

A GEOGRAPHICAL ANALYSIS OF TENNIS DEMAND
IN THE UNITED STATES

By

KYLE ANDREW ANDERSON

Bachelor of Arts

University of Nebraska

Lincoln, Nebraska

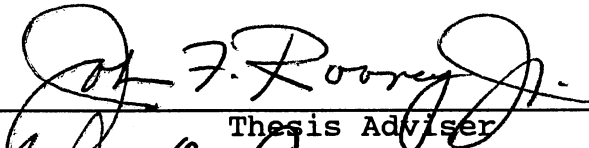
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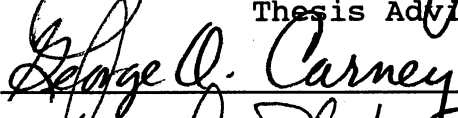
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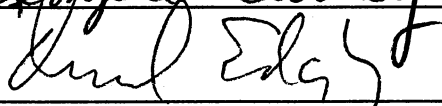
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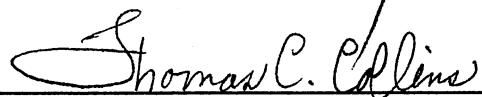
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Thesis Approved:



Thesis Adviser






Dean of the Graduate College

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CHAPTER I

INTRODUCTION

The American involvement in sport and recreational activities has increased dramatically over the last thirty years. Recent statistics indicate that the trend shows no sign of abating. In the United States, the retail sales of sporting goods in 1988 totaled more than \$35 billion dollars (S&P Industry Surveys, 1990). This figure helped to propel recreation spending (\$247 billion dollars in 1988) to the fifth largest category of personal consumption expenditures in the United States. Now surpassing spending on clothing, recreation falls in line behind transportation (\$406 billion), medical care (\$443 billion), food (\$597 billion), and housing (\$887 billion). Indeed, products of the twentieth century industrial revolution, population growth and per capita income, the shorter work week, and an improved transportation infrastructure have provided the impetus for a recreation boom in the United States.

In response to America's pronounced appetite for recreational activities, the delivery of leisure services has become one of the fastest growing segments of our

economy. Leisure as a business segment is estimated to generate in excess of \$350 billion a year in revenues (Kelly, 1990). Consumer demand for recreation products and services offers many opportunities for investments that promise growth. The business of providing recreational resources relies on the assessment of the demand for specific leisure-oriented activities. To facilitate an effective return on investments, recreation suppliers need to identify and locate markets for their products and programs. Recreation-related markets are unique in that they are based on participation and market analyses. Thus demand forecasting has become crucial for prudent investment decisions.

Implications for meeting the demand for recreational opportunities are not limited to the entrepreneur. Governments at the national, state, and local level have certain obligations to supply recreational resources. In planning land-use and recreation facility development, these various entities must estimate present patterns and future trends in recreation participation. Estimates of participation in recreational activities are the basis for decisions to allocate funds and resources for sporting and recreational products. Both public and private suppliers of leisure opportunities employ a variety of methods devoted to tracking the pulse of America's recreation habits. Consumer surveys, recreation activity

participation rates, purchasing behavior, media preferences, and psychographic and demographic analyses are the mainstream procedures to identify recreation market trends. Most of these methods can be lumped under the umbrella of market research, the process of obtaining information on a particular market for strategic planning and business decisions.

The geography of markets is also an important component in marketing research. "Where consumers live may be more important in determining what they'll buy than age, lifestyle, or other demographic and psychographic factors (STORES, 1989)." Categorizing geographical units by demographic structure, consumer attitudes, behavior and buying patterns has proven to be a powerful marketing tool. A "geodemographic" analysis can identify a particular area as belonging to a specific market segment (Weiss, 1989), and can track changing demographics, such as age structures and household composition, of an area over time (Meyers, 1988).

Increasingly, the methods of sport geography, coupled with the geodemographic concept, are being utilized to decipher recreation-related markets. The United States recreation market is characterized by great regional variation. The geography of sport is concerned with analyzing the spatial variation and regionalization of the games people play. Matching specific recreation market

segments with the appropriate products and services is the function of market research. When market research must address questions of location in the sport and recreation context, the techniques of sport geography can greatly enhance the process.

The present study examines some locational attributes of the American tennis market within the framework of sport geography. The purpose of this thesis is to study regional patterns of tennis involvement in the United States. A geographical analysis of tennis involvement in the United States which includes spatial units at the zip code, county, Metropolitan Statistical Area (MSA), Area of Dominant Influence (ADI), and state levels will have useful application for the management of the tennis market and help facilitate its growth.

Tennis as a popular recreational sport has had a relatively short history. During this time the mass participatory aspects of tennis in America have demonstrated vivid periods of growth and decline. Kelly (1990) claims that all leisure activities exude a distinctive life cycle like any other consumer product. The gamut of recreational pursuits each possess an activity life cycle that includes initiation, growth, peak, decline and plateau with regard to participation. The sport of tennis in the United States demonstrates this cycle in dramatic fashion.

Emergence and Aspects of the United States

Tennis Market

The present game of tennis in the United States is a product of the elitist British Victorian social class. In 1873, an English Major named Walter Clopton Wingfield adapted a game by taking the ancient indoor contest of court tennis and placed it outside to be played on the lawn. Wingfield's lawn tennis was soon a success migrating throughout the island nation and its colonies overseas.

Most historians of the game agree that socialite Miss Mary Outerbridge of Staten Island, New York, after returning from a vacation in Bermuda in 1874 with net, rackets, and balls in tow, is responsible for bringing the game to the United States (Buchanan, 1951). Her enthusiasm for the game was contagious, for the sport was soon a fashionable activity of the well-to-do. The game's popularity can be measured at this time by the numerous organized tennis clubs springing up throughout the northeast. Pillsbury (1990) relates that by 1881, thirty-four clubs existed that engaged in some variation of lawn tennis.

September of 1880 witnessed the first important tennis tournament held at the Staten Island Cricket Club. In the following year, the United States Lawn Tennis Association was formed to standardize rules and equipment

and to act as the governing body of American tennis, a role it continues to perform today as the United States Tennis Association (USTA). By 1895, 106 clubs belonged to the national tennis association (Rader, 1983).

Lawn tennis remained a sporting activity of the upper class after its adoption in America. It was associated with country clubs and cricket grounds and its adherents enthusiastically complied with the established etiquette and tightly controlled dress codes. Amateur status prevailed as a way to filter out athletes with inferior social credentials. Prior to the 1920s, the game of tennis was mainly associated with exclusive social gatherings.

Wider public appeal for tennis began in the 1920s when international competition stirred national pride and the sport produced its first celebrities. The emergence of Big Bill Tilden and Suzanne Lenglen "... marked the end of the conservative, casual, and social age of tennis and the beginning of an age in which tennis players became public celebrities (Rader, 1983: 220)." Their on and off court antics repeatedly filled stadiums with spectators and increased tennis coverage in the newspapers. Although tennis began to reach a larger audience and became established as a high school and collegiate sport, growth in the number of tennis players and courts remained limited until the late 1960s.

The Open era of tennis technically began in 1968 and marked the beginning of the tennis boom. Open tennis meant rebuking the time honored practice of amateur tennis. Tournaments were opened to both pro and amateur players offering prize money to ensure classic confrontations between the best contestants. Open tennis, television coverage of tournaments, the emergence of a new set of American tennis stars, and lavish tournament purses contributed to unprecedented public demand for the game. Amdur (1979) considers 1968 to 1978 an unparalleled time in sport, when tennis journeyed from the classes to the masses, when popularity meant not only more spectators but millions of new players and thousands of new courts.

A phase of democratization occurring in the late 1960s and through the 1970s did indeed substantially increase the base of tennis participants in the United States. According to the early A.C. Nielsen surveys, 34 million people played the game in 1975 compared to 10.6 million in 1970. A 1977 survey by the Department of Interior's Heritage, Conservation, and Recreation Service indicated that 33 percent of Americans (58.3 million) over the age of twelve played tennis at least once a year. Retail sales of tennis equipment jumped 90 percent from 1974 to 1978 (Van Doren et al, 1984).

After a ten year period of unprecedented growth, the peak of participation rates had been reached by 1980.

Though remaining a most popular recreational activity, figures compiled for the 1980s indicate substantial drops in tennis participation. The sport, like many other recreation-based markets in the 1980s, constricted into narrower population segments (Kelly, 1985).

According to a 1989 study by Audits & Surveys conducted for the American Tennis Industry Federation, the number of those who played tennis at least once in the United States in 1989 stood at just over 21 million. Those who played four or more times numbered 14.2 million.

The Audits & Surveys', A Second Study of U.S. Household and Individual Tennis Playing, and other recreation market research provides a range of information on the United States tennis market. This research suggests that tennis players have above average household income, and that a high proportion are college graduates and hold professional or managerial jobs. Simmons Market Research Bureau's, The 1988 Study of Media and Markets, estimates that 88.9 percent of the tennis market is Caucasian. The information obtained on the American tennis player is substantial, especially when one can identify their television viewing, household buying patterns, and other lifestyle habits. However, these market analyses lack a geographical understanding of the tennis market beyond broad national and regional generalizations.

The Problem Statement and Objectives of the Research

This thesis utilizes sport geography methodology for a market analysis for the sport of tennis. Specifically, this thesis has three primary objectives:

- 1) To measure and describe the present spatial pattern of tennis demand in the United States,
- 2) To help explain the present spatial pattern of tennis demand in the United States,
- 3) To demonstrate how a geographical analysis of tennis demand can be used as a marketing tool.

Tennis demand, as defined for this study, relates to an expression of the desire to participate in tennis. To measure this expression and involvement in the game, data pertaining to tennis magazine subscriptions, tennis association memberships, high school tennis participation, tennis television viewing, and market research statistics have been collected for analysis.

The data will be considered on a per capita basis to obtain relative measures of tennis demand in the United States. The supposition is that cartographic analysis and per capita measures of the database will reveal regional patterns of tennis demand. Levels of analysis will include zip code, county, Areas of Dominant Influence (ADIs), and state spatial resolutions.

Kelly (1987) relates that recreation markets are

characterized by the "20-80 rule". The rule suggests that 20 percent of the most active participants in an activity make up 80 percent of the total participation as measured by frequency and duration. The rule also implies that the 20 percent who are most committed to an activity constitute 80 percent of the demand for resources, facilities, equipment, and instruction (Kelly, 1987). The present analysis will focus on that 20 percent, in other words, the core of the United States tennis market.

World Tennis and Tennis magazine subscribers and United States Tennis Association (USTA) members will comprise the sample representing the core tennis market. It will be assumed that these individuals reflect a heightened awareness of the game, hence possess a greater propensity to participate at frequent intervals in the sport of tennis.

To account for the spatial distribution of the tennis sample in the United States, correlation and regression analysis will be conducted at the ADI level of spatial resolution. A complex combination of factors pertaining to age, income characteristics, education level, ethnicity, geography, leisure time, and opportunity directly influence how a population recreates. The present study does not have the capacity to analyze how such a complex combination of variables can affect tennis participation. The study will examine some socio-economic

correlates that may influence the locational pattern of the core tennis market. The role that climate plays in the distribution of tennis interest will also be investigated.

Also within the scope of this thesis is a demonstration of how measures of demand of tennis, coupled with measures of supply of tennis, can be utilized as a tool to chart future development of needed facilities. Tennis supply data were gathered for the metropolitan area of Atlanta and merged with tennis demand measures. Combining accurate measures of supply and demand can prove to be an invaluable tool for the tennis industry.

Justification and Context of Research

The role of geography as a discipline in the study of sport and recreation has progressed significantly in recent years. Rooney, a pioneer in sport geography, has demonstrated how geographic principles may be utilized to gain greater understanding of a particular sport. Some of his earlier investigations in the realm of golf, from a geographical perspective, has initiated a working relationship with the Sports and Leisure Division of the New York Times Company Magazine Group. This division is responsible for the publication of numerous magazines, such as, Golf Digest, Snow Country, and Tennis, devoted to the professional and participatory aspects of various

sports. It is the Research and Marketing Services department of the Sport and Leisure Division that realized the important contributions that the discipline of geography can make in marketing analysis. Especially applicable within the sphere of marketing is the geographic principles of spatial organization, spatial interaction, and delimiting supply and demand regions of particular sporting activities.

This research falls under the context of sport geography and is concerned with delimiting tennis demand regions. The study stems from ongoing research conducted for the New York Times Magazine Group and is intended as a potential planning tool for the tennis industry. Tapping latent tennis demand, tennis facility development, and tennis product market penetration are a few of the issues that the methods and database of this study could address. The thesis also contributes to the growing body of literature devoted to a geography of sport in America.

Scope and Limitations

Sport researchers have used the analogy that the structure of sport in society resembles a pyramid (Rooney, 1974). Mass leisure sport in society represents the base of the pyramid which supports and feeds into an increasingly hierarchical organized system of sport as one progresses to the tip (Figure 1). Cross sections of the



After John Rooney, "A Geography of American Sport," 1974.

Figure 1. The Spatial Organization of Sport in the United States

pyramid would include community recreation programs, little league, high school sport programs, intercollegiate athletics, and other systems of sport present in society. Very few reach the pinnacle of the pyramid which relates to high achievement sport, such as professional or Olympic sport.

In investigating aspects of tennis consumption in the United States, the focus of this thesis is on the base and mid-section of the tennis pyramid. These portions of the pyramid reflect the mass participatory aspects of tennis (the tennis market) in America.

To maximize the comprehensiveness of the measure of tennis consumption in the United States, data related to tennis equipment purchases and spectating at tennis events would be desirable. The present study does include a limited discussion on tennis television viewing. However, it does not come close to measuring the magnitude of involvement with regard to watching tennis on television or attendance at tennis events.

Another pertinent measure of tennis consumption in the United States relates to the market for tennis equipment and products. The competitive nature of the tennis equipment industry poses limitations on the availability of data pertaining to equipment sales. Industry-wide figures on tennis ball, racquet, and apparel sales are available, but do not allow for a geographical

breakdown. Therefore, this aspect of tennis consumption is not included in the present study.

It is also noted and acknowledged that magazine subscriptions and association memberships will not always represent the desired measure of tennis involvement. Subscriptions belonging to libraries, corporations, doctor's waiting rooms, and other institutional entities are undesirable in the context of this study, but their inclusion is unavoidable. Another limitation of the dataset is the occurrence of overlapping measures of tennis involvement. It is probable that there are some instances of subscribers to World Tennis also belonging to the USTA causing a double count. This occurrence is believed to be negligible.

CHAPTER II

LITERATURE REVIEW

Introduction

The literature review begins with a discussion on the emergence and the conceptual tenets of sport geography. The role of sport geography as an applied science will also be considered. The study of tennis from a spatial perspective concludes the discussion on sport geography. The chapter culminates with a brief overview of the body of literature devoted to sport/recreation participation analysis.

Sport Geography

The universal pervasiveness of sport in society, spurring a plethora of spatial questions, has attracted formal study within the discipline of Geography. Since an initial call for its study (Burley, 1962), the field of sport geography has witnessed an expanding volume of research performed at a progressive rate. Evidence of the subdiscipline's accelerated growth is provided by Mitchell and Smith (1985). They document that the number of sport related articles published in geographic and

interdisciplinary journals, and papers presented at Association of American Geographers meetings between 1962 to 1975 equaled eight. From 1975 to 1982, using the same parameters to measure productivity, the number had jumped to thirty-one.

Instrumental in the subdiscipline's development was original research contributions by Rooney (1969, 1974, 1975). These publications established sport geography as a relevant research specialty and justified the subfield as a significant component in the total geography of leisure. The major conceptual subdivisions of the field were first introduced in the text A Geography of American Sport (Rooney, 1974), and later elaborated upon in a book chapter (Rooney, 1975).

The majority of sport geography scholarship follows the conceptual framework established by Rooney (Mitchell and Smith, 1989). Rooney's (1975) research frame for the geographic analysis of sport allows for both a systematic and a regional basis for study. A systematic, or topical approach, would focus on a particular sport to examine its place of origin and subsequent diffusion, its spatial organization and interaction, and its regionalization. Sport's impact on the landscape is included in the conceptual framework as a relevant research theme.

By employing the regional approach, the focus is on a particular area and the sports of the area are inventoried

and ranked according to importance or emphasis. Spatial organization, spatial variation and interaction continue to be significant considerations in the regional approach to geographical sport studies.

According to Bale (1988), sports-geographic studies have been aligned with five basic approaches. The first approach related by Bale (1988) is the large number of studies focusing on the identification of temporal and regional variations in different sport attributes. Research on the diffusion and innovation in sports, the geographical variations in the 'production' of players or participants, and the study of fan regions of specific teams or sports comprise this research direction. Describing and interpreting the geographical variation in the production of elite players or mass participants in a specific sport is an important component in the identification of sport regions.

The second approach identified by Bale (1988) includes the analysis of the migration patterns of elite athletes. Especially noteworthy in this context is the publication The Recruiting Game (Rooney, 1987), in which the geographical perspective is used to scrutinize recruiting patterns within big time college sports. A number of suggestions for improvement over the present collegiate system are offered by the author. Bale's (1987) study of the migratory patterns of superior

athletes from foreign origins to American college campuses also represents this approach.

Another group of studies that involve certain spatial dimensions of sport, but are principally authored by economists and other non-geographers, focus on the locational dynamics of sports clubs. Bale notes that this category of research frequently uses statistical and mathematical models to predict optimal locational aspects for future sport franchises. Walker's (1986) study of the demand for professional football is indicative of this group of research.

A fourth clustering of sports-geographic studies addresses the economic impact of sporting events and major professional sport teams on the local area. Here, Bale also includes research which conceptualize the area over which sports-induced impacts are felt as externality fields. The significance of sporting impacts of all kinds makes this area of investigation ripe for further development.

A final group of studies according to Bale, employs a more humanistic and cultural-geographic perspective. The core of this research is essentially concerned with sport and the cultural landscape. Raitz's (1987) study on the perception of the sport landscape and its effect on the sport experience, "...is one of the most innovative and useful perspectives in the cultural-environmental

tradition of recreation geography (Mitchell and Smith, 1989: 400)." The landscapes that sports produce has received a growing crossdisciplinary interest providing a rich store of ideas on the character of sport places (Bale, 1988).

A significant trend in both sport and recreational geography research has been the increase in applied studies (Mitchell and Smith, 1985). Various public agencies and private firms have recognized the benefits that the spatial perspective can bring to recreation planning and management.

Many geographers are involved in designing and conducting large scale recreation participation surveys for statewide comprehensive outdoor recreation plans. The data that are generated from the surveys are used for participation models and forms the basis for planning decisions (Fesenmaier and Lieber, 1985).

Rooney has provided applied research for private industry in skiing (1989a), and golf (1987a, 1987b, 1989b). His compilation of a database of golf in America allows for both supply (number and type of golf courses) and demand (based on a golfer survey and other variables indicating involvement) measures of the golf industry. The combined measures are a unique tool in the analysis of adequate facility supply for any selected golf market.

The topic of tennis from a spatial perspective has

received scant attention from sport geographers. Rooney included a brief analysis of the distribution of high school tennis participation in his early investigations in sport geography (1974).

Pillsbury (1990) examines the changing geography of contemporary tennis. He sites demographic, historic, and environmental factors as most important in the regionality of current tennis involvement. The northeast urban corridor, cities and vacation areas of the South, and the far West, especially Hawaii are noted as possessing dominant concentrations of tennis interest.

The lack of sport geography literature concerning tennis is understandable in the light of the subdiscipline's relatively recent conception. The subject matter of most research has focused on the national sports of the United States (football, baseball, basketball) and Great Britain (football, rugby, cricket).

The expansion of research topics and the refinement of methodological orientations will occur as the field evolves. This is already evident since the initiation in 1987 of Sport Place: an International Journal of Sports Geography. The journal provides an avenue for continued growth in sport geography research. The publication of The Atlas of American Sport (forthcoming), is further indication of a subdiscipline expanding in the quantity and quality of its research endeavors.

Sport/Recreation Participation Analysis

Active recreation and sport have become important components in the use of leisure time in the United States in the post World War II era. For planners and decision-makers, the concept of "demand" for sport and recreation has become a central concern in the provision of recreation opportunities. This section of the chapter will provide a brief overview of the substantial body of literature on demand analyses and studies devoted to sport/recreation participation.

In recreation nomenclature, the definition of demand is one of the most often used, least understood, and most significant concepts in recreation planning (NAS, 1975). Demand is often shown as potential use of recreation facilities (total population of an area) or actual participation in specific activities (participation rates). In many cases total demand may be much greater than actual participation (Bevins, 1982).

The majority of demand analyses in the context of recreation is delivered by the field of economics. As demand for goods and services is a central economic concept, this would be natural. Marion Clawson, providing the earliest efforts to analyze demand, supply, and price with regard to recreation (Clawson, 1963; Clawson and Knetsch, 1966), is considered the father of this field

(Bevins, 1982). These initial publications provided researchers with the principal guidelines for using economic analysis in addressing recreation issues.

Within the structure of economic analysis, travel-cost approaches are the dominant methods for demand estimation. This method recognizes that the recreationist "pays" for the services of a site by traveling, at some expense in time and money, to the site. By observing the pattern of use of a site, i.e., the participation rates from a number of geographic zones surrounding the site, one can estimate a relationship between the travel-cost "price" of the site's services and the quantity that will be consumed.

Another popular approach considers the quantity of recreation consumed as measured in terms of the number of occasions or the amount of time that individuals choose to participate. The output of a recreation site is, therefore, considered the measure of demand by consumers.

Walsh (1986) identifies several approaches to measure the quantity of recreation consumed. These include: 1) recreation days or activity days; 2) recreation visitor days, user days or hours; 3) trips, visits, or visitors; and 4) entrance permits, licenses, and tickets issued or units occupied.

Problems with this method of measuring demand for recreation occur when individuals wish to participate in a

specific activity, but because of time or income constraints are not able to do so. Demand for the activity goes unmeasured. Another consideration is that the activity with the highest rate of participation, may be so preferred as a result of numerous opportunities to participate or the lack of supply of other opportunities (NAS, 1975).

The application of standards has been a popular means for identifying inadequacies in the supply of recreation opportunities (NAS, 1975). Standards are the means by which desired ratios of recreation facilities to population provide a measure of presumed needs. For the sport of tennis, the ratio of one tennis court to every 2,000 people has been calculated as the standard (Godbey, 1978). A shortcoming of standards has been the general lack of uniformity in defining parameters for the ratios.

Surveys are another method to obtain estimates of recreation participation. This approach seeks expressed preferences for recreation directly from individuals. Sophisticated techniques for the scaling of preferences, obtained from the surveys, include paired comparisons, conjoint analysis, and gaming techniques. Populations can be surveyed for both their perceived wants in recreation opportunities and actual participation from past experiences.

Appropriate methods for accurate measures of consumer

demand for a recreation activity has been an elusive matter. The selection process is dependent on the geographical range of the target market, the specific activity, and the budget allocated for the demand study.

Another option is to consult the range of recreation participation studies conducted by governments and private industry. At the national level, the federal government conducts periodic surveys of leisure and recreation use by Americans (U.S. Dept. of Interior, 1979). A source for state level recreation statistics is the Statewide Comprehensive Outdoor Recreation Plans that the states produce as mandated by the federal government. A problem with the Recreation Plans is that each state creates their own methods and measures of recreation making comparisons between states and regional or national aggregations impossible.

Kelly (1987) claims that the best sources for current recreation information can be obtained from the Simmons Market Research Bureau and Medimark market surveys. The surveys do provide plenty of information on various segments of the population, but as related earlier are lacking in geographical analysis.

CHAPTER III

DATA COLLECTION AND METHODOLOGY

Data Collection

It is acknowledged that a wide spectrum of tennis participation exists in this country, from spontaneous unorganized play to the professional level. This study targets the frequent tennis playing population in the United States. The assumption is that individuals who subscribe to tennis related magazines, join tennis associations, receive tennis instruction, view tennis on television, possess a greater attachment to the game and are indicative of the core tennis market.

The National Federation of State High School Associations collects and releases data pertaining to boys and girls high school sports participation. This source was utilized for data on high school tennis participation by state.

TENNIS magazine subscription data, United States Tennis Association membership data, and locational identification of tennis teaching professionals were obtained from the New York Times Company Magazine Group. This company publishes TENNIS magazine and currently holds

a contract with the USTA to distribute TENNIS to the association's members as part of the membership benefits. Magazine subscription and USTA membership data were provided as separate datasets by five-digit zip code, ensuring no overlap between the two datasets.

U.S. Professional Tennis Association and U.S. Professional Tennis Registry members are individuals certified to provide tennis instruction to the public. An analysis of the spatial distribution of tennis teaching professionals will provide insight on the demand for tennis instruction. The N.Y. Times Magazine Group was able to furnish U.S.P.T.A. and U.S.P.T.R. membership data at the 3-digit zip code level.

World Tennis magazine subscription data for 1990 were obtained from the Audit Bureau of Circulation (ABC). World Tennis circulation was available at the county level of spatial resolution.

A television rating index obtained from Arbitron Ratings Company for the July 1985 Women's Clay Court Tennis Championship, was used as a measure of tennis television viewing. It is felt that this event, more obscure than Wimbledon or the U.S. Open, would represent a true measure of the television markets that adhere to tennis television viewing.

Population data at the five-digit zip code, county, ADI, and state geographical scales were obtained from

Strategic Mapping, Inc., a computer software company specializing in computer mapping software and population, demographic, and economic datasets. Median household income and per capita income data for ADIs were also used from these datasets.

The 1989 Sales & Marketing Management Survey of Buying Power: Part II was used to obtain percent black and Hispanic population and population by age for ADIs for the purposes of statistical analysis.

Methodology

The geographical distribution of the tennis demand variables is identified through cartographic analysis. Both absolute and per capita measures are included in the study. A per capita index of variables for each areal unit studied was calculated by using the formula for location quotients (LQ):

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

Where t is a measure of a tennis demand variable for a specified areal unit and p is the population of that areal unit, T is the total national measure of the tennis demand variable and P is the total national population. This

index allows a measure of tennis demand for a particular areal unit relative to other units negating the occurrence of population density.

The magazine subscription data and the tennis association membership data provided by 5-digit zip code was aggregated to county, ADI, and state spatial scales with software by Strategic Mapping, Inc. World Tennis circulation data provided by county was aggregated to ADI and state levels. Database manipulations were achieved through the use of spreadsheets on personal computer. Maps were produced using the "Mapmaker" mapping software program manufactured by Strategic Mapping, Inc.

To account for the spatial distribution of tennis demand in the United States, correlation and regression analysis was performed at the ADI geographic resolution. Statistical analysis involving demographic and economic variables were used with a tennis demand variable to determine which factors are significant to the current locational pattern. The tennis demand variable was arrived at by aggregating the magazine subscription data and USTA member data by ADI. Location quotients of the aggregated data were generated, there by gaining a normally distributed dependent variable classified as interval data.

CHAPTER IV

A GEOGRAPHICAL ANALYSIS OF TENNIS DEMAND

Introduction

The purpose of this chapter is to measure and illustrate regional variations in the demand for and interest in the game of tennis in the United States. The analysis is organized into three components. The first section of the chapter focuses on data that relate measures of actual participation in the sport of tennis. The use of market studies, high school tennis participation figures, and United States Tennis Association membership data are the focus of this section.

Tracking interest in tennis as reflected from consumption patterns of the mass media comprises the middle section of this chapter. Spatial variations in the readership of the nation's two major tennis magazines, TENNIS and World Tennis, and tennis television viewing, are examined.

The chapter concludes with a summary of the spatial character of tennis demand in the United States. Some explanations are offered pertaining to this distribution.

Spatial Variations In Tennis Participation

Twenty years after the 1970s tennis "awakening", the sport remains one of the most popular recreational pastimes in the nation. The 1988 Simmons' Study of Media and Markets projected that 8.8 percent of the adult population participated in tennis. Audits & Survey's 1989 study estimated that 13,276,000 households (15 percent of all households) contained one or more persons, age 12 or older, who played tennis at least once over a 12 month period. The study also figured that 9,488,000 households contained at least one person who played four or more times.

Although tennis is a significant American leisure activity enjoyed by millions, participation in the game is characterized by regional variation. On a broad scale, the 1988 Simmon's study found that the West census region accounted for a larger share of overall tennis participation. Based on population distribution, the West has 7 percent more tennis players than the rest of the country. However, when considering those who participated 10 or more times, the South census region has the greatest concentration of frequent players.

A 1987 sports participation study by the National Sporting Goods Association (NSGA) provides state level statistical analysis of tennis participation. The NSGA

provides both total and frequent tennis playing data per state. Frequent tennis playing is defined as those individuals participating thirty or more days a year in the sport. For 1987, the NSGA calculated that 17,464,000 individuals seven years of age or older played tennis more than once within the year. Frequent tennis players numbered 4,574,000. It should be noted that the NSGA data is based on a nationally balanced sample of 15,000 households and the sampling error may increase for some of the smaller populated states.

The report shows the percentage that each state represents of the total U.S. population together with the percentage of tennis participants in each state. An index of participation, relating participation to population, is calculated by dividing the percent of participants in the state by the percent of population in the state. For example, Vermont contains .4 percent of the nation's tennis participants, but has .2 percent of the nation's population, yielding Vermont an index of 2.00. This means that the population in Vermont is twice as likely to play tennis at least once in a 12 month period as compared with total U.S. participation.

The per capita distribution of tennis participants tends to be uniform over much of the country (Figure 2). Strongest measures of involvement occur in some states not normally associated with a high demand for tennis, such as

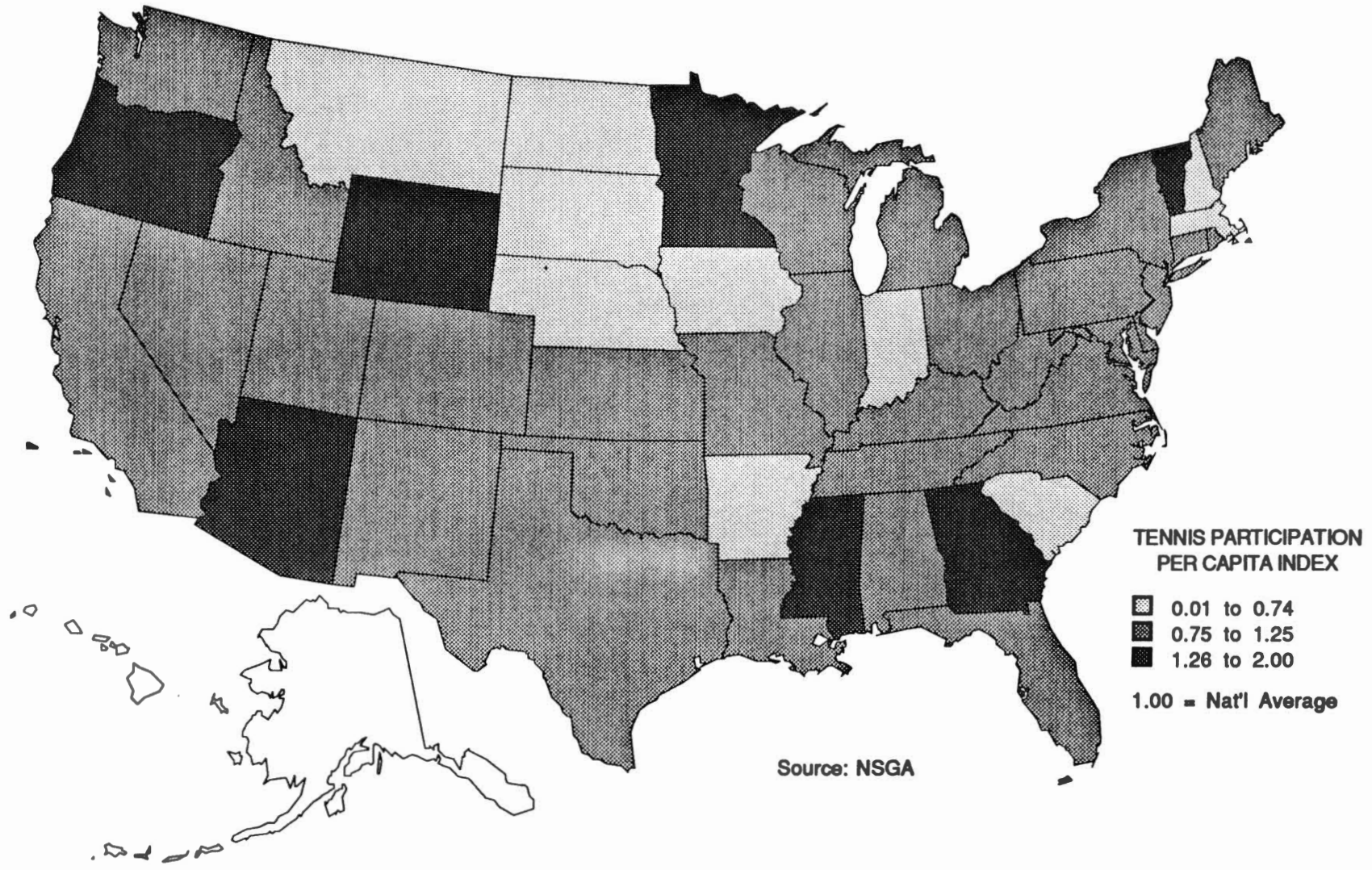


Figure 2. National Sporting Goods Association Tennis Participation Survey, 1987

Vermont (2.00), Oregon (1.82), Wyoming (1.5), and Minnesota (1.28). These states possess a percentage of total tennis participation that exceeds their percentage of total population. The NSGA statistics reveal that the majority of play in these states is categorized as infrequent. Meaning the general tennis playing population of these states engage in the sport only 2-9 days a year.

The Sunbelt states of Arizona (1.46), Georgia (1.36), and Mississippi (1.36) also have high participation rates. This would support the image that prevalent tennis playing occurs in a climate conducive to year-round outdoor play. Arkansas and South Carolina are exceptions to the South's average to above-average distribution of per capita tennis participation.

The upper plains states of Iowa, Nebraska, South Dakota, North Dakota, and Montana is a region defined by low interest in the sport. A climate where the winter season can grow long and severe has influenced participation in other activities. The rural population of this part of the country has adopted other leisure pursuits such as bowling, fishing, and hunting (NSGA, 1987).

This Northern plains region expands when studying per capita measures of frequent tennis participation (Figure 3). The map portrays a distribution that can largely be generalized by climatic considerations. From the state of

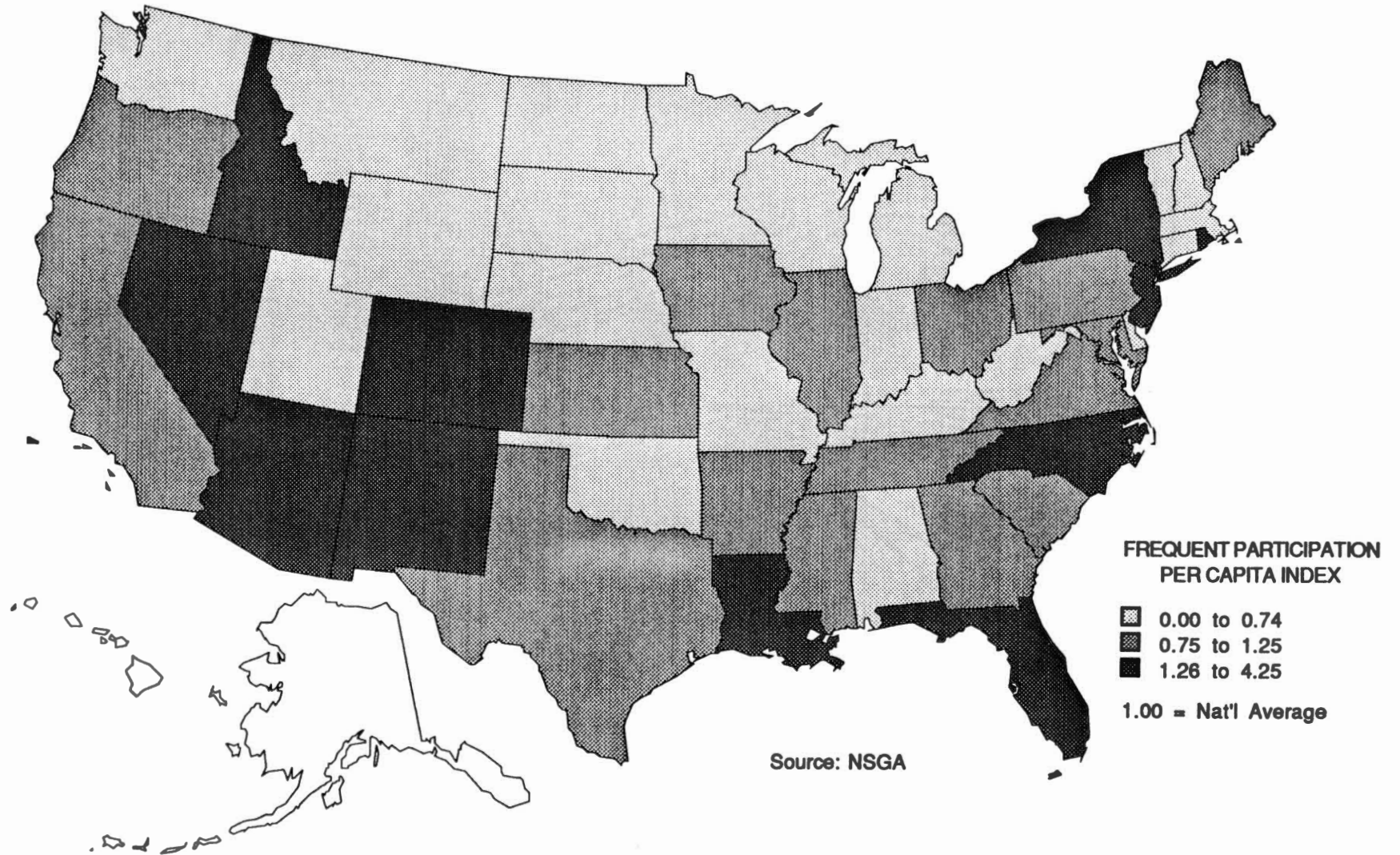


Figure 3. National Sporting Goods Association Tennis Participation Survey, 1987

Washington to the New England states of Vermont, New Hampshire, Massachusetts, and Connecticut, the general population is hard pressed to engage in tennis 30 plus days a year because of a shorter playing season. This broad generalization does not necessarily mean that populations in states with longer summer seasons take to frequent tennis playing. Low measures in Oklahoma and Alabama are representative of this fact.

States that have above normal measures of recurrent tennis players include New York, New Jersey, and Rhode Island. A deep tradition in the sport has been established in this region where the game was first introduced. The Newport Casino Club in Rhode Island, and New York's Forest Hills and the USTA National Tennis Center are landmarks in the sport's historical development. Tennis is a featured pastime and social activity at many of the country clubs and summer retreats. An adequate supply of tennis courts are available throughout the suburban landscape surrounding the urban centers (Whittingham, 1986).

Another region showing strong measures of frequent tennis participants is a portion of the western United States. The NSGA statistics reveal that the states of Idaho, Nevada, Arizona, New Mexico, and Colorado collectively possess 4.1 percent of the nation's population and maintain 8 percent of the nation's frequent

tennis playing population. These state's collective per capita index is 1.95 which is close to twice the national average in terms of frequent tennis participation.

Mild winters and a year-round climate favorable for outdoor tennis in Reno and Las Vegas, Nevada; Phoenix and Tucson, Arizona; and Santa Fe and Albuquerque, New Mexico, is the right perquisite for a concentration of tennis enthusiasts. A genial climate also contributes to high concentrations of frequent tennis players in Louisiana, Florida, and North Carolina. The added leisure time stemming from the sizable retirement populations in the West and Sunbelt states can equate to extended opportunities for tennis play. Greater employment growth and a regional shift in population from the Northeast and Midwestern states to the Sunbelt will no doubt keep fueling a growing base of tennis participation in this section of the country.

High School Tennis Participation

High School sport programs for the 1989-'90 season had 136,939 boys and 128,076 girls participate on tennis teams. Tennis has steadily increased in popularity each year since 1983-'84 when 232,716 boys and girls partook in organized play. According to the National Federation of State High School Associations, peak participation numbers occurred in 1978-'79 when 318,018 high school students

engaged in tennis. Table I provides high school participation figures for the 1989-'90 school year by state.

On a total participation basis, Texas, with 38,500 players, ranked first in the number of tennis players, followed by California, New York, Michigan, Illinois, and Ohio. These six states together accounted for 42% of all high school tennis participation. Generally, the most populous states render the greatest share of tennis players, but this measure makes no allowance for population differences.

Nationally, there was approximately one high school tennis player for every 910 people. If that level of participation is assigned a per capita index value of 1.00, then a state with one high school tennis player for every 1820 people would have an index of 0.5. These ratios are calculated using the high school tennis participation data supplied by the National Federation of State High School Associations and population data obtained from Strategic Mapping, Inc. Analysis at the state level should negate any regional disparities in the distribution of 14-17 year olds.

On a per capita basis, Texas' index of 2.1 indicates a rate of participation that more than doubles the national average. Other leading states that have a strong interest in tennis at the high school level, are

TABLE I
HIGH SCHOOL TENNIS PARTICIPATION FIGURES BY STATE
(BOYS AND GIRLS)

NAME	TOTAL PARTICIPATION	PER CAPITA INDEX
Alabama	2,064	0.46
Alaska	199	0.34
Arizona	3,083	0.86
Arkansas	2,452	0.94
California	25,546	0.86
Colorado	4,653	1.30
Connecticut	3,989	1.14
Delaware	834	1.20
District of Columbia	300	0.44
Florida	6,140	0.48
Georgia	6,145	0.92
Hawaii	1,081	0.93
Idaho	1,402	1.27
Illinois	11,660	0.92
Indiana	9,952	1.64
Iowa	4,078	1.30
Kansas	3,691	1.36
Kentucky	1,825	0.45
Louisiana	2,353	0.48
Maine	1,621	1.26
Maryland	3,302	0.67
Massachusetts	6,122	0.95
Michigan	12,834	1.28
Minnesota	6,536	1.41
Mississippi	2,394	0.83
Missouri	5,366	0.96
Montana	1,582	1.76
Nebraska	1,522	0.87
Nevada	655	0.62
New Hampshire	1,324	1.17
New Jersey	9,349	1.12
New Mexico	1,106	0.68
New York	13,730	0.70
North Carolina	6,402	0.92
North Dakota	684	0.92
Ohio	11,511	0.97
Oklahoma	1,969	0.54
Oregon	1,784	0.60
Pennsylvania	7,920	0.61
Rhode Island	1,268	1.18

TABLE I CONTINUED

NAME	TOTAL PARTICIPATION	PER CAPITA INDEX
South Carolina	2,504	0.67
South Dakota	580	0.75
Tennessee	7,496	1.42
Texas	38,500	2.10
Utah	1,817	0.99
Vermont	761	1.28
Virginia	5,295	0.83
Washington	8,677	1.77
West Virginia	1,839	0.87
Wisconsin	6,711	1.28
Wyoming	407	0.73

Source: National Federation of State High School
Associations

Washington (1.77), Montana (1.76), Indiana (1.64), Tennessee (1.42), and Minnesota (1.41).

The per capita measures offer an effective means to identify regional differences in the popularity of tennis at the high school level (Figure 4). Besides Texas and possibly Tennessee, the states exhibiting above average enthusiasm for high school tennis fall outside the Sunbelt. Regional concentrations of high participation in tennis include the states of Washington, Idaho, and Montana in the Northwest, a collection of states in the upper Midwest, and Vermont and Maine in New England. Kansas and Colorado's above average participation also indicate that verve for tennis at the high school level does not necessarily coincide with a year-round seasonal climate as one might expect.

The low participation rates for some of the Southern tier states may reflect commitments to other sporting activities. Rooney (1986) has identified the Sunbelt as the bastion of football. In the South, the high school football program is a rich breeding ground for the supply of college football talent. The emphasis on football can translate to other programs, such as tennis, going without needed resources. Arkansas, Mississippi, Georgia with average tennis participation, and Texas with above average emphasis in high school tennis are exceptions to the south's relative low rates of high school tennis

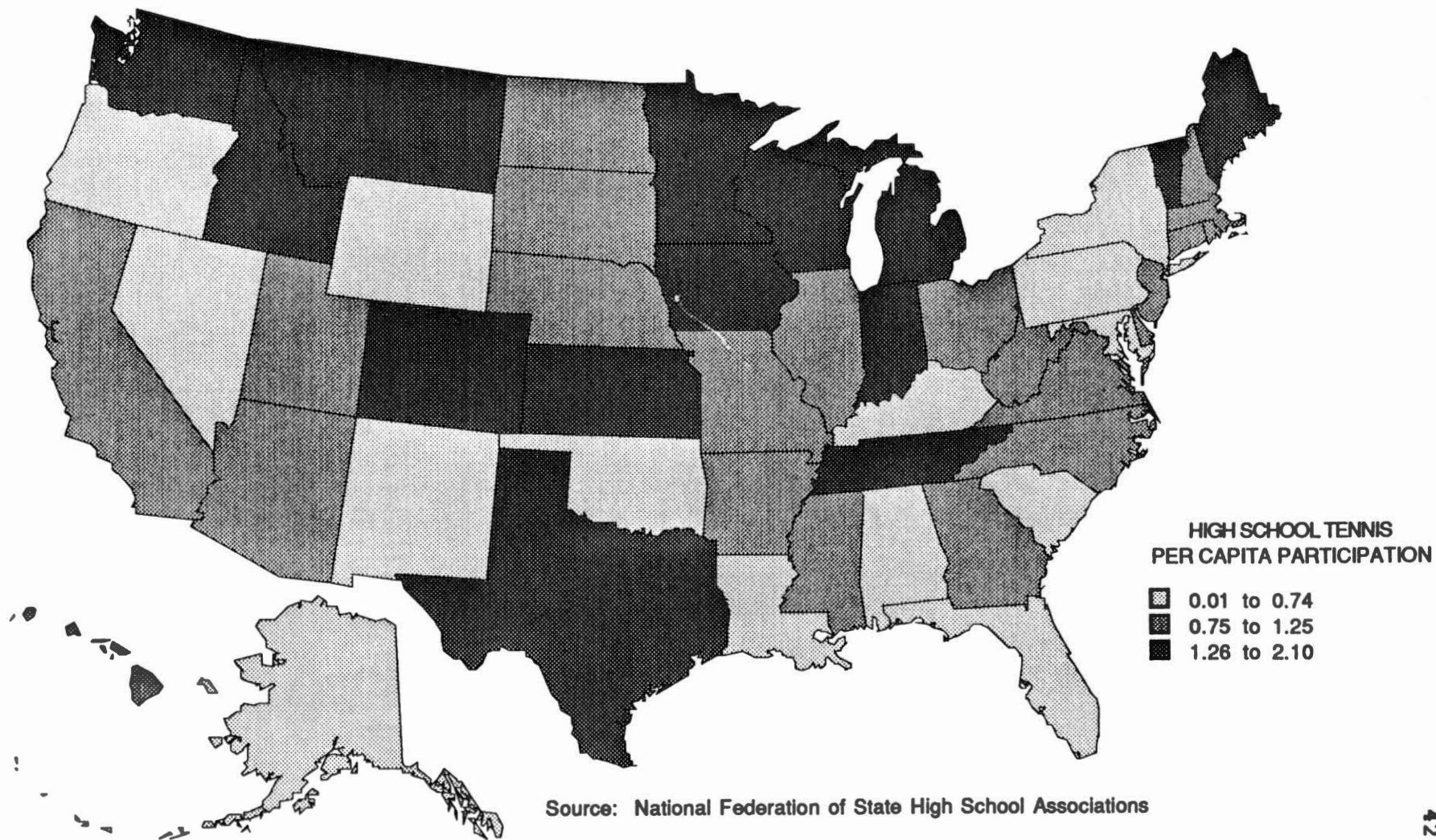


Figure 4. Per Capita High School Tennis Participation, 1989-'90

participation.

The current geographical pattern of high school tennis participation holds many similarities with the per capita distribution of participation studied in the 1971-'72 season (Rooney, 1974; Adrian, 1974). The Pacific Northwest (minus Oregon), the Great Lakes region, and Texas, for both study periods, are areas of above-average high school tennis participation. States emerging from the bottom ranks of per capita participation in the earlier study to the highest range in the current study are Montana, Iowa, Tennessee, and Vermont.

High school sports participation levels and the general availability of various sport programs depend on a complex combination of local variables. Factors such as community wealth, population density, settlement patterns, climate, ethnic and racial composition, and tradition have been identified as influencing geographical variations in sport participation (Rooney, 1974). These factors would certainly play a role in the spatial configuration of high school tennis participation.

United States Tennis Association

The United States Tennis Association is the governing body for tennis in the United States, overseeing the administration of rules of the game and development of tennis on all levels. At the pinnacle of tennis

competition, the USTA sponsors the teams for international play in the Olympics, Pan Am Games, Davis Cup, Federation Cup and Wightman Cup. The USTA also runs the U.S. Open Tennis Championships, one of professional tennis' premier tournaments.

A primary objective of the USTA is to field competitive national teams for international play year in and year out. To achieve this objective, the association in 1987 initiated its player development program that starts at the grass roots level. The first stage of the master plan is to introduce kids from all socio-economic backgrounds to tennis and to sustain their interest in the game. The USTA schools program, launched in 1985 with three pilot programs, now reaches 2.5 million children a year in 1,300 communities across the nation (Carter, 1990). The program seeks to coordinate schools, parks, and community based tennis associations to launch the next generation of tennis players.

Youngsters who take to the game are further encouraged to participate in local tennis tournaments and improve their skills through training workshops and instructional programs. The USTA National Junior Tennis League (USTA/NJTL) is the next stage in the player development program. The USTA/NJTL is promoted as an entry-level, low-key team competition format for boys and girls ages 8-18. This team tennis program for younger

players is based on challenge ladders and inter-team match play. The USTA/NJTL local programs make up a national network of recreational tennis for kids. Junior competition is further promoted through sectional and district ranking tournaments, teenagers with the greatest potential feed into advanced tennis programs.

National tournaments continue to pare down the broad base of players. The best juniors are identified and supported through financial aid and coaching, including the opportunity to attend clinics with the national coaching staff at regional training centers. The design of the USTA player development program both enhances recreational tennis participation and provides the structure for developing a competitive U.S. national team.

Tennis players are attracted to the USTA by its numerous services and programs. Thousands of tournaments a year are sanctioned by the USTA geared for a range of age groups and playing abilities. USTA national championship tennis tournaments for juniors, adults, and seniors, hard court, clay court, and grass court, are scheduled throughout the year. The USTA certainly can play a decisive role in the spatial structure of recreational tennis in America.

USTA membership is used as another indicator of primary tennis participation. Generally, the bulk of USTA involvement is associated with the most populous states

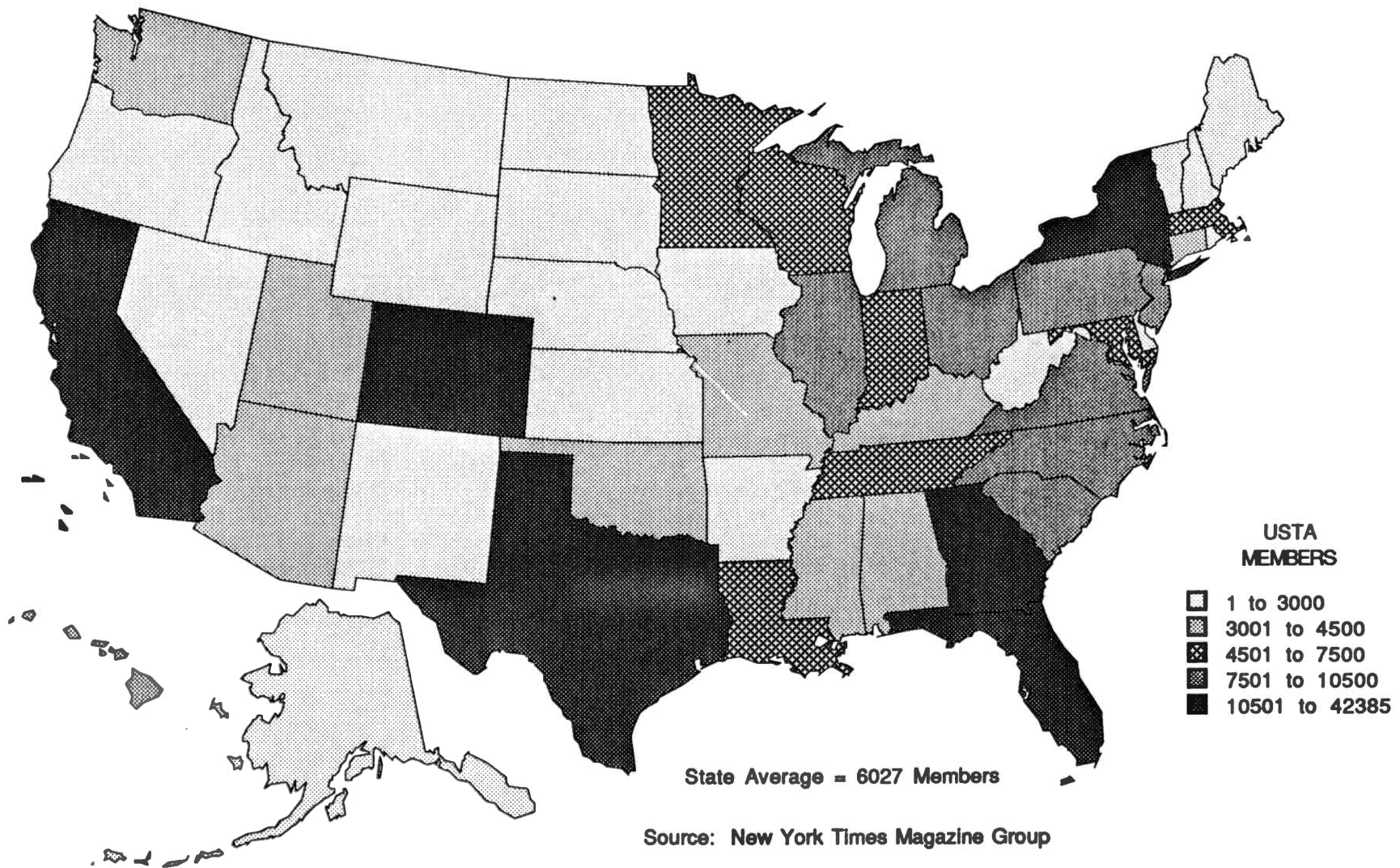


Figure 5. United States Tennis Association Membership by State, 1990

(Figure 5). California, with 42,385 members, is far and away the leading membership state. The state has 19,083 more members than the next largest membership state, Georgia, with 23,302 members.

That Georgia ranks second in the nation's supply of USTA members bears evidence of this state's penchant for tennis. Georgia's per capita index is 2.99. Other leading states on a per capita basis are Hawaii (2.84), Colorado (2.53), Delaware (1.91), South Carolina (1.77), Utah (1.50), Nevada (1.32), Mississippi (1.31), and Florida (1.27).

Average measures of per capita involvement in the USTA characterizes a large expanse of the country (Figure 6). The West coast and the Southern tier of states show per capita measures in line with the national average.

Pockets of low interest mark the Rocky Mountain states of Idaho, Wyoming, and Montana, and the Plains states of North and South Dakota, Iowa, and Missouri. Illinois, Michigan and a line of states from West Virginia to Maine also relate sub-par membership rates.

Analysis of USTA membership at the county level allows identification of regional variations within states. The leading counties in total USTA membership are provided in Table II. Top USTA membership counties are associated with large metropolitan areas. The Los Angeles metro's Orange and Los Angeles counties, combine for

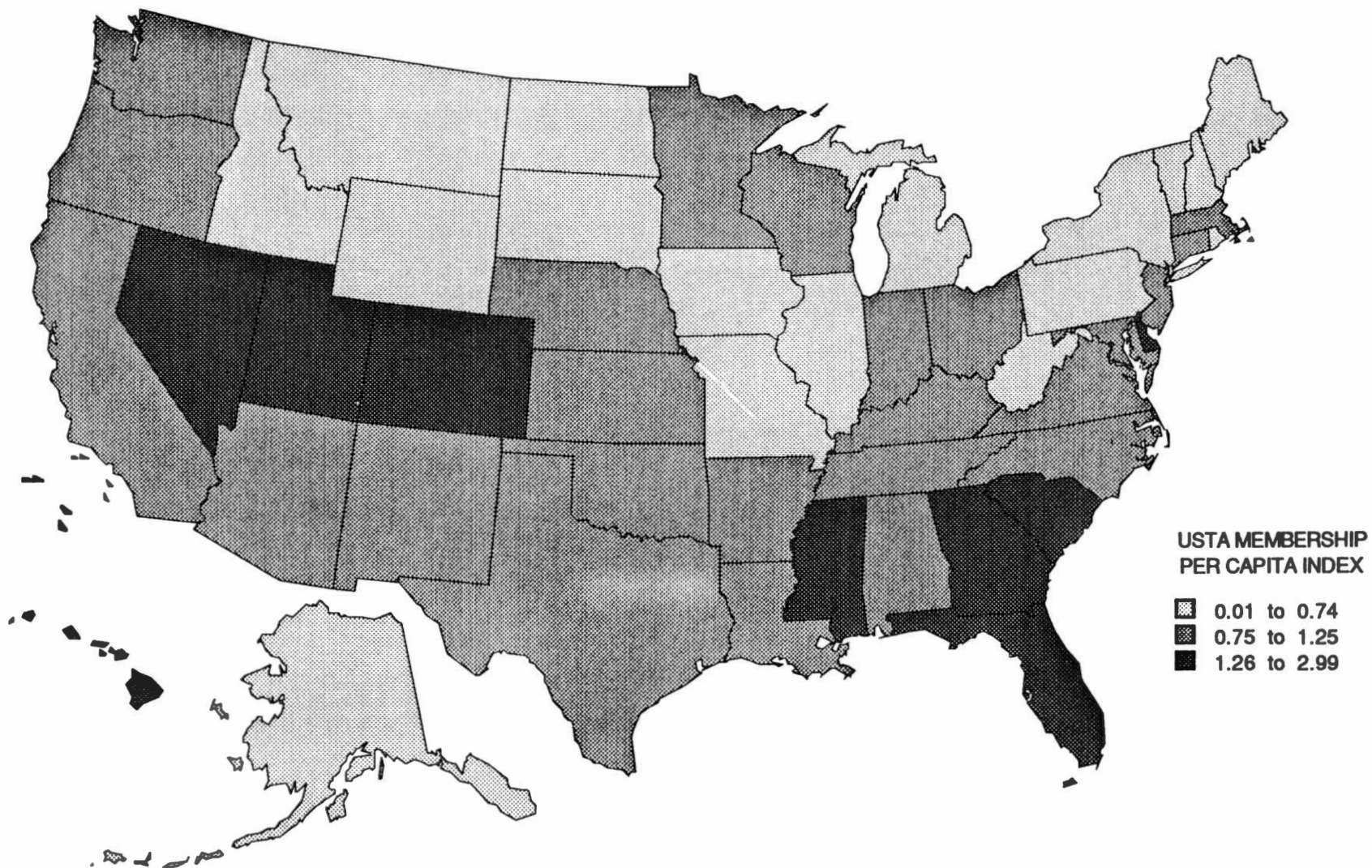


Figure 6. Per Capita United States Tennis Association Members by State, 1990

TABLE II
 USTA MEMBERSHIP
 TOP 15 COUNTIES

COUNTY	USTA MEMBERS	PER CAPITA INDEX
Los Angeles CA	10,847	1.14
Fulton GA	5,225	7.35
Cobb GA	4,587	10.24
San Diego CA	4,407	1.75
Harris TX	4,327	1.35
De Kalb GA	4,064	6.72
Cook IL	3,504	0.58
Santa Clara CA	3,500	2.19
Orange CA	3,489	1.41
Nassau NY	3,162	1.89
Gwinnett GA	3,108	9.83
Hennepin MN	2,942	2.61
Dallas TX	2,716	1.30
Honolulu HI	2,712	2.91
Dade FL	2,645	1.31

14,336 members. The metropolitan area of Atlanta, with four counties on the list (Fulton, Cobb, De Kalb, and Gwinnett), contributes 7,172 members to the association.

Texas' two largest urban areas, Houston (Harris Co.) and Dallas, are also represented with high membership counties. The other MSAs supplying large numbers of members are Chicago (Cook Co.), San Jose (Santa Clara Co.), New York (Nassau Co.), Minneapolis (Hennepin Co.), Honolulu, and Miami (Dade Co.).

Per capita USTA membership at the county level reveals a different story (Table III). A rural Texas county (Mason Co.) tops the list with a whopping 12.89 per capita index. Archer county, near Wichita Falls, Texas, and Schleicher county, in west Texas, also show large above average per capita measures of USTA membership. A strong commitment to the USTA and a base of tennis activity exists in many sections of rural Texas.

The Atlanta area again shows a devotion to organized tennis through the USTA. Atlanta metro counties have a per capita membership rate that ranges from over ten times in Cobb county (10.24), to over six times in De Kalb county (6.72), the national average. Forsyth county, northeast of the Atlanta metro area, also has a strong commitment to tennis through the USTA.

Per capita USTA membership at the county scale is useful for the identification of regional variations

TABLE III
 PER CAPITA USTA MEMEBERSHIP
 TOP 15 COUNTIES

COUNTY	USTA MEMBERS	PER CAPITA INDEX
Mason TX	53	12.89
Cobb GA	4,587	10.24
Gwinnett GA	3,108	9.83
Summit UT	132	8.96
Douglas CO	387	8.73
Archer TX	76	8.42
Fulton GA	5,225	7.35
De Kalb GA	4,064	6.72
Schleicher TX	22	6.42
Greenwood SC	391	5.90
Forsyth GA	252	5.87
Marin CA	1,430	5.55
Richland SC	1,705	5.44
Blaine ID	81	5.37
Pitkin CO	62	5.27

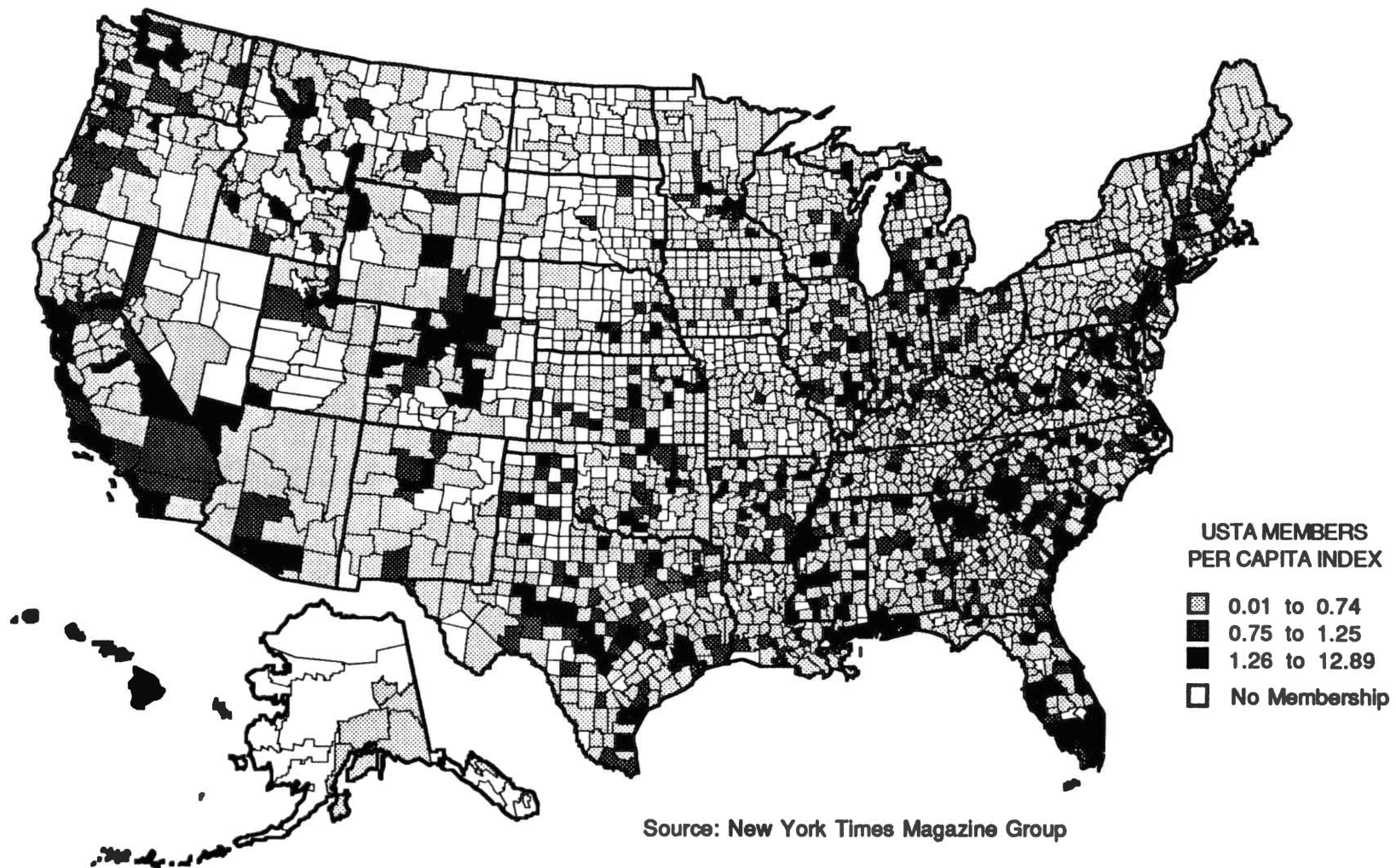


FIGURE 7. Per Capita Distribution of United States Tennis Association Members by County, 1990

within states (Figure 7). The national pattern indicates widespread involvement in the association through most of the country east of the Mississippi River. However, a cluster of counties with no members is found in Appalachia and the upper reaches of Wisconsin and Michigan.

In the western half of the country a lack of membership in counties is more pervasive. A large measure of this occurrence can be explained by the low population densities characteristic of vast expanses of the land. In

the Northeast, strong per capita indices coincides with Megalopolis. New York City, Philadelphia, and Washington D.C. are centers of high USTA activity. The trend of above average USTA measures associated with urban areas continues into Virginia. The cities of North Carolina are also well represented.

Throughout the state of South Carolina, a dedication to the USTA is disclosed. The western part of the state, a section from Augusta, GA to Columbia, and all along the coast, USTA membership is strong. Many tennis centers and resorts exist throughout South Carolina, sponsoring a range of tournaments from local to national in scope.

Atlanta is a city devoted to tennis. Counties extending beyond the limits of the metropolitan boundary relate above average USTA membership rates. Atlanta's strong commitment to organized tennis is further enhanced by the support for the Atlanta Lawn Tennis Association.

Other areas of the Southeast with strong tennis interest as measured by USTA membership include the southern section of Florida. The Tampa-St. Petersburg, Ft. Myers-Naples, and West Palm Beach to Miami metropolitan areas maintain high USTA membership relative to population. A band along the Gulf of Mexico centering on Pensacola, Florida, also possesses an affinity toward USTA tennis.

Other states revealing centers of high USTA activity include Mississippi, Arkansas, Indiana, Illinois, Oklahoma, and Kansas. Tennis participation is strong in a number of counties in California and Colorado, and in Hawaii.

Tennis Teaching Professionals

The U.S. Professional Tennis Association and the U.S. Professional Tennis Registry tests, certifies and registers tennis teaching professionals. The organization's members are those persons who derive a major part of their income from teaching tennis. Combined membership of the two organizations equates to 4,721 tennis teaching professionals.

The per capita distribution of the teaching professionals at the state level is used as another indicator in the geography of tennis demand. States with higher measures of per capita tennis professionals are

thought to possess a greater demand for tennis instruction and participation. It would seem likely that the teaching professionals would gravitate to the areas where they are needed most.

The per capita distribution of tennis teaching professionals reveals pronounced demand for tennis instruction in Hawaii, Arizona, Florida, and South Carolina (Figure 8). California, New Mexico, and metropolitan Las Vegas NV in the West also show high rates of teaching professionals per population. Partial explanation of this pattern may relate to the numerous tennis academies, camps, and resorts emphasizing tennis instruction that are prevalent within these states (USTA, 1989). As popular vacation destination states with climates amiable to tennis play all year, these parts of the country attract numerous out-of-state tennis players. The distribution of tennis teaching professionals may disproportionately favor these states.

Minnesota, Virginia, and the New England region, especially Vermont, are other areas displaying high tennis involvement through the demand for tennis instruction. These states, not ordinarily known as tennis vacation destination states, more accurately reflect the indigenous population's demand for tennis instruction.

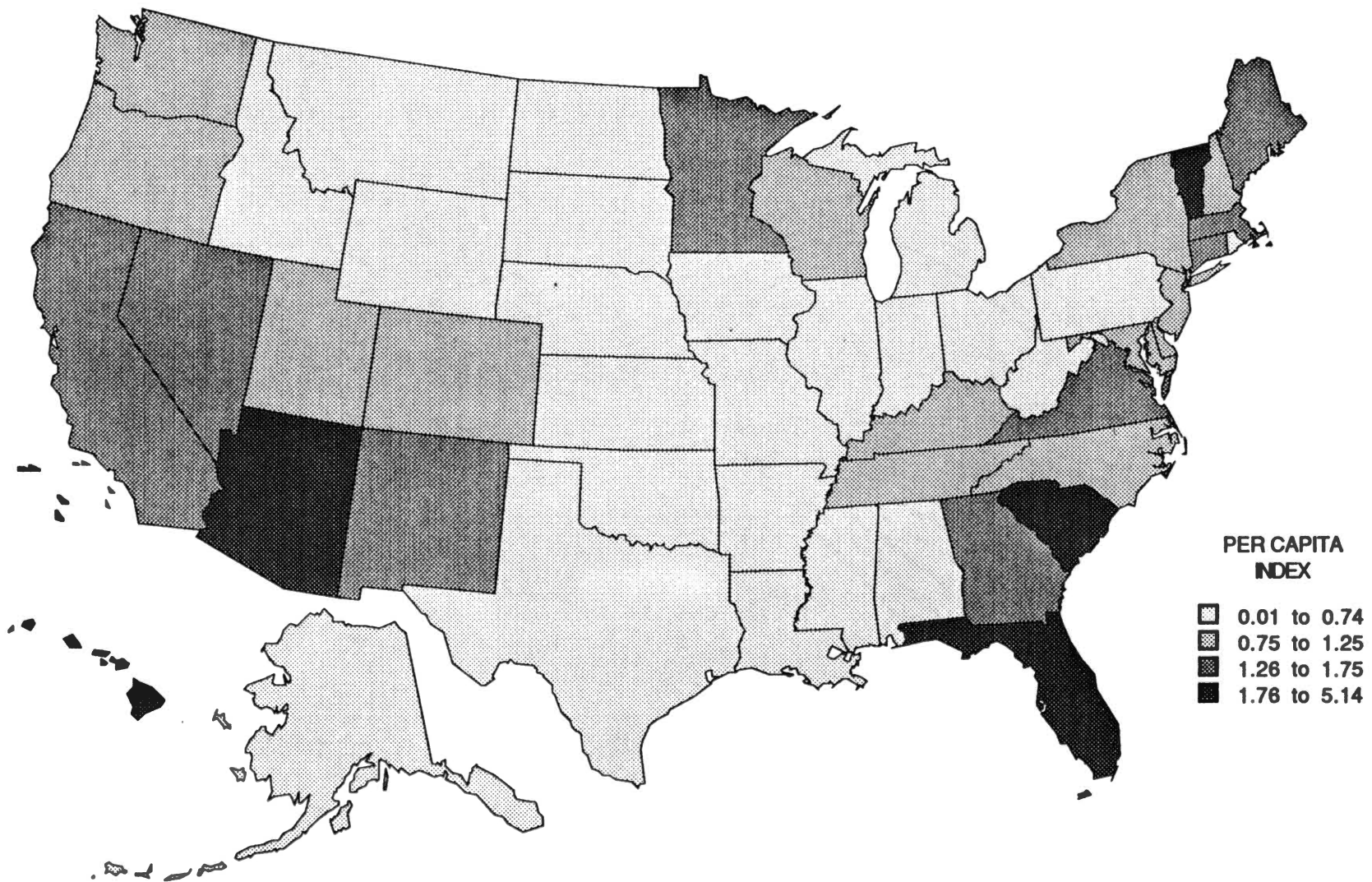


Figure 8. Per Capita Distribution of Tennis Teaching Professionals by State, 1990

Spatial Aspects of Tennis Consumption
Through Measures of the Mass Media

Television Viewing

The preceding section of the analysis focused on the regionalization of tennis participation. This section of the chapter further investigates the regionality of tennis in the U.S. utilizing data on tennis spectating and tennis magazine readership.

Tennis coverage on broadcast television played a critical role in the democratization of the sport in the United States. Low production costs, the exciting new format of "Open" tennis, and the willingness of advertisers to invest capital influenced the networks to triple the amount of time devoted to tennis between 1970 and 1973 (Rader, 1983). A large portion of the American public soon became enamored with the game's brash young tennis stars clashing for unprecedented purses. Jimmy Connors' display of an intense determination to succeed in a match, "playing every point of his career like it was the last punch of a 15-round spectacle (Nyad, 1989)," provided great entertainment. The September 1973 "The Battle of the Sexes" match involving Bobby Riggs and Billie Jean King attracted 30,472 people to Houston's Astrodome and millions more on television (Rader, 1983).

Demand for the game skyrocketed as tennis became the

"in" sport of middle and upper middle income groups. The pace of tennis court construction soared and new tennis centers began springing up throughout the country. Sporting goods companies quadrupled their sales of tennis gear, and it is reported that in 1973 the manufactures, unable to respond to the sudden boom, depleted their stores of tennis balls (Rader, 1983). The 1970s tennis boom was the result of many factors, but the abundance of television coverage played a prominent role.

A saturation point in America's fanaticism for the sport was reached by the end of the 1970s. The downturn of tennis resulted in the networks drastic reduction of their tennis coverage. While tennis dimmed in popularity on broadcast television, it increasingly became a major attraction on cable. Throughout the 1980s, cable stations such as USA Network and ESPN have substantially expanded their coverage of tennis with an array of events (N.Y. Times, 1988). Today, tennis television viewership is on an upswing, with the cable channels competing with the broadcast networks for the game's major events.

The 1988 Simmons market study revealed that 22.3 million people, or 12.7 percent of the country's adult population, are frequent consumers of tennis on television. An index is created by Simmons that demographically defines and segments television audiences for various sports. The index provides the relative

concentration of a particular demographic group within a selected sport's television audience. An index of 100 would reveal that a percentage of a demographic segment watching a particular sport is equal to the percentage of the total population that watch the sport.

The tennis viewing index of 111 for men indicates that men are 11 percent more likely to watch tennis on television than the average adult. From the Simmons data, a demographic profile of the most likely tennis television viewer is possible. This viewer is apt to be a college graduate (index=160) holding a professional or managerial job (148) with a household income exceeding \$60,000 a year (152). The South census region (103) edges out the Midwest (101) and West (100) regions with the greatest concentration of viewers.

Additional insight regarding the geography of tennis television viewing is available from data garnered from Arbitron's television ratings. Arbitron estimates network program audiences for the gamut of network telecasts. From the estimated percent of television households tuned in to a network program, a rating index is computed to show how a particular program audience share in an Area of Dominant Influence (ADI) compares with the country as a whole. ADIs are television market areas defined by Arbitron.

Arbitron rating indexes by ADI were obtained for the

Women's Clay Court Championships broadcasted July 1985 on the CBS television network. This is a rather nondescript event as compared to the U.S. Open or Wimbledon championship tournaments. This fact was desirable to capture an audience devoted to tennis television viewing.

Figure 9 displays the spatial configuration of the 1985 Women's Clay Court Tennis Championships television rating indexes. The map relates a generalized pattern of strong viewership in the Western quarter of the country, parts of the upper Midwest, a section of the South around the Arkansas/Louisiana border, and especially high measures are evident in the South's Piedmont region.

ADIs with measures doubling the national average of viewership for this event are most abundant in the Mid-Atlantic and Southeastern sections of the country. A belt of ADIs with particularly high ratings extends from the Tampa-St. Petersburg ADI in the south to the Washington DC television market in the north. The Savannah and Augusta GA, Charleston SC, Greenville-Spartanburg-Asheville SC-NC television markets form a core of strong viewership in this region. Another core of ADIs with lofty measures involves the Raleigh-Durham NC, Roanoke-Lynchburg and Richmond VA, and District of Columbia markets.

The Shreveport, Louisiana ADI is the center of a region with television markets showing above average to average viewership measures. Columbus-Tupelo MS market

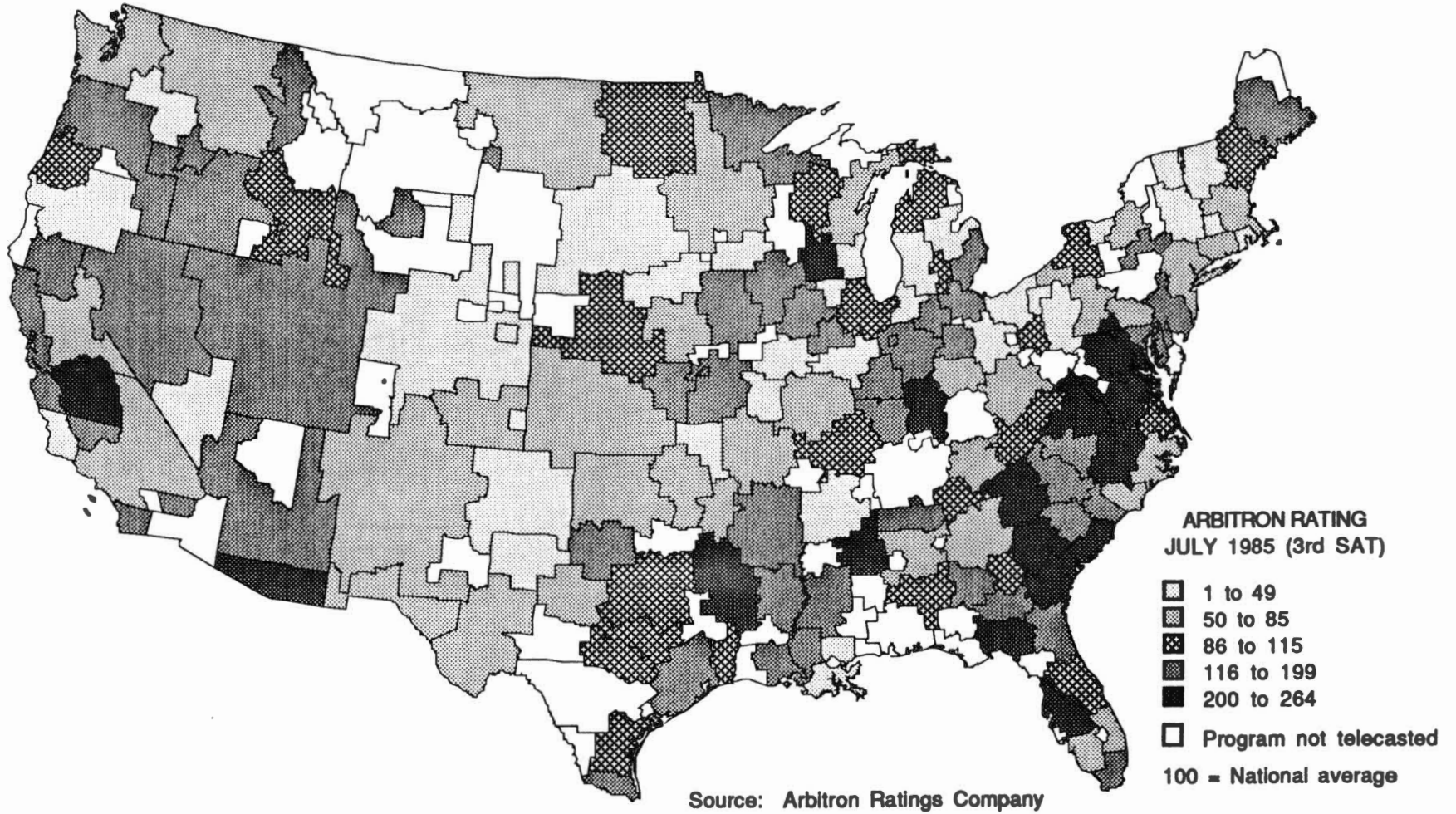


Figure 9. U.S. Women's Clay Court Tennis Viewing Ratings

also relates a rating twice the national average. Other ADIs in the eastern half of the U.S. with this distinction are Louisville KY and Madison WI.

A vast mid-section of the country displays low interest for this particular television event. West of the Albuquerque NM and Denver CO television markets, average to above average ratings predominate. The Tucson AZ and Fresno CA markets lead this section of the country with ratings doubling the national average. Phoenix AZ, Salt Lake City UT, and southern Idaho ADIs form a band of tennis television interest that extends into Oregon. California television markets with strong measures occur along the coast in the northern half of the state and in the San Diego and Bakersfield ADIs.

Major Tennis Magazine Circulation Patterns

Another data source for the investigation of the regionality of tennis interest in the U.S. is tennis magazine subscriptions. It is surmised that only those individuals with a particular interest in tennis will subscribe to the magazines associated with the sport. In terms of readership, TENNIS and World Tennis are the nation's leading magazines. In 1990 there were 359,906 TENNIS magazine subscribers and 404,464 World Tennis subscribers in the United States. The subscription rates for the two publications were combined to form one overall

magazine measure.

As the measures before it, the distribution of tennis magazines is a function of population (Figure 10).

Leading states in the number of subscribers are California (93,449), New York (56,164), Texas (44,836), Florida (42,075), Illinois (34,880), and Pennsylvania (31,562). These six states account for 40 percent of the nation's tennis magazine readership.

Per capita measures of magazine circulation is more conducive for the identification of regions with a proclivity towards tennis (Figure 11). The geographical distribution of per capita tennis magazine subscriptions shows most of the country in line with the national norm. States with a robust interest in tennis based on relative measures of subscription rates are Hawaii (1.92), the District of Columbia (1.85), Minnesota (1.64), Georgia (1.50), Colorado (1.38), and Connecticut (1.36).

The Southern states of Louisiana, Arkansas, Mississippi, and Alabama form a region where interest is low. North Dakota and South Dakota, Montana, Wyoming and Oregon also reveal a dearth for tennis.

On a per capita basis at the county level, the distribution of magazine readership fills in many of the gaps of the USTA membership coverage (Figure 12). Some degree of circulation is present throughout most of the country. Only a limited number of counties show no

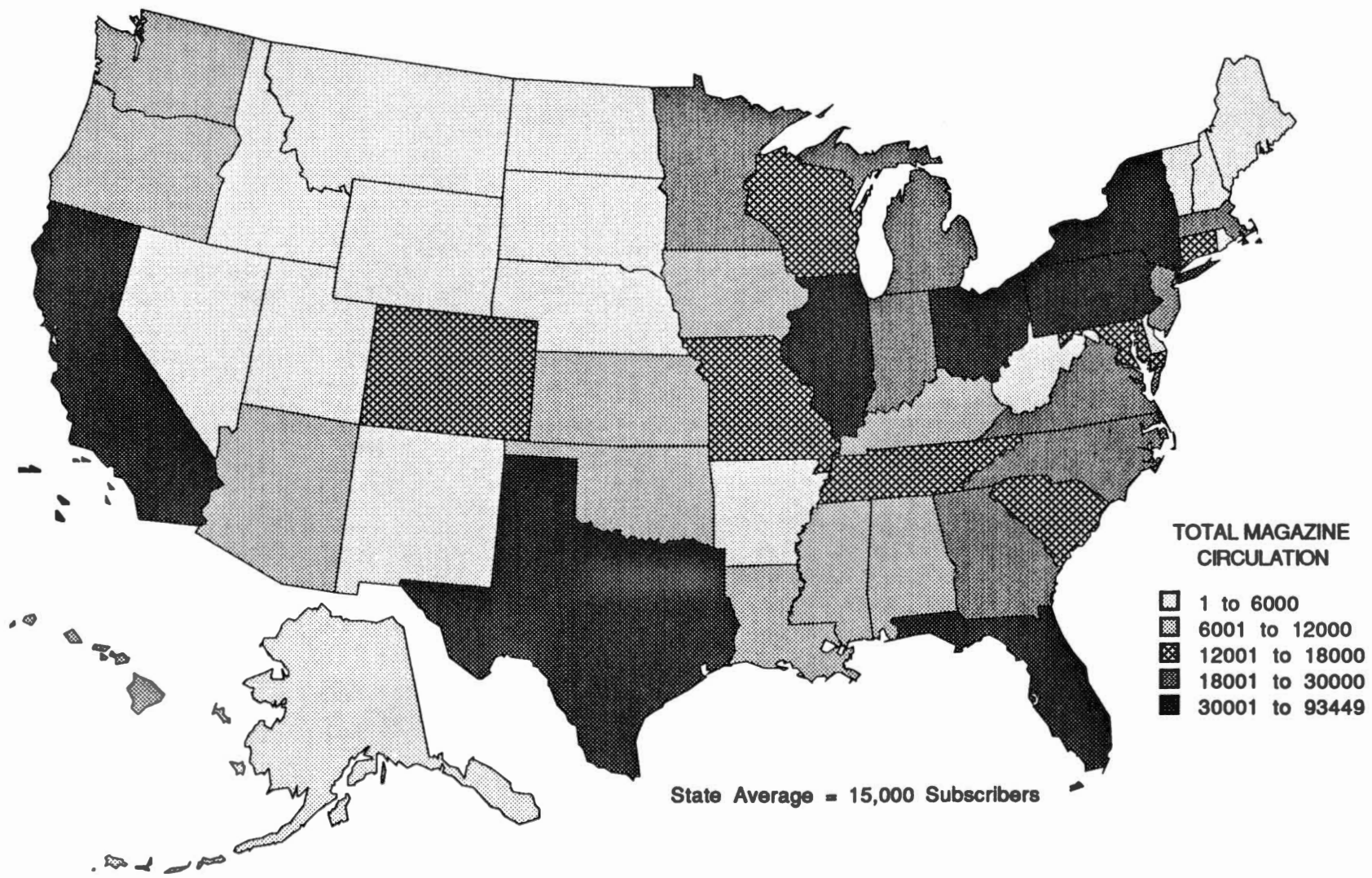


Figure 10. Geographical Distribution of WORLD TENNIS and TENNIS Combined Circulation, 1990

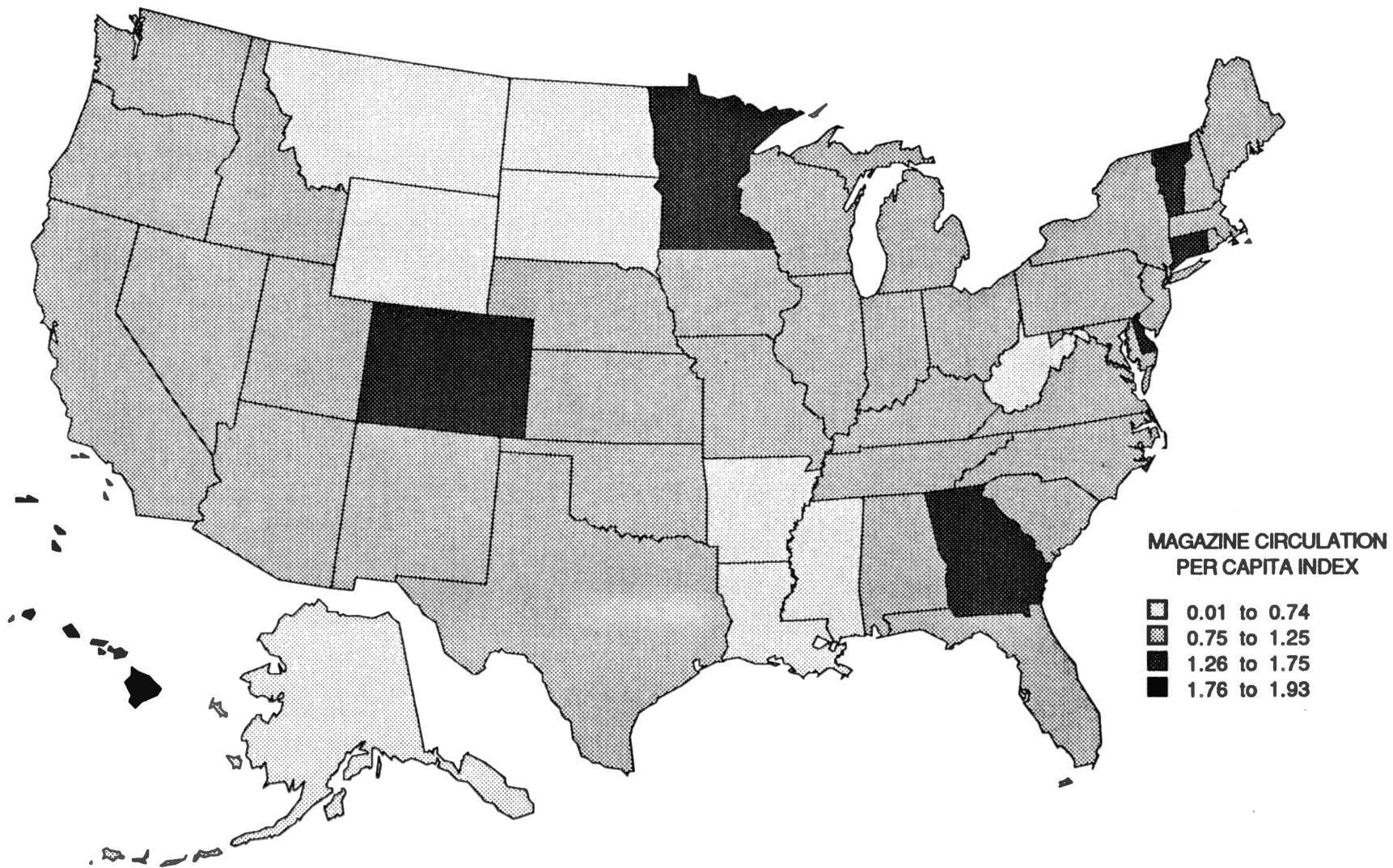


Figure 11. Per Capita Distribution of WORLD TENNIS and TENNIS Combined Circulation, 1990

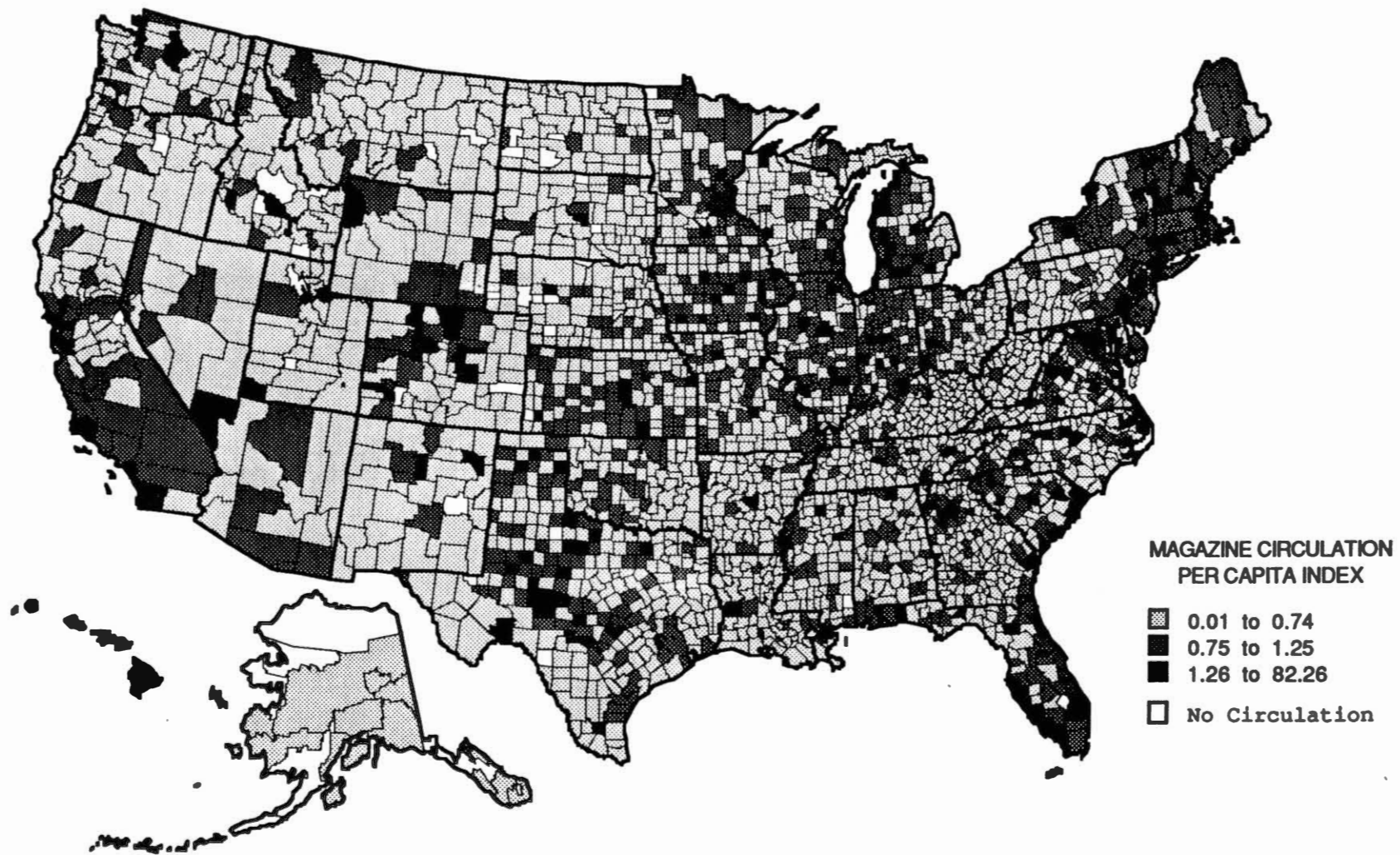


Figure 12. Per Capita Circulation of Major Tennis Magazines by County, 1990

circulation rates.

For much of the nation and especially in the East, strong concentrations of readership coincide with densely populated counties. In urban areas, tennis, as a recreational amenity, holds tremendous appeal because of its low land requirements (Phillips, 1986). Flexibility in the site selection of a tennis court, as compared to a baseball diamond or a golf course, can equate to an adequate supply of tennis in many built-up urbanized sections of the country.

Average to above average measures of tennis magazine readership in rural counties is more prevalent in the Midwest and Western sections of the nation. Less populated counties in Kansas, Minnesota, Michigan and throughout the Corn Belt show healthy tennis activity. Strong circulation patterns and USTA membership in Rocky Mountain counties known for their snow skiing indicate an inclination for tennis in the non-ski season. From the range of user-oriented activities, tennis seems to have emerged as a popular compliment to snow skiing.

Hawaii with high readership rates, as with most tennis demand measures before it, reveals a predilection for tennis. San Diego, Orange, Santa Barbara counties and the San Francisco Bay area are strong tennis markets in California.

Generalizations

The conclusion of this chapter generalizes the spatial distribution of tennis demand in the United States. From the assembled data, a Tennis Demand Index was created to summarize the analysis to this point. A summary at the state level begins this section of the chapter.

A demand index was created using the NSGA statistics, tennis teaching professionals, high school tennis participation, USTA membership data, and tennis magazine circulation. Because of the limitations of the tennis teaching professionals and NSGA data, these variables were grouped and weighted less than the other variables. The index is adjusted on a per capita basis.

Hawaii, measuring 2.23, leads the nation with the highest Tennis Demand Index (Figure 13). Hawaii's distinct environmental qualities makes it the consummate locale for the sport. Other states with above average demand indices are dispersed across the country, from Arizona in the southwest to Vermont in the northeast.

To generalize the U.S. tennis market within states an index was created at the ADI spatial scale. To obtain this index, United States Tennis Association membership data was merged with the tennis magazine circulation data. A sample size of 1,071,722 is obtained by merging the USTA member data, TENNIS magazine subscriber data, and World

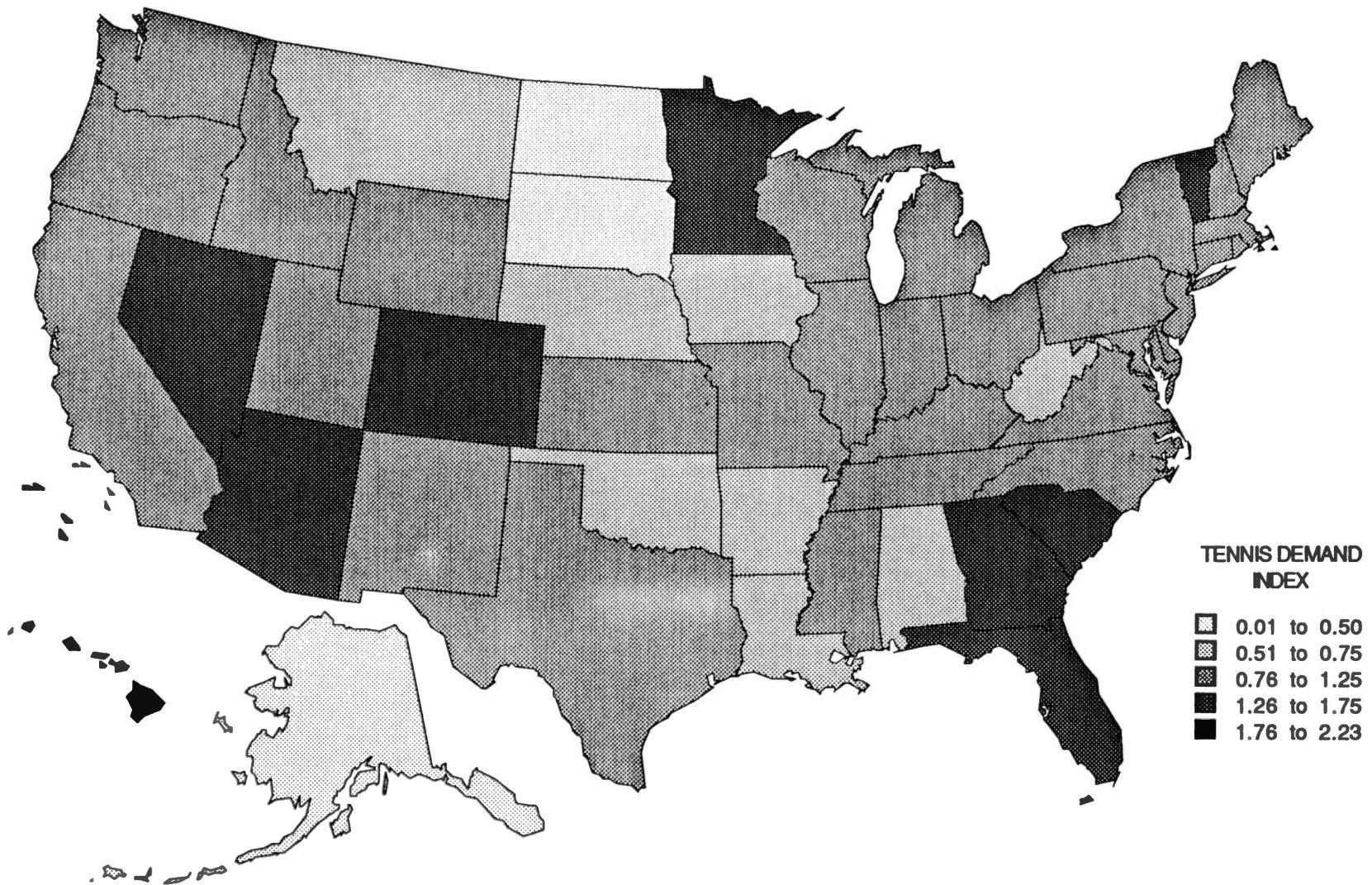


Figure 13. Tennis Demand Index (Weighted) by State

Tennis subscriber data. As before, the data were adjusted for population variation by calculating a per capita measure. Average distribution of the sample was 1 tennis participant for every 225 people. The per capita result was used as The Tennis Demand Index.

It is suggested that USTA members and subscribers to the major tennis magazines are representative of the approximately 20 percent of individuals that account for some 80 percent of all tennis play, equipment purchases, and other demands for tennis-related services (Kelly, 1990). A high Tennis Demand Index for an ADI would attest to a strong local tennis market relative to other areas.

Figure 14 displays the geographical distribution of the tennis demand measures. As alluded to previously in the analysis, a majority of the country possesses an involvement with tennis equal to that of the national norm. Areas of low interest in the sport outnumber the scattered ADIs showing above average tennis involvement.

The pattern reconfirms a dearth of interest in the sport across a large portion of the North. Most of the ADIs that border Canada show low measures. Montana, North and South Dakota are especially devoid of any average to above average indices. Low involvement also marks some of the industrial belt from Alpena, Flint, Bay City, Detroit MI through the Cleveland OH area to Buffalo NY and Wilkes Barre-Scranton PA. This line of ADIs reconnoiters with

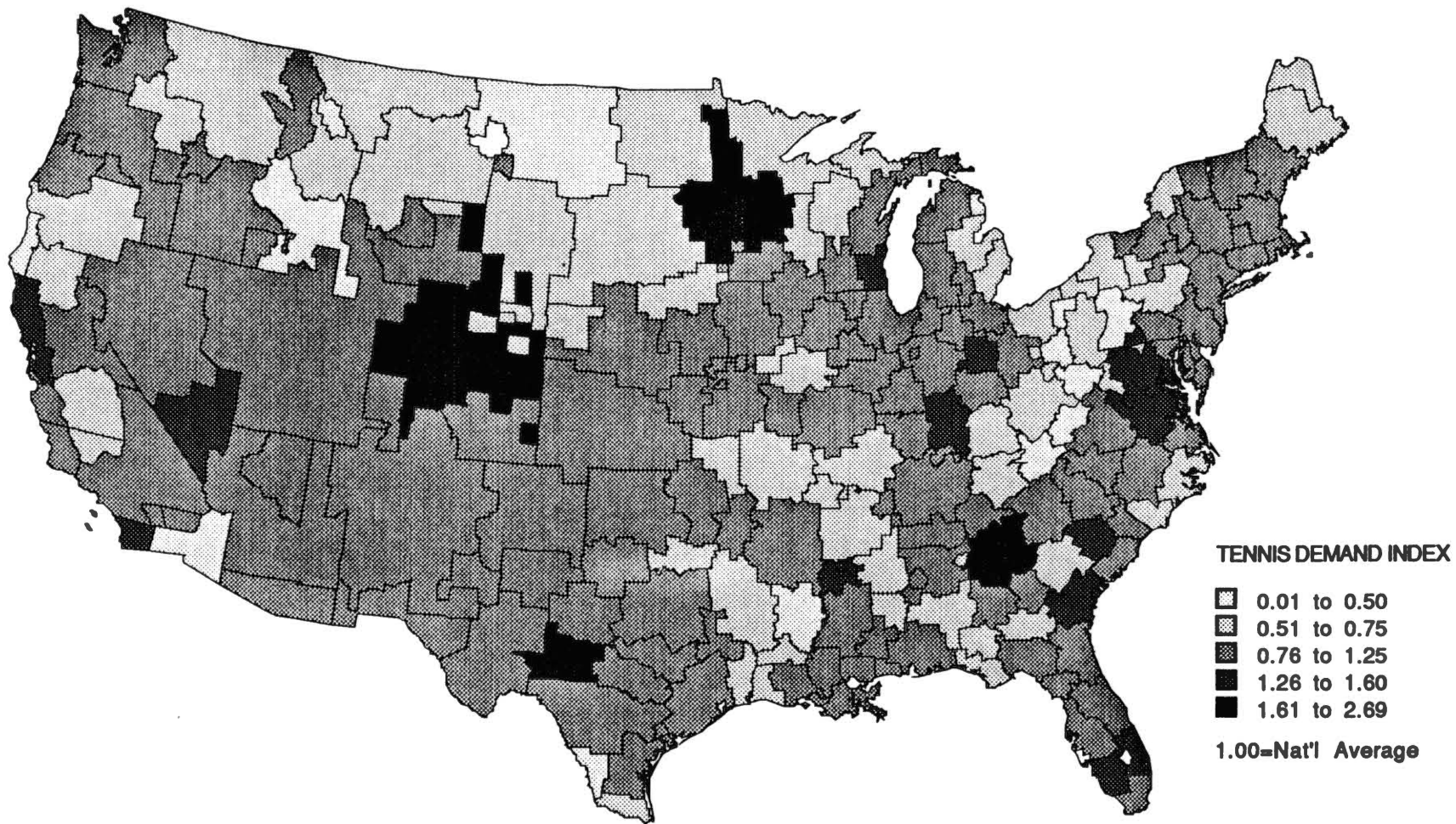


Figure 14. Distribution of the Tennis Demand Sample by Area of Dominant Influence (ADI)

Appalachia forming another sizable low-interest cluster.

Other sections of the country where the demand for tennis appears to be feeble includes a segment of the Pacific Northwest and the Central Valley of California. A large section of Louisiana, and to its north a belt in Missouri, from Joplin to the Paducah-Cape Girardeau-Marion ADI, reveal small markets for the game. Mississippi, Alabama, North Carolina, the southern tip of Texas and Maine all possess multiple ADI clusters relating weak involvement in tennis.

There are 18 ADIs that measure above average markets for tennis demand (Table IV). ADIs with the strongest tennis markets are Atlanta GA, Denver CO, Minneapolis MN, and San Angelo TX. The pattern of above average Tennis Demand Indices is difficult to generalize. These strong tennis markets occur in various locations over the country representing a range of climatic and socioeconomic dispositions.

Factors stimulating a healthy tennis market can be a localized phenomenon. An ample supply of tennis courts and quality tennis programs can propel an area's demand for tennis. Many of the ADIs that show strong tennis demand in the present analysis are also noted in Rand McNally's top 11 sports places for tennis (Table V). This list is based on a metropolitan's supply of tennis courts and eludes to the importance of supply in the

TABLE IV
TENNIS DEMAND INDEX
TOP ADIS

ADI	INDEX
Atlanta GA	2.69
Denver CO	1.84
Minneapolis MN	1.68
San Angelo TX	1.67
San Francisco CA	1.57
Columbia SC	1.55
Greenwood-Greenville MS	1.55
Fort Myers-Naples FL	1.52
Washington DC	1.48
Charlottesville SC	1.46
Savannah GA	1.45
Dayton OH	1.42
West Palm Beach FL	1.38
Milwaukee WI	1.35
Louisville KY	1.33
San Diego CA	1.32
Richmond VA	1.30
Las Vegas NV	1.26

TABLE V
RAND McNALLY'S TOP 11 SPORTS PLACES FOR TENNIS

SPORTS PLACE	RANK
Chicago IL	1
New York NY	2
Pheonix AZ	3
San Jose CA	3
Los Angeles CA	5
Long Island CA	6
Dallas TX	7
Detroit MI	7
Milwaukee WI	7
Louisville KY	10
Minneapolis-St. Paul MN	10

Source: Rand McNally's Sports Places Rated, 1986

tennis demand equation.

Variations in the patterns of tennis participation are attributable to a range of factors. Fluctuations in any recreation market are dependent on the individual decision to participate. Time constraints, economic conditions, climate, and lifestyle choices are dominant variables that influence recreation decisions.

Community traditions, attitudes, and values also can help explain the geographical variations in a recreation activity (Rooney, 1974). Another issue is the time it takes to reach a skill level to enjoy a particular sport. It has been suggested that the slump in the tennis boom was attributable to the time it took to master the game (Phillips, 1986).

Understanding why individuals participate in selected leisure activities can bring added insight to the explanation of a sport's spatial arrangement. People enjoy tennis for a multitude of reasons. The benefits of strenuous exercise from a match, the competitive nature of the game, and its inherently fast paced play are recurring answers to why people play (Audits & Surveys, 1989). Because tennis can be an important feature of many private athletic and country clubs, the game can also serve as a mechanism for social mobility and social networking.

For the most part, tennis provides a means for individuals to get out and have fun. Stability and

stimulus for growth in many local tennis markets have been associated with organized play (Loehr, 1987). As the number of tennis players steadily declined throughout the 1980s, participants in team tennis and league play have ballooned. Figures for 1980 indicated that 13,000 people were involved in national league competition and by 1989 the numbers had swelled to upwards of 500,000 (Prince, 1990). The concept behind organized recreational play is to emphasize fun, fitness, and friends and to de-emphasize win-at-all-costs cut-throat competition.

The enthusiasm for organized play has prompted many corporations to sponsor their own leagues. Domino's Pizza TeamTennis and the USTA/Volvo Tennis League have enjoyed tremendous success through the latter part of the 1980s and into the 1990s. Domino's TeamTennis grew from 6,000 members in its first year, 1985, to more than 120,000 in 1989. Other leagues have stimulated tennis play by appealing to families. The Equitable Family Tennis Challenge only accepts mother/daughter, father/son, husband/wife combination type teams.

The regional arrangement of tennis activity in the United States in many instances is influenced by the strength of local tennis programs. An active core of volunteers committed to the promotion of the sport can initiate community tennis associations, develop league play, and arouse new interest in the game in the process

(Williams, 1980).

CHAPTER V

ANALYSIS OF TENNIS DEMAND VARIATION

In an attempt to better understand what factors are associated with the spatial variation in tennis demand in the United States, a statistical study was conducted. This chapter considers the type and degree of relationship between an index of tennis demand and selected independent variables using correlation analysis. Regression analysis was used to help explain variation in the relationship between the dependent variable and independent variables.

Data Selection

The Tennis Demand Index utilized in the previous chapter was used as the dependent variable for the statistical analysis. As interval data, this gauge of tennis demand meets the scale of measurement criteria for the selected statistical tests utilized. To check the distribution of the dependent variable, a SAS univariate procedure was run returning a Shapiro-Wick statistic of 0.93 with 0.0001 probability of obtaining a higher statistic. This would indicate that the variable meets the requirement of a normal distribution.

Independent variables with regard to climate, race,

age, and income were selected for the statistical study. The data were assembled and tests were conducted at the ADI geographic resolution.

Per capita and average household income were used as a measure of an ADI's income characteristics. Income measures are thought to have one of the stronger positive relationships with tennis involvement. Phillips (1986) purports that of all the population and demographic indicators, "...the most consistently reliable predictor of participation in recreational activities is household income. Although the strength of the correlation varies with the type of activity, the extent of participation generally increases with rising income." The market studies utilized throughout the present inquiry have also provided overwhelming evidence that there is a positive relationship between tennis play and income levels.

Climate is also believed to play a significant role in the spatial distribution of tennis demand. To test the relationship between these two variables, the normal January daily maximum temperature was collected for the principle city of each ADI. The temperature data were obtained from the 1985 (2nd ed.) Weather of U.S. Cities. Only 158 of the 209 ADI cities had temperature data.

Racial data were acquired from the 1989 Sales & Marketing Management Survey of Buying Power: Part II. The percent of an ADI's population which is Black and Hispanic

was used as an ethnic variable. Decades ago one would expect a locational correlation between predominantly white populations and tennis participation. Although the all white country club image of tennis still exists, thousands from the spectrum of minority groups have taken to the game. At the sport's professional level, American's Pete Sampras, Zina Garrison, and Michael Chang represent a variety of ethnic groups that are evident in all phases of the game.

The 1989 S & MM Survey of Buying Power: Part II, also provided the age data by ADI. Six age ranges, each as a percent of an ADI's population, were used to test what age groups are associated with tennis demand. The age ranges were, 2-11, 12-17, 18-24, 25-34, 35-49, and 50 and over. The strongest correlation between tennis demand and age is expected to be found in the 25-34 and 35-49 ranges.

Correlation Results

The SAS programming language was used for generating the statistical analyses. All correlations computed were Pearson correlation coefficients (r). Table VI provides the correlation results between the dependent tennis demand variable and the independent variables.

As expected, variables that relate an ADI's income characteristics have the highest degree of association with the tennis demand variable. Average household

TABLE VI
PEARSON CORRELATION RESULTS

Variable	Pearson's r	Prob>r
Average Household Income	0.51	0.0001
Per Capita Income	0.49	0.0001
Percent Population Age 25 to 34	0.34	0.0001
Normal January Maximum Temperature	0.23	0.0031
Percent of Population Age 35 to 49	0.20	0.0041
Percent Population Black/Hispanic	0.14	0.0382
Percent of Population Age 18 to 24	0.12	0.0872
Percent of Population Age 12 to 17	-0.15	0.0340
Percent of Population Age 50 and over	-0.15	0.0291
Percent of Population Age 2 to 11	-0.18	0.0112

income, with a correlation coefficient of 0.51, and per capita income, with an r-value of 0.49, indicates a strong tendency for those ADIs with higher income levels to possess a population with above normal involvement in tennis. The income-related correlation coefficients were found to be statistically significant at the 0.01 level.

Income differentials help explain the lack of interest in tennis found throughout Appalachia and regions of the South. Many of these sections of the country are plagued with a relentless cycle of poverty. This relationship may also account for the low measures in other areas of the economically depressed rust belt.

The percent of an ADI's population that is aged 25 to 34, yielding an r-value of 0.34, was the age group found to have the strongest association with tennis participation. The next age range showing a positive correlation with tennis participation, possessing a correlation coefficient of 0.20, is the 35 to 49 year-olds. The 18 to 24 year-olds would be the third most important age group to be associated with tennis participation. However, the r-value of 0.12 for this last age group is not statistically significant at the 0.05 level of confidence.

Generally, the 12 to 17 year-old age group have not quite taken to the sport of tennis. This is one of the three remaining age groups with a negative correlation

with the tennis demand variable. Not surprisingly, the percent of an ADI's population aged 50 and over, and aged 2 to 11 relate a negative association with tennis participation. In all likelihood, a greater portion of the over 50 age group participates in tennis than this statistic indicates. This age segment should be further divided to provide an accurate measure of tennis participation of those in their fifties and sixties.

A higher normal January maximum temperature, indicating a longer playing season for outdoor tennis, was found to be positively correlated with the tennis demand variable. The correlation coefficient of 0.23, statistically significant at the 0.05 confidence level, would imply that higher measures of interest in tennis are associated with areas of the country that have milder winters.

A higher percentage of an ADI's population that is Black and Hispanic does not necessarily coincide with low tennis demand according to the present analysis. Although significant at the 0.05 level, a correlation coefficient of 0.14 indicates only a slight positive relationship with the tennis demand index. That it is a positive relationship may reflect the growing tendency of tennis players emerging from the country's diverse minority population.

The correlation analysis has helped to corroborate a

demographic profile of the tennis player that represents the core market. The market studies utilized in the present study have supplied distinct characteristics of those most likely to watch tennis on television and play the game recurrently. The study by Audits & Surveys revealed the frequent tennis player (21 or more times played in the last 12 months) as one with a mean age of 33.6 years and mean household annual income of 55,100 a year. The income level is the result of a high proportion of frequent tennis players as being college graduates, and holding down professional or managerial jobs.

Regression Analysis

The purpose of running regression analysis was to ascertain which of the independent variables and/or combination of variables explained the most variation in the dependent tennis demand variable. Once again using the SAS statistical package, stepwise regression techniques were computed for the same group of variables.

Table VII provides a coefficient of determination (R-squared) for every independent variable in the regression model for the dependent tennis demand variable. The coefficient relates the proportion of the variation in the dependent which can be statistically accounted for by the selected independent variable (Cody and Smith, 1987).

Average household income is the best regressor, and

TABLE VII
 COEFFICIENTS OF DETERMINATION (R-SQUARE)
 FOR SELECTED INDEPENDENT VARIABLES

Variable	R-square
Average Household Income	0.2849
Per Capita Income	0.2649
Percent Population Age 25 to 34	0.0851
Percent of Population Age 35 to 49	0.0654
Normal January Maximum Temperature	0.0546
Percent of Population Age 2 to 11	0.0487
Percent of Population Age 12 to 17	0.0329
Percent of Population Black/Hispanic	0.0193
Percent of Population Age 50 and over	0.0074
Percent of Population Age 18 to 24	0.0064

per capita income is the second best regressor for variance explained in the dependent variable. The average household income of an ADI would account for approximately 29 percent of the variation in the demand for tennis. Per capita income of an ADI would account for approximately 27 percent of the variation. However, this does not imply that average household income and per capita income together explain 56 percent of the variation in the tennis demand variable. Singularly, the remaining variables contribute very little to the explained variation in the dependent variable.

A stepwise regression, using the forward selection technique, was computed to explore what group of independent variables would explain the greatest variation in the dependent variable. The forward selection stepwise regression process starts with the best single regressor and continuously loads the next best variable until the variable list is exhausted or the coefficient of determination cannot be improved. Of the income-related variables, only per capita income was used in the regression analysis. Table VIII furnishes the results of the stepwise regression procedure.

The procedure entered four variables into the regression model for a coefficient of determination of 0.40. This would indicate that the model explained approximately 40 percent of the variation in the tennis

TABLE VIII
 FORWARD STEPWISE REGRESSION STEPS FOR THE
 DEPENDENT TENNIS DEMAND VARIABLE

Step In	Variable	R-square	Change in R-square
1	Per Capita Income	0.2649	-----
2	Normal January Maximum Temperature	0.3534	0.0885
3	Percent of Population Age 18 to 24	0.3875	0.0341
4	Percent of Population Age 2 to 11	0.4015	0.0141

No other variable met the 0.5000 significance level for entry into the model.

demand variable. Sixty percent unexplained variation in the dependent variable remains unaccounted for using the assembled independent variables.

Per capita income, accounting for 27 percent of the dependent variable's variation, was the first variable entered into the regression model. As it has the strongest correlation with the tennis demand index, the stepwise procedure entered it as the best regressor.

The variable representing the length of an outdoor tennis season, normal January daily maximum temperature, was the next variable to enter the model. The climate variable added approximately nine percent to the explained variation in the dependent variable. Two age group variables, percent of population aged 18 to 24 and 2 to 11, were the last variables entered that would meet the required 0.50 significance level for inclusion into the regression model.

A complex combination of factors determines the spatial variation in the demand for and participation in the game of tennis. In large part, tennis participation patterns of an area are dependent on the supply of and access to tennis facilities. Construction of tennis courts in a neighborhood can in many instances stimulate local tennis demand.

Audits & Surveys' research indicated that the principal barriers to achieving significant growth in the

sport appeared to be: 1) the lack of sufficient leisure time; 2) competition from other forms of exercise, specifically bicycling, running/jogging, weight lifting/exercise machines, and exercise walking; and 3) the lack of any organized local league which provides both competitive and non-competitive play. Data that would relate the nature of tennis supply, leisure time and leisure attitudes, on a nationwide scale would help account for a large measure of the unexplained variation found in the present regression model for tennis demand.

CHAPTER VI

A TENNIS INTENSITY INDEX FOR ATLANTA, GEORGIA

Introduction

The purpose of this chapter is to demonstrate how tennis demand measures, when merged with measures of tennis supply, can be used to evaluate the adequacy of facility supply in a given market. The Atlanta tennis market was selected for a case study to test the Tennis Intensity Index (TII) concept. For the case study, the index is used to identify areas of high tennis demand where a strain on facilities may be present. In the context of recreation management, the TII has great potential to be used as a planning tool for tennis facility development.

The Tennis Intensity Index

Throughout the present study, metropolitan Atlanta has been identified as one of this nation's hotbeds for tennis. The city has consistently ranked high in every measure of tennis demand computed throughout the analysis. In 1990, the metropolitan Atlanta counties of Clayton,

Cobb, DeKalb, Fulton, and Gwinnett, with 30 percent of the state's population, furnished 74 percent of the state's total membership in the USTA. The residents of Atlanta have also related high participation rates in tennis through strong support of the Atlanta Lawn Tennis Association (ALTA) and the Domino's TeamTennis League (Loehr, 1987). Due to Atlanta's active tennis market, it seemed appropriate as a case study to demonstrate the application of the Tennis Intensity Index.

For the study, metropolitan Atlanta was spatially defined by the 303 three-digit zip code boundary. This area included a large portion of Fulton county and the western quarter of DeKalb county. The study area included the city limits of Atlanta proper and the communities of College Park, East Point, Hapeville, Chamblee, and Doraville. Other sections of the metropolitan area falling within the defined area included Sandy Springs, Dun's Springs, Dunwoody, North Atlanta and North Lake. Figure 15 provides a map of the study area.

The calculation of the Tennis Intensity Index is dependent on an accurate assessment of tennis court supply. Tennis facility data were assembled for the study area from a variety of sources. The Georgia Department of Natural Resources provided a list of tennis court sites from their recreation facility inventory. From this list, tennis court counts at colleges and universities, schools,

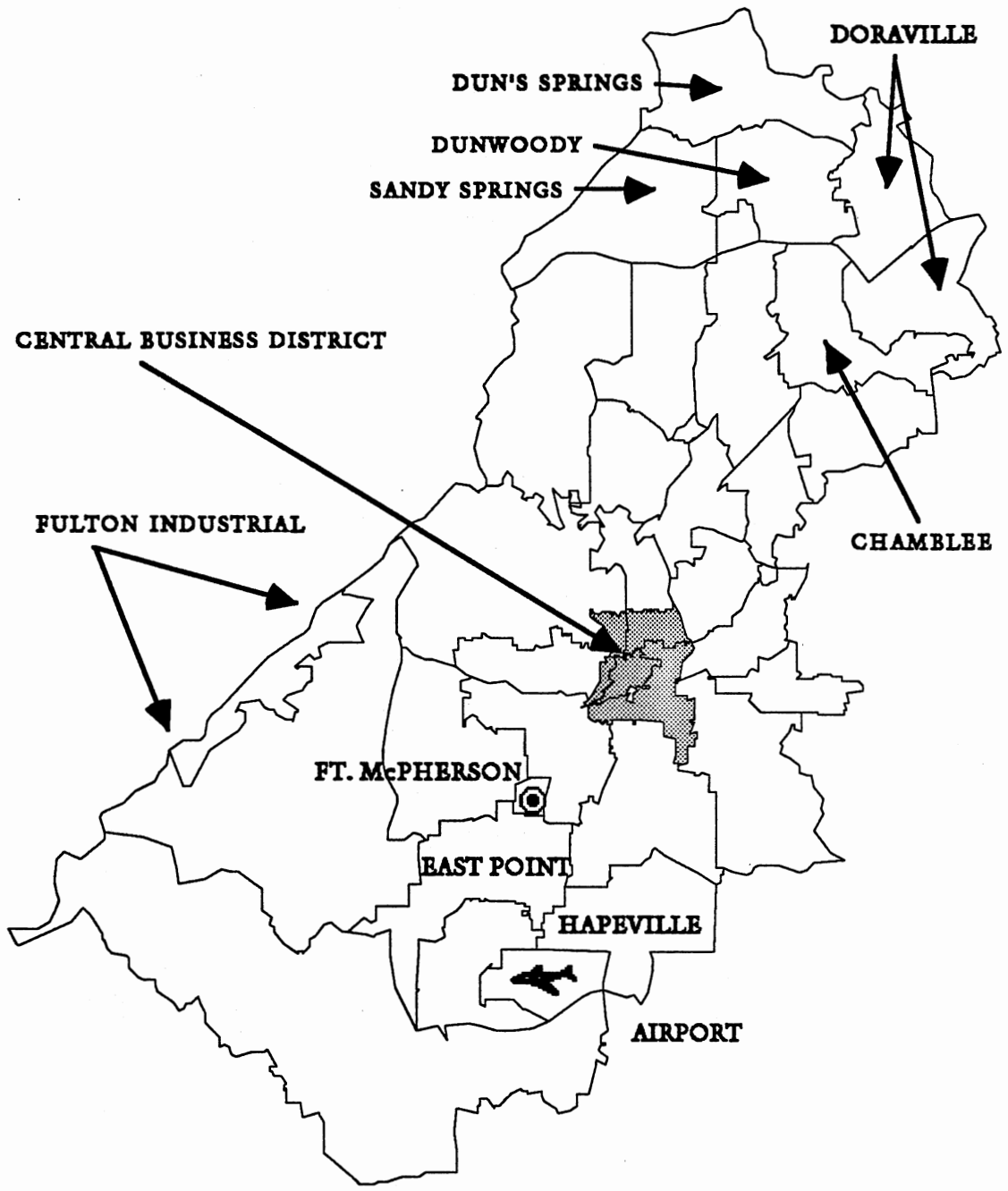


Figure 15. Atlanta Study Area

parks, and recreation and community centers were obtained. A record of tennis courts at the city's parks, acquired from the Atlanta Department of Parks, Recreation and Cultural Affairs, supplemented the Department of Natural Resource's list.

Tennis court supply in the private sector was assembled primarily from a mailing list obtained from Triangle Software, a firm that supplies direct mail lists. This list provided the location and number of tennis courts at golf courses, country clubs, tennis and fitness facilities. The Atlanta Yellow Pages directory was also consulted as a source for tennis court locations.

This study also considered tennis courts at private households, housing complexes, condominiums, and apartments. A general accounting for residential tennis courts was achieved through the use of aerial photographs. The Oklahoma State University map library provided air photos of the Atlanta metropolitan region. By manually scanning the photos, residential tennis courts were tallied and locationally referenced. Two hundred fifty-six private household tennis courts and 242 other courts categorized as residential were identified through the air photo analysis. The air photo method of accounting also proved to be valuable for the identification of tennis courts previously not included in the inventory.

A total of 1,378 tennis courts were enumerated in the

Atlanta study area. Tennis court counts were aggregated by five-digit zip code which allowed a geographical breakdown. The north-northwest sections of the study area maintain the greatest supply of tennis facilities (Figure 16). It is in this part of the city where the heaviest concentrations of residential courts are found. Sandy Springs, with 119 private household courts, is noted for its collection of residential type tennis courts. A number of country clubs featuring tennis also account for the area's high court counts.

Throughout the city, colleges and universities are a major source of tennis supply. The Georgia Institute of Technology, supplying 28 tennis courts, helps to keep Atlanta's Central Business District well stocked with facilities. The city's tennis centers and parks, contributing 191 tennis courts, also help meet the demand for tennis. The Fulton county industrial area and the airport do not provide any tennis facilities.

A Tennis Supply Index (TSI) is calculated for each five-digit zip code in the study area. Based on the area's population of 822,580 and the supply of tennis courts, the norm for Atlanta is computed at 597 people per tennis court. The TSI, a per capita measure of tennis supply, allows comparisons among zip code areas relative to the city's norm (1.00). A zip code with a TSI of 1.50 would have a fifty percent greater supply of tennis than

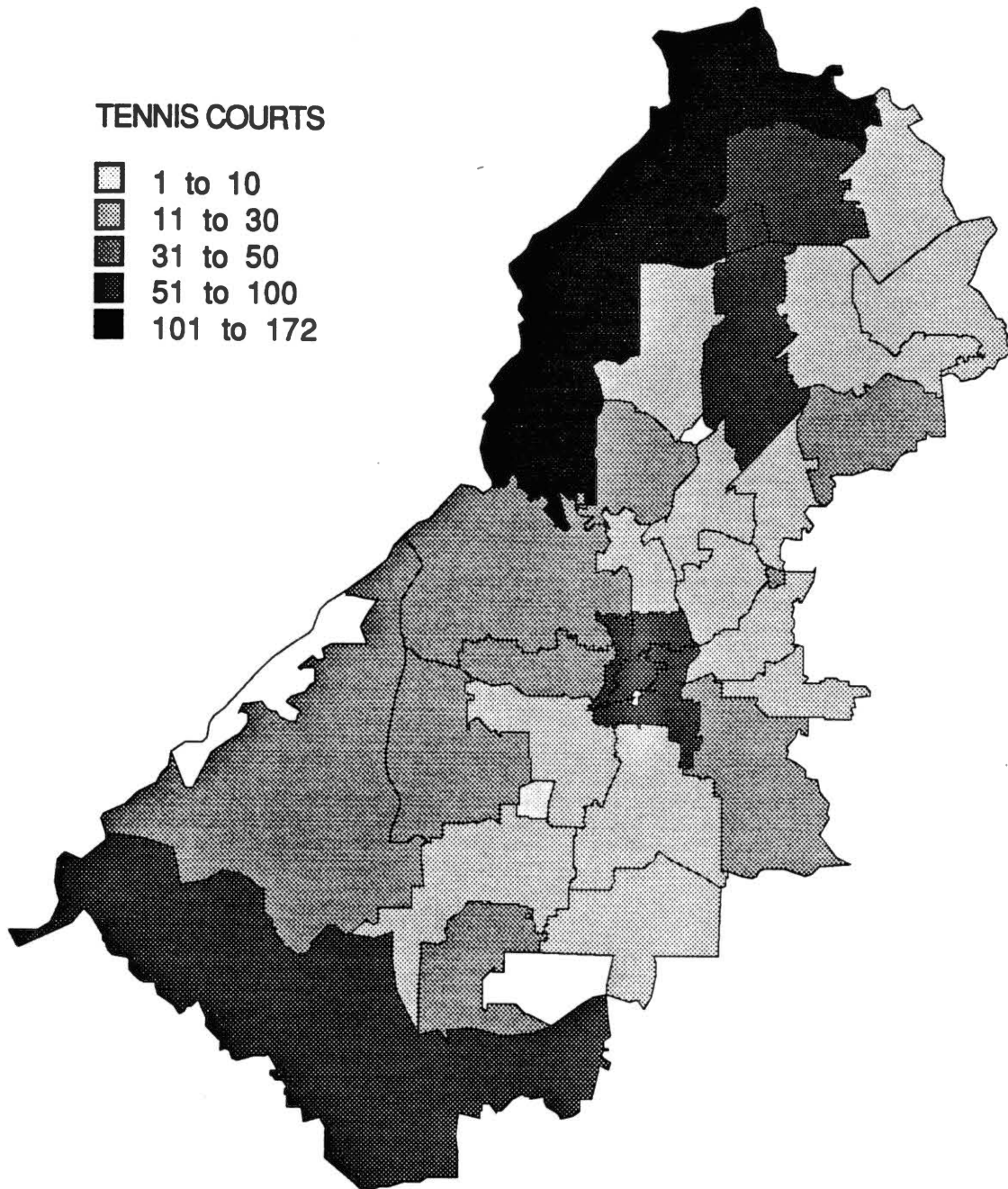


Figure 16. Metropolitan Atlanta Tennis Court Supply

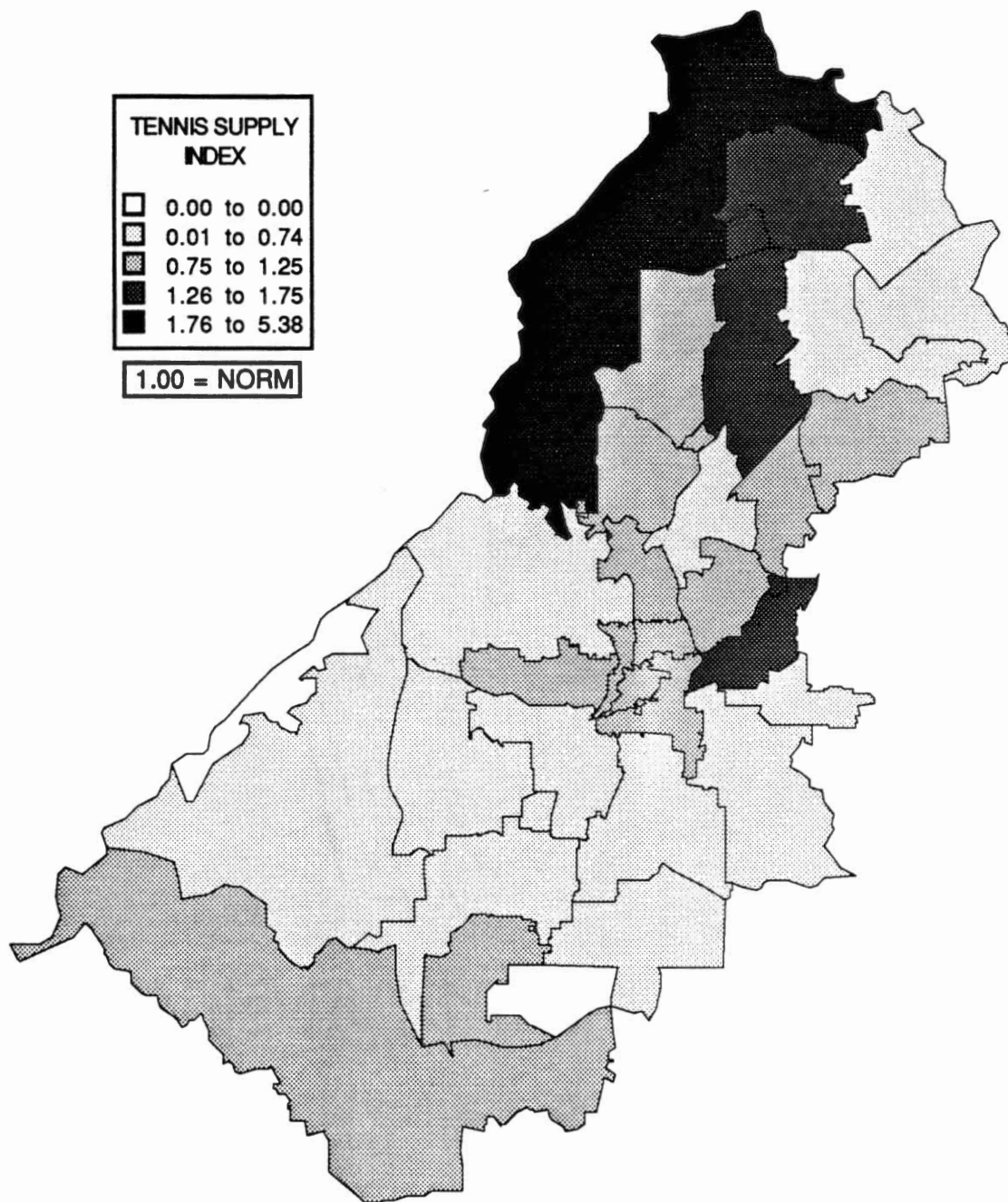


Figure 17. Metropolitan Atlanta Tennis Supply Index

the city.

Figure 17 displays the spatial distribution of Tennis Supply indices for metropolitan Atlanta. The north-northwest area of the city maintains strong per capita measures of tennis court supply. The northernmost zip code, Dun's Springs, Sandy Springs to its south, and the next zip code south, have supplies of tennis from over three times to over five times the city's average. A large expanse of Atlanta, southeast, south, and west of the city center, relates a supply of tennis below the city's norm. Tennis supply is only one component of the

Tennis Intensity Index. A Tennis Demand Index (TDI) was computed for the study area by combining USTA memberships and TENNIS magazine subscribers resulting in a sample population of 7975. World Tennis circulation, not available at the five-digit zip code spatial scale, was not included as a measure of tennis demand.

The sample provided a geographical representation of Atlanta's tennis playing population. The procedure for calculating a TDI is the same as the TSI. The demand variables were adjusted for population differences and expressed as a percentage of the study area's norm. As

expected, the north-northwest portion of Atlanta indicated the highest levels of demand for tennis (Figure 18). The southern half of the city revealed low measures

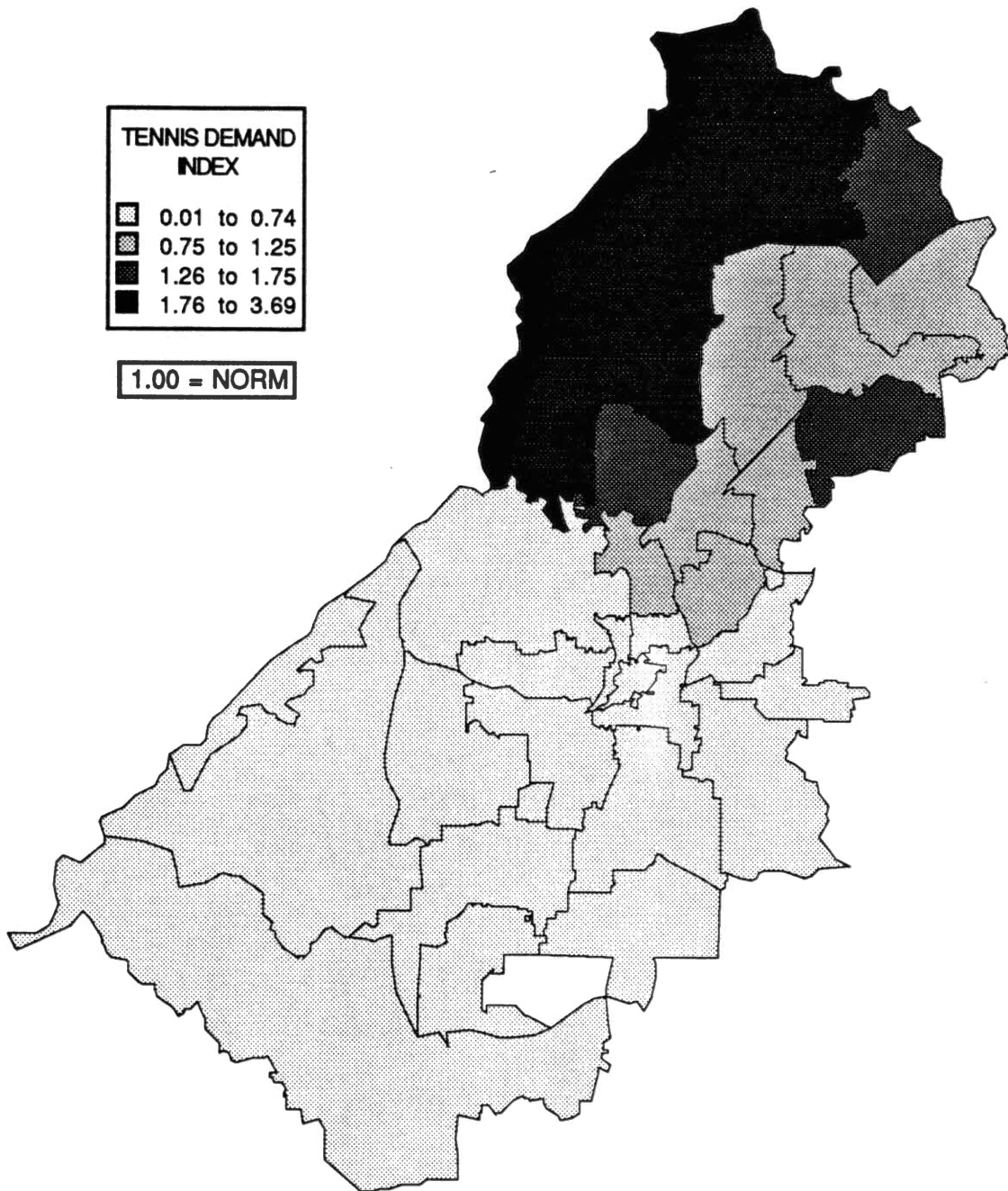


Figure 18. Metropolitan Atlanta Tennis Demand Index

of involvement with the game.

The Tennis Intensity Index is calculated by dividing the TDI by the TSI. A TII of 1.00 would suggest that tennis demand is in step with tennis supply. In other words, the balance of tennis players to tennis courts is ideal.

When the TII was calculated for Atlanta, disparities in the balance of tennis supply and demand were found in the city (Figure 19). The zip codes with measures over 1.76 would indicate areas where tennis court development is most needed. Dunwoody and Doraville are two examples of communities with high TII measures and, therefore, are candidates for tennis court expansion.

Sections of Atlanta where the TII hovers around the norm are found in the northern half of the city. The southern half of the city relates a situation where the supply of tennis courts is greater than the present demand.

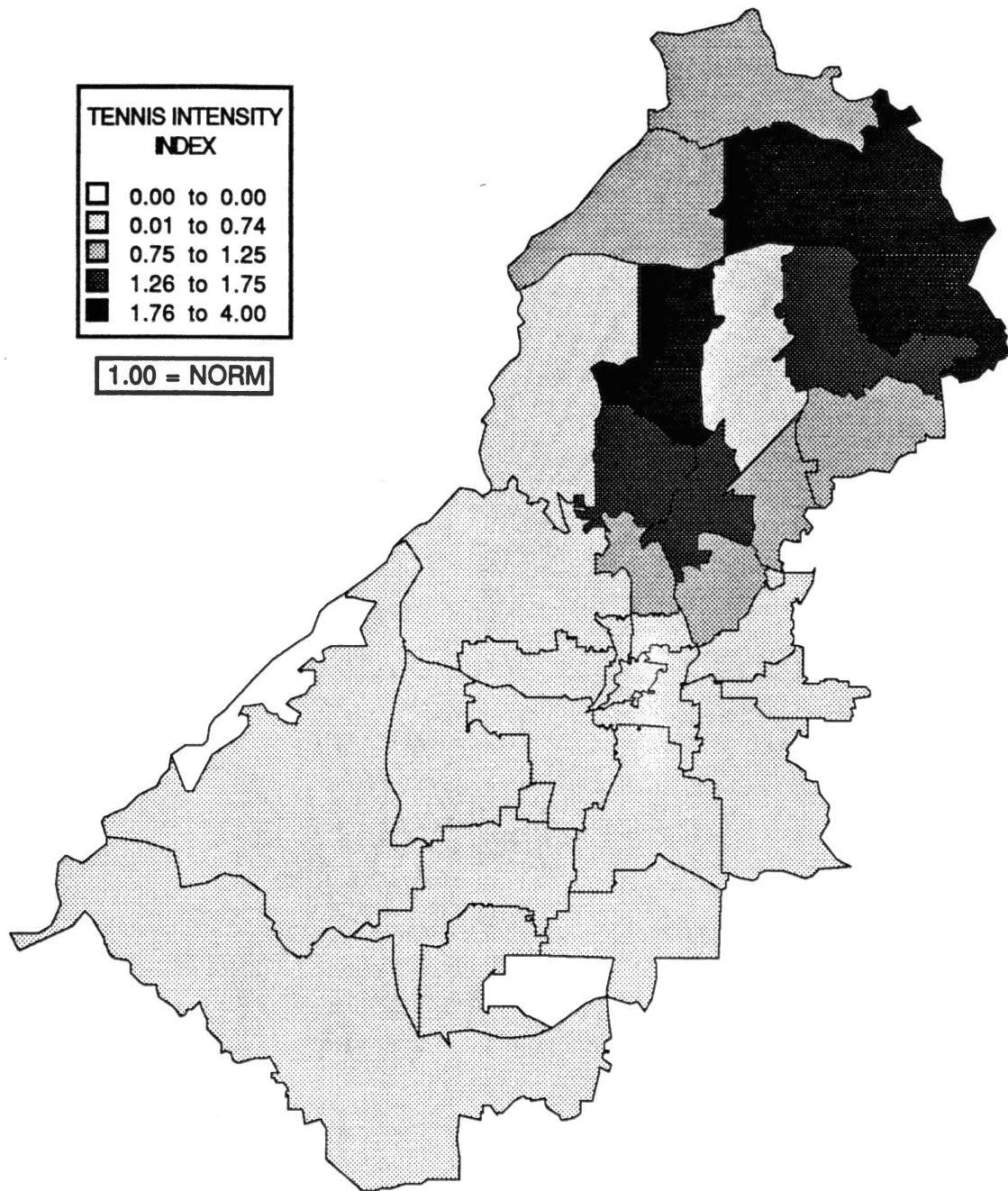


Figure 19. Metropolitan Atlanta Tennis Intensity Index

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The objective of this thesis was to measure and identify regional variations in the U.S. tennis market. Several variables were used to gauge a range of interest in the sport, from the consumption of tennis through the mass media to actual participation statistics. The data used for this study, especially USTA membership and major tennis magazine subscription rates, has been useful for tracking the frequent tennis playing population. From the analysis several conclusions concerning the spatial arrangement of tennis demand in the United States can be drawn.

Tennis has attained status as one of this country's mainstream recreational pastimes. Some degree of involvement in the sport has been identified in almost every county in the United States. However, consideration of the data on a per capita basis reveals tremendous spatial variation in the distribution of robust tennis demand.

State level analysis has revealed a region of strong

tennis demand in the southeastern states of South Carolina, Georgia, and Florida. This is one region of country where tennis is taken very seriously. Tennis is a recreational necessity in most residential and resort developments (Phillips, 1986). The Southeast's devotion to the sport is evidenced by its numerous sprawling tennis centers and professional tennis teaching academies (USTA, 1989). A heightened dedication to the sport also exists throughout California. California's importance in the distribution of tennis demand is noted for the sheer volume of tennis enthusiasts. The use of per capita measures can obscure California's strong localized tennis markets.

Concentrations of above average involvement with the sport have also been recorded in the western states of Colorado, Arizona, and Nevada. Las Vegas, the urban centers and retirement communities of Arizona, and the cities and mountain resorts of Colorado have related consistently strong demand indices. Hawaii is a state with high measures in all of the tennis demand measures used throughout this study.

Minnesota and Vermont's above average measures in involvement with the game suggests that a climate genial to year-round outdoor play does not necessarily dictate the distribution of tennis demand. However, in Alaska, and North and South Dakota, where negligible measures of

interest in the sport are found, the climate has influenced participation in other recreational endeavors. The Appalachian region and pockets of the deep South also reveal paltry involvement in the sport.

Analysis at county and ADI levels of resolution has allowed insight on the regional variation of tennis demand within states. Although the majority of tennis participation takes place in the urbanized counties of the United States, many of the country's less populated areas relate strong tennis demand. The upper reaches of New England, portions of the Corn Belt, some of the Rocky Mountain counties, and sections of Texas are most notable.

At the metropolitan level, a diverse geographical distribution of strong tennis markets is evidenced by high demand measures in San Diego CA, Louisville KY, Milwaukee WI, and Washington DC. MSAs revealing the strongest measures in the demand for tennis are Atlanta GA, Denver CO, Minneapolis MN, and San Angelo TX. Explanation of the

spatial distribution of tennis demand in the United States is an elusive matter. Income characteristics, climate, and age levels were found to be significant factors in the explanation of variation in tennis demand regionality. The supply of tennis facilities and the strength of community tennis programs is believed to play an important role in the structure of any local tennis market.

Recommendations

The data utilized for this study was conducive for the locational identification of the core U.S. tennis market. Geographically delimited data on tennis ball and/or tennis racquet sales would extend the scope of the study to include all tennis play. This would lead to a more thorough identification of the spatial distribution of tennis demand in the United States.

Another approach in the identification of regional patterns of tennis interest would be to track the origins of professional tennis players from the United States. Using elite player origins as a database has been a proven and popular method in the delineation of specific sport regions (Rooney, 1974). This method could contribute to understanding the regionalization of tennis in the United States.

The case study chapter on Atlanta included in this thesis demonstrated how merging supply and demand measures of tennis can be used as a prescriptive tool for tennis facility development. Gathering accurate tennis supply data for the United States, meaning an inventory of every tennis court in the country, is a formidable task. However, accurate tennis court counts is possible for selected market areas and when merged with demand measures can be utilized as a powerful planning and marketing tool.

Combining the two measures of supply and demand can provide an invaluable tool for such applications as tapping latent demand, tennis facility expansion, and tennis product market penetration.

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VITA

Kyle Andrew Anderson

Candidate for the Degree of
Master of Science

Thesis: A GEOGRAPHICAL ANALYSIS OF TENNIS DEMAND IN THE
UNITED STATES

Major Field: Geography

Biographical:

Personal Data: Born in Kansas City, Kansas, July 24,
1962, the son of Bob and Phyllis Anderson.

Education: Graduated from Bellevue West High School,
Bellevue, Nebraska, in June 1980; received
Bachelor of Arts Degree from University of
Nebraska at Lincoln in December, 1984; completed
requirements for the Master of Science degree at
Oklahoma State University in December, 1991.

Professional Experience: Research Assistant,
Department of Geography, Oklahoma State
University, August, 1989 to August, 1991.