	22.07	0.27
Page	16,870	395	12	32.92	0.41
Palo Alto	10,669	233	9	25.89	0.32
Plymouth	23,388	520	19	27.37	0.34
Poweshiek	19,033	549	21	26.14	0.32
Sac	12,324	312	13	24.00	0.30
Shelby	13,230	335	9	37.22	0.46
Tama	17,419	448	7	64.00	0.79
Union	12,750	363	4	90.75	1.13
Washington	19,612	428	11	38.91	0.48
Winnebago	12,122	303	13	23.31	0.29
Winneshiek	20,847	390	23	16.96	0.21
Wright	14,269	339	11	30.82	0.38

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
KY					
Adair	15,360	449	12	37.42	0.46
Allen	14,628	422	2	211.00	2.62
Anderson	14,571	409	4	102.25	1.27
Bourbon	19,236	563	10	56.30	0.70
Breathitt	15,703	692	1	692.00	8.59
Breckinridge	16,312	439	9	48.78	0.61
Butler	11,245	382	9	42.44	0.53
Caldwell	13,232	366	8	45.75	0.57
Carter	24,340	1,025	6	170.83	2.12
Casey	14,211	621	3	207.00	2.57
Clay	21,746	1,094	4	273.50	3.40
Edmonson	10,357	347	2	173.50	2.15
Estill	14,614	456	1	456.00	5.66
Fleming	12,292	355	5	71.00	0.88
Garrard	11,579	289	3	96.33	1.20
Grant	15,737	436	8	54.50	0.68
Grayson	21,050	657	14	46.93	0.58
Green	10,371	271	6	45.17	0.56
Harrison	16,248	469	5	93.80	1.16
Hart	14,890	511	9	56.78	0.71
Henry	12,823	350	5	70.00	0.87
Jackson	11,955	597	4	149.25	1.85
Johnson	23,248	889	3	296.33	3.68
Knott	17,906	817	6	136.17	1.69
Larue	11,679	305	8	38.13	0.47
Lawrence	13,998	546	5	109.20	1.36
Leslie	13,642	622	6	103.67	1.29
Lewis	13,029	396	5	79.20	0.98
Lincoln	20,045	672	6	112.00	1.39
Logan	24,416	609	11	55.36	0.69
McCreary	15,603	724	3	241.33	3.00
Magoffin	13,077	576	5	115.20	1.43
Marion	16,499	405	9	45.00	0.56
Martin	12,526	352	5	70.40	0.87
Mason	16,666	494	9	54.89	0.68
Meade	24,170	575	14	41.07	0.51
Mercer	19,148	441	21	21.00	0.26
Monroe	11,401	405	7	57.86	0.72
Montgomery	19,561	481	8	60.13	0.75
Morgan	11,648	468	3	156.00	1.94
Ohio	21,105	658	4	164.50	2.04
Pendleton	12,036	324	3	108.00	1.34
Powell	11,686	365	6	60.83	0.76
Rockcastle	14,803	658	1	658.00	8.17
Rowan	20,353	810	16	50.63	0.63

County	1990 Pop.	# of Frq Plyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
KY					
Russell	14,716	643	8	80.38	1.00
Scott	23,867	800	18	44.44	0.55
Shelby	24,824	784	9	87.11	1.08
Simpson	15,145	348	5	69.60	0.86
Taylor	21,146	569	20	28.45	0.35
Todd	10,940	324	2	162.00	2.01
Trigg	10,361	259	6	43.17	0.54
Union	16,557	465	10	46.50	0.58
Washington	10,441	293	12	24.42	0.30
Wayne	17,468	688	7	98.29	1.22
Webster	13,955	365	8	45.63	0.57
Woodford	19,955	872	10	87.20	1.08
MO					
Adair	24,577	863	15	57.53	0.71
Andrew	14,632	394	11	35.82	0.44
Audrain	23,599	534	7	76.29	0.95
Barton	11,312	282	7	40.29	0.50
Bates	15,025	369	7	52.71	0.65
Benton	13,859	411	8	51.38	0.64
Bollinger	10,619	331	1	331.00	4.11
Carroll	10,748	260	15	17.33	0.22
Cedar	12,093	311	6	51.83	0.64
Clinton	16,595	356	15	23.73	0.29
Cooper	14,835	336	8	42.00	0.52
Crawford	19,173	531	12	44.25	0.55
Dallas	12,646	345	3	115.00	1.43
Dent	13,702	369	3	123.00	1.53
Douglas	11,876	454	3	151.33	1.88
Gasconade	14,006	388	4	97.00	1.20
Grundy	10,536	288	9	32.00	0.40
Henry	20,044	524	5	104.80	1.30
Iron	10,726	351	5	70.20	0.87
Lewis	10,233	343	6	57.17	0.71
Linn	13,885	406	11	36.91	0.46
Livingston	14,592	330	3	110.00	1.37
McDonald	16,938	568	8	71.00	0.88
Macon	15,345	365	6	60.83	0.76
Madison	11,127	404	4	101.00	1.25
Miller	20,700	549	35	15.69	0.19
Mississippi	14,442	394	14	28.14	0.35
Moniteau	12,298	341	10	34.10	0.42
Montgomery	11,355	283	3	94.33	1.17
Morgan	15,574	474	7	67.71	0.84
New Madrid	20,928	531	8	66.38	0.82

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
MO					
Nodaway	21,709	864	17	50.82	0.63
Osage	12,018	305	1	305.00	3.79
Pemiscot	21,921	539	6	89.83	1.12
Perry	16,648	487	6	81.17	1.01
Pike	15,969	349	10	34.90	0.43
Polk	21,826	613	6	102.17	1.27
Randolph	24,370	656	8	82.00	1.02
Ray	21,971	685	6	114.17	1.42
Ripley	12,303	494	4	123.50	1.53
Ste. Genevieve	16,037	350	6	58.33	0.72
Saline	23,523	578	5	115.60	1.44
Stone	19,078	573	7	81.86	1.02
Texas	21,476	754	11	68.55	0.85
Vernon	19,041	505	8	63.13	0.78
Warren	19,534	503	14	35.93	0.45
Washington	20,380	612	8	76.50	0.95
Wayne	11,543	486	7	69.43	0.86
Webster	23,753	713	15	47.53	0.59
Wright	16,758	503	5	100.60	1.25
OH					
Harrison	16,085	383	6	63.83	0.79
Meigs	22,987	726	4	181.50	2.25
Monroe	15,497	308	1	308.00	3.83
Morgan	14,194	316	2	158.00	1.96
Noble	11,336	301	5	60.20	0.75
Paulding	20,488	479	4	119.75	1.49
Pike	24,249	747	2	373.50	4.64
Vinton	11,098	290	2	145.00	1.80
Wyandot	22,254	634	5	126.80	1.57

Class 3 Counties:
25,000 - 49,999

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
IL					
Boone	30,806	1,274	11	115.82	1.44
Bureau	35,688	1,002	6	167.00	2.07
Christian	34,418	993	4	248.25	3.08
Clinton	33,944	993	17	58.41	0.73
Effingham	31,704	866	17	50.94	0.63
Franklin	40,319	1,179	6	196.50	2.44
Fulton	38,080	1,099	14	78.50	0.97
Grundy	32,337	958	3	319.33	3.97
Iroquois	30,787	864	3	288.00	3.58
Jefferson	37,020	967	8	120.88	1.50
Kendall	39,413	1,814	7	259.14	3.22
Lee	34,392	952	18	52.89	0.66
Livingston	39,301	1,150	4	287.50	3.57
Logan	30,798	901	1	901.00	11.19
McDonough	35,244	1,512	65	23.26	0.29
Macoupin	47,679	1,376	6	229.33	2.85
Marion	41,561	1,135	12	94.58	1.17
Montgomery	30,728	815	5	163.00	2.02
Morgan	36,397	1,150	17	67.65	0.84
Ogle	45,957	1,326	5	265.20	3.29
Randolph	34,583	890	1	890.00	11.05
Saline	26,551	818	8	102.25	1.27
Stephenson	48,052	1,368	14	97.71	1.21
Woodford	32,653	1,082	6	180.33	2.24
IN					
Adams	31,095	813	4	203.25	2.52
Boone	38,147	1,741	21	82.90	1.03
Cass	38,413	1,169	15	77.93	0.97
Clinton	30,974	978	28	34.93	0.43
Daviess	27,533	709	8	88.63	1.10
Dearborn	38,835	1,499	6	249.83	3.10
De Kalb	35,324	1,199	13	92.23	1.15
Dubois	36,616	957	39	24.54	0.30
Fayette	26,015	731	9	81.22	1.01
Gibson	31,913	921	12	76.75	0.95
Greene	30,410	771	7	110.14	1.37
Hancock	45,527	2,060	9	228.89	2.84
Harrison	29,890	898	5	179.60	2.23
Henry	48,139	1,202	7	171.71	2.13
Huntington	35,427	1,105	22	50.23	0.62
Jackson	37,730	1,059	3	353.00	4.38

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
IN					
Jefferson	29,797	848	14	60.57	0.75
Knox	39,884	1,198	22	54.45	0.68
Lagrange	29,477	678	4	169.50	2.11
Lawrence	42,836	1,069	10	106.90	1.33
Marshall	42,182	1,004	50	20.08	0.25
Miami	36,897	964	34	28.35	0.35
Montgomery	34,436	1,155	14	82.50	1.02
Noble	37,877	990	11	90.00	1.12
Posey	25,968	1,003	8	125.38	1.56
Putnam	30,315	946	19	49.79	0.62
Randolph	27,148	688	10	68.80	0.85
Shelby	40,307	1,368	4	342.00	4.25
Steuben	27,446	728	9	80.89	1.00
Wabash	35,069	985	11	89.55	1.11
Warrick	44,920	1,822	5	364.40	4.53
Wells	25,948	779	7	111.29	1.38
Whitley	27,651	733	8	91.63	1.14
IA					
Boone	25,186	609	23	26.48	0.33
Cerro Gordo	46,733	1,367	15	91.13	1.13
Dallas	29,755	905	11	82.27	1.02
Des Moines	42,614	1,263	14	90.21	1.12
Jasper	34,795	1,045	23	45.43	0.56
Lee	38,687	1,086	12	90.50	1.12
Marion	30,001	772	38	20.32	0.25
Marshall	38,276	1,030	20	51.50	0.64
Muscatine	39,907	1,307	19	68.79	0.85
Sioux	29,903	968	43	22.51	0.28
Wapello	35,687	1,155	37	31.22	0.39
Warren	36,033	1,223	30	40.77	0.51
Webster	40,342	1,274	25	50.96	0.63
KY					
Barren	34,001	902	19	47.47	0.59
Bell	31,506	1,216	11	110.55	1.37
Boyle	25,641	810	18	45.00	0.56
Bullitt	47,567	1,837	10	183.70	2.28
Calloway	30,735	1,091	49	22.27	0.28
Clark	29,496	1,081	13	83.15	1.03
Floyd	43,586	1,683	20	84.15	1.05
Franklin	43,781	1,434	22	65.18	0.81
Graves	33,550	850	14	60.71	0.75
Greenup	36,742	1,390	13	106.92	1.33
Harlan	36,574	1,327	11	120.64	1.50

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
KY					
Henderson	43,044	1,612	36	44.78	0.56
Hopkins	46,126	1,187	24	49.46	0.61
Jessamine	30,508	1,333	10	133.30	1.66
Knox	29,676	1,238	12	103.17	1.28
Laurel	43,438	1,321	8	165.13	2.05
Letcher	27,000	1,074	10	107.40	1.33
Marshall	27,205	732	17	43.06	0.53
Muhlenberg	31,318	916	17	53.88	0.67
Nelson	29,710	776	28	27.71	0.34
Oldham	33,263	1,323	13	101.77	1.26
Perry	30,283	1,193	12	99.42	1.23
Pulaski	49,489	1,583	26	60.88	0.76
Whitley	33,326	1,352	20	67.60	0.84
MO					
Barry	27,547	784	23	34.09	0.42
Butler	38,765	1,149	6	191.50	2.38
Callaway	32,809	857	15	57.13	0.71
Camden	27,495	847	29	29.21	0.36
Christian	32,644	891	13	68.54	0.85
Dunklin	33,112	1,085	17	63.82	0.79
Howell	31,447	969	44	22.02	0.27
Johnson	42,514	1,791	38	47.13	0.59
Laclede	27,158	752	1	752.00	9.34
Lafayette	31,107	776	15	51.73	0.64
Lawrence	30,236	825	14	58.93	0.73
Lincoln	28,892	766	9	85.11	1.06
Marion	27,682	799	20	39.95	0.50
Newton	44,445	1,196	7	170.86	2.12
Pettis	35,437	967	15	64.47	0.80
Phelps	35,248	1,196	18	66.44	0.83
Pulaski	41,307	1,192	11	108.36	1.35
St. Francois	48,904	1,373	29	47.34	0.59
Scott	39,376	1,136	24	47.33	0.59
Stoddard	28,895	935	18	51.94	0.65
Taney	25,561	748	29	25.79	0.32

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
OH					
Adams	25,371	970	1	970.00	12.05
Ashland	47,507	1,464	27	54.22	0.67
Auglaize	44,585	1,426	16	89.13	1.11
Brown	34,966	859	4	214.75	2.67
Carroll	26,521	817	37	22.08	0.27
Champaign	36,019	829	20	41.45	0.51
Clinton	35,415	925	14	66.07	0.82
Coshocton	35,427	1,174	18	65.22	0.81
Crawford	47,870	1,382	20	69.10	0.86
Defiance	39,350	1,289	30	42.97	0.53
Fayette	27,466	675	2	337.50	4.19
Fulton	38,498	1,411	23	61.35	0.76
Gallia	30,954	1,026	2	513.00	6.37
Guernsey	39,024	1,020	14	72.86	0.90
Hardin	31,111	910	22	41.36	0.51
Henry	29,108	885	2	442.50	5.50
Highland	35,728	961	12	80.08	0.99
Hocking	25,533	787	9	87.44	1.09
Holmes	32,849	743	6	123.83	1.54
Jackson	30,230	849	12	70.75	0.88
Knox	47,473	1,481	32	46.28	0.57
Logan	42,310	1,056	10	105.60	1.31
Madison	37,068	1,287	15	85.80	1.07
Mercer	39,443	1,015	29	35.00	0.43
Morrow	27,749	595	12	49.58	0.62
Ottawa	40,029	1,389	52	26.71	0.33
Perry	31,557	800	6	133.33	1.66
Pickaway	48,255	1,788	4	447.00	5.55
Preble	40,113	1,205	9	133.89	1.66
Putnam	33,819	897	19	47.21	0.59
Shelby	44,915	1,191	11	108.27	1.34
Union	31,969	1,072	6	178.67	2.22
Van Wert	30,464	903	8	112.88	1.40
Williams	36,956	1,124	24	46.83	0.58

Class 4 Counties:
50,000 - 99,999

County	1990 Pop.	# of Frq Plyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
IL					
Adams	66,090	1,933	11	175.73	2.18
Coles	51,644	2,236	69	32.41	0.40
De Kalb	77,932	3,495	63	55.48	0.69
Henry	51,159	1,836	10	183.60	2.28
Jackson	61,067	2,929	27	108.48	1.35
Kankakee	96,255	3,341	27	123.74	1.54
Knox	56,393	1,693	41	41.29	0.51
Vermilion	88,257	2,788	17	164.00	2.04
Whiteside	60,186	2,066	7	295.14	3.67
Williamson	57,733	1,599	5	319.80	3.97
IN					
Bartholomew	63,657	2,582	26	99.31	1.23
Clark	87,777	3,047	29	105.07	1.30
Floyd	64,404	2,462	68	36.21	0.45
Grant	74,169	2,517	46	54.72	0.68
Hendricks	75,717	3,248	14	232.00	2.88
Howard	80,827	2,932	26	112.77	1.40
Johnson	88,109	3,505	25	140.20	1.74
Kosciusko	65,294	2,114	18	117.44	1.46
Morgan	55,920	2,246	5	449.20	5.58
Wayne	71,951	2,357	23	102.48	1.27
IA					
Clinton	51,040	1,632	24	68.00	0.84
Dubuque	86,403	3,033	60	50.55	0.63
Johnson	96,119	6,673	89	74.98	0.93
Pottawattamie	82,628	2,675	25	107.00	1.33
Story	74,252	4,373	62	70.53	0.88
Woodbury	98,276	3,373	51	66.14	0.82
KY					
Boone	57,589	2,201	24	91.71	1.14
Boyd	51,150	1,815	27	67.22	0.83
Campbell	83,866	3,205	46	69.67	0.87
Christian	68,941	1,882	17	110.71	1.37
Daviess	87,189	2,788	66	42.24	0.52
Hardin	89,240	2,262	47	48.13	0.60
McCracken	62,879	2,060	35	58.86	0.73
Madison	57,508	1,974	46	42.91	0.53
Pike	72,583	2,321	19	122.16	1.52
Warren	76,673	2,751	67	41.06	0.51

County	1990 Pop.	# of Frq Plyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
MO					
Buchanan	83,083	2,657	43	61.79	0.77
Cape Girardeau	61,633	1,971	26	75.81	0.94
Cass	63,808	2,314	14	165.29	2.05
Cole	63,579	2,132	17	125.41	1.56
Franklin	80,603	2,892	38	76.11	0.95
Jasper	90,465	2,611	69	37.84	0.47
Platte	57,867	2,640	22	120.00	1.49
OH					
Ashtabula	99,821	3,037	36	84.36	1.05
Athens	59,549	2,694	41	65.71	0.82
Belmont	71,074	2,328	18	129.33	1.61
Darke	53,619	1,171	22	53.23	0.66
Delaware	66,929	3,367	22	153.05	1.90
Erie	76,779	3,024	33	91.64	1.14
Geauga	81,129	4,208	71	59.27	0.74
Hancock	65,536	2,275	46	49.46	0.61
Huron	56,240	1,755	16	109.69	1.36
Jefferson	80,298	2,631	29	90.72	1.13
Lawrence	61,834	2,219	19	116.79	1.45
Marion	64,274	2,231	14	159.36	1.98
Miami	93,182	3,707	55	67.40	0.84
Muskingum	82,068	2,240	27	82.96	1.03
Ross	69,330	2,082	17	122.47	1.52
Sandusky	61,963	1,982	40	49.55	0.62
Scioto	80,327	2,162	46	47.00	0.58
Seneca	59,733	1,794	33	54.36	0.68
Tuscarawas	84,090	2,361	35	67.46	0.84
Washington	62,254	2,137	49	43.61	0.54

Class 5 Counties:
100,000 - 499,999

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
IL					
Champaign	173,025	8,907	86	103.57	1.29
Kane	317,471	13,496	106	127.32	1.58
La Salle	106,913	3,628	26	139.54	1.73
McHenry	183,241	8,504	57	149.19	1.85
McLean	129,180	6,197	91	68.10	0.85
Macon	117,206	4,434	64	69.28	0.86
Madison	249,238	9,720	55	176.73	2.19
Peoria	182,827	7,843	60	130.72	1.62
Rock Island	148,723	5,510	82	67.20	0.83
St. Clair	262,852	9,841	59	166.80	2.07
Sangamon	178,386	7,305	25	292.20	3.63
Tazewell	123,692	4,872	30	162.40	2.02
Will	357,313	15,468	105	147.31	1.83
Winnebago	252,913	10,357	76	136.28	1.69
IN					
Allen	300,836	12,319	98	125.70	1.56
Delaware	119,659	5,367	44	121.98	1.51
Elkhart	156,198	5,543	69	80.33	1.00
Hamilton	108,936	5,651	24	235.46	2.92
Lake	475,594	16,879	209	80.76	1.00
La Porte	107,066	3,758	60	62.63	0.78
Madison	130,669	4,637	53	87.49	1.09
Monroe	108,978	5,738	91	63.05	0.78
Porter	128,932	5,431	39	139.26	1.73
St. Joseph	247,052	9,828	175	56.16	0.70
Tippecanoe	130,598	6,163	61	101.03	1.25
Vanderburgh	165,058	6,309	87	72.52	0.90
Vigo	106,107	3,890	71	54.79	0.68
IA					
Black Hawk	123,798	5,214	76	68.61	0.85
Linn	168,767	6,319	78	81.01	1.01
Polk	327,140	14,545	245	59.37	0.74
Scott	150,979	6,183	55	112.42	1.40

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
KY					
Fayette	225,366	10,811	186	58.12	0.72
Kenton	142,031	5,705	126	45.28	0.56
MO					
Boone	112,379	5,654	49	115.39	1.43
Clay	153,411	6,342	109	58.18	0.72
Greene	207,949	8,353	130	64.25	0.80
Jefferson	171,380	6,416	73	87.89	1.09
St. Charles	212,907	9,300	66	140.91	1.75
St. Louis City	396,685	15,471	117	132.23	1.64
OH					
Allen	109,755	3,938	56	70.32	0.87
Butler	291,479	12,504	158	79.14	0.98
Clark	147,548	5,409	95	56.94	0.71
Clermont	150,187	5,857	10	585.70	7.27
Columbiana	108,276	3,209	38	84.45	1.05
Fairfield	103,461	4,116	33	124.73	1.55
Greene	136,731	6,346	88	72.11	0.90
Lake	215,499	8,489	112	75.79	0.94
Licking	128,300	4,353	42	103.64	1.29
Lorain	271,126	9,834	115	85.51	1.06
Lucas	462,361	17,852	312	57.22	0.71
Mahoning	264,806	9,811	64	153.30	1.90
Medina	122,354	5,440	27	201.48	2.50
Portage	142,585	6,784	71	95.55	1.19
Richland	126,137	4,427	58	76.33	0.95
Stark	367,585	13,762	215	64.01	0.79
Trumbull	227,813	8,440	42	200.95	2.50
Warren	113,909	4,665	65	71.77	0.89
Wayne	101,461	3,205	37	86.62	1.08
Wood	113,269	5,875	51	115.20	1.43

Class 6 Counties:
500,000 - 1 Million

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
IL					
Du Page	781,666	43,289	424	102.10	1.27
Lake	516,418	26,182	352	74.38	0.92
IN					
Marion	797,159	32,333	418	77.35	0.96
KY					
Jefferson	664,937	27,748	426	65.14	0.81
MO					
Jackson	633,232	26,425	266	99.34	1.23
St. Louis	993,529	45,722	905	50.52	0.63
OH					
Franklin	961,437	43,870	500	87.74	1.09
Hamilton	866,228	37,161	578	64.29	0.80
Montgomery	573,809	23,274	288	80.81	1.00
Summit	514,990	21,491	200	107.46	1.33

Class 7 Counties:
> 1 Million

County	1990 Pop.	# of FrqPlyrs.	# of Cts.	Freq. Plyrs/ct	T.I.I. # 2
IL					
Cook	5,105,067	219,007	1,818	120.47	1.50
OH					
Cuyahoga	1,412,140	56,175	715	78.57	0.98

VITA

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Candidate for the Degree of

Master of Science

Thesis: A GEOGRAPHICAL ANALYSIS OF TENNIS SUPPLY IN SIX CONTIGUOUS STATES

Major Field: Geography

Biographical:

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