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Mapping Indian Elders

National Indian Council on Aging

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See next page for additional authors

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National Indian Council on Aging, S. Baros, B. Campos, M. Garrett, L. Henriksen, and M. Inglis
GIS AND THE NATIONAL AGING NETWORK

For more than 25 years, dedicated professionals from a wide range of disciplines have been honing the capabilities of spatial analysis technologies—satellite imagery, remote sensing, geographic information systems (GIS)—to better understand and portray the natural and man-made world. Now mature and thoroughly proven, these technologies are in regular use at all levels of government, in universities and non-profit organizations, as well as in key segments of the private sector throughout the world. Their uses range from the simple production of maps and charts to supporting the study and analysis of complex environmental, economic and natural resource issues.

Even so, the disciplines affecting human services, preventive medicine, medical research, and health care/social services delivery remain noticeably absent from the development and application of this powerful analytic tool.

This project, Mapping Indian Elders, represents the national aging network’s first application of Geographic Information System (GIS) computer mapping technology to identify health and demographic characteristics of a minority population. This technology’s spatial and geographic reference capabilities result in a highly visual, easily understood set of maps which portray and characterize older American Indian populations in ways never before attempted.

Mapping Indian Elders takes into account national and local elder populations, where they live, how their numbers compare with others of similar age in the general population and how shifts may be occurring from rural to urban environments. It also takes into account 1) the availability of health care and related community services, including location of facilities and transportation; 2) socio-economic factors as revealed by the 1990 U.S. Census; and (3) selected health data from the Indian Health Service (IHS) computerized, on-line patients medical records database.

In addition to mapping, comparing, and analyzing statistical information from disparate databases, the technology permits tracking of trends over time—information with significant implications for long-range planning and service delivery to a wide variety of special populations.
PART I

... an introduction to the distribution of American Indian and Alaska Native elders
Introduction

This section looks at Indian elders geographically from a national perspective. A computerized base map of the continental United States was prepared showing all state and county boundaries, using data from the United States Geological Survey (USGS), the nation's mapping authority. At the same time, population information about where people live and how their numbers vary from county to county was obtained from the 1990 national Census. Census information is also entirely computerized. Bringing these two data sources together electronically permitted the production of the maps that follow.

The facing map portrays the density per square mile for the total population of the United States by county. Those counties in dark red designate urbanized areas with 100 or more people for every square mile. The greatest densities of people (higher concentration and closer proximity) are found in roughly four separate geographic areas. These include states adjoining the Great Lakes (Wisconsin, Illinois, Michigan, Ohio, Pennsylvania, New York); along the northeastern seaboard from Virginia and Washington D.C. through Massachusetts; North Carolina and Florida in the southeast; and on the Pacific Coast, Southern California and portions of Oregon and Washington.
The pattern of concentration for American Indians and Alaska Natives (AI/AN) differs substantially from that of the general population. About two-thirds of Indian elders live in ten states, with about half living in five states: Oklahoma, California, Arizona, New Mexico, and Alaska.

**Figure 1**
Five States with the largest American Indian and Alaska Native Population in 1990

(in thousands)

- Oklahoma; 252
- California; 242
- Arizona; 204
- New Mexico; 134
- Alaska; 86

Source: 1990 U.S. Census of Population and Housing, Bureau of the Census

This picture is complicated by the fact that many AI/ANs do not live on tribal lands but in urban areas. Thus, Los Angeles, Portland, and Seattle appear as areas of high AI/AN concentration, as do rural reservation populations in Idaho and Montana. In 1990, the distribution of AI/ANs shows that 62 percent of the population resided in urban environments outside of trust lands.
States with the largest American Indian, Eskimo and Aleut Population
Within the total American population of 248 million, American Indians and Alaska Natives represent approximately 0.8% (1.9 million) according to the 1990 census. Since this population is not evenly distributed across the country, some counties have a very high proportion of AI/ANs while most others have few to none. The highest proportions of AI/ANs tend to be found in largely rural counties throughout the western and Midwestern U.S. and Alaska. As the accompanying graph illustrates, AI/AN populations are growing steadily, and their concentrations are expected to increase over time. Tracking this growth and supporting the study of economic impacts, social service, and health care needs is one of the most important capabilities of spatial analysis.

Proportion of American Indian, Eskimo and Aleut Population by County

AI/AN as % of U.S. Population
0 - 9%
10 - 49%
50 - 100%
For elderly of all races, density by county from the 1990 Census closely correlates with the distribution of the general population, as the facing map illustrates. Not surprisingly, urban concentrations of elderly, as shown in Figure 4, coincide in all cases with geographic areas where higher concentrations of the general population are found. Large populations also have a correspondingly large concentration of elderly people.

Figure 4
Cities with the Ten Largest Elderly 65-plus Population

Source: 1990 U.S. Census of Population and Housing. Bureau of the Census, Summary Tape File 1-A
Population Density by County of All Americans over 55 years

Elderly per Square Mile
less than 25

equal to or greater than 25
In 1990, distribution of AI/ANs inside and outside of American Indian and Alaska Native Areas parallels that of the general population, with slightly higher numbers of the elderly in rural regions. It is surprising to note that the majority of the 250,000 households on reservations and trust lands were non-AI/AN (128,000). Only 45 percent (112,000) had an AI/AN head of household. However, AI/ANs made up more than half (437,000 or 54 percent) of all persons living on reservations, suggesting that AI/AN households were larger than non-AI/AN households.

Figure 5
Cities with the Six Largest American Indian and Alaska Native 65-plus Population

Source: 1990 U.S. Census of Population and Housing, Bureau of the Census, Summary Tape File 1-A
American Indian, Eskimo and Aleut Population over 55 years by County

AI/AN Elders per Square Mile
less than 0.2
equal to or greater than 0.2
The proportion of American Indian and Alaska Native elders shows a distribution pattern similar to that of the general AI/AN population. The greatest concentrations of elders in states with high concentrations (Alaska, Arizona, New Mexico, and Oklahoma) lie within distinct counties in these states and are not distributed evenly. Inferences could be drawn from the 1990 Census data suggesting that migration of younger AI/AN people, although subtle, is nevertheless taking place. It could also be inferred that AI/AN migration patterns are yet to be understood. Information on urban Indians, who now comprise more than 62% of all AI/ANs, is lacking. The map also shows that while the AI/AN population may be high in some areas, their proportion to the general population is low.

An example of density versus proportion occurs in Los Angeles County, California, home to 100,000 AI/ANs. Yet AI/ANs comprise only 3% of the county’s total population of 3,485,398.

For research or advocacy regarding trends and patterns among AI/ANs, the application of spatial analysis technology to public domain databases could prove indispensable.

Source: 1990 U.S. Census of Population and Housing, Bureau of the Census, total reservation population 437,358
**Discussion**

Although this project highlights only four medical conditions (hundreds were possible), a pattern has started to emerge. The rural areas of New Mexico report the highest rates of diagnosis for the four diseases. In all circumstances, especially with less common diseases, the state's rural and remote communities report the highest prevalence.

Given the large size of the state, distances to services become a key factor in examining the effectiveness of health care and medical services delivery. Analysis has provided a snapshot, in the form of a few graphics, of some of the health conditions experienced by New Mexico Indian elders.

Even at this project's relatively superficial level of analysis, it becomes apparent that a GIS-generated presentation is both unique and appropriate for identifying service needs of special populations.
Summary

Because facilities can be assigned geographic locations, GIS—with its capacity to relate demographic and health data spatially—can help determine whether a facility is serving appropriate clients, where new services should be developed or initiated, and where certain medical conditions are found to be more prevalent than others. When examining the relationship between patient and provider, GIS is a powerful tool.

The next section will apply this proven technology to characterize a neighborhood of Indian elders who utilize the IHS in an urban environment within Albuquerque.
an urban population

... a close-up view: mapping

PART III
The city of Albuquerque, largest in New Mexico, encompasses approximately 133 square miles and is home to some 412,000 people. Another 247,000 live outside the city but within the metropolitan area.

Geographically, the city lies along the Rio Grande River at an average elevation of 5,700 feet above sea level. Directly to the east, the Sandia Mountains reach a height of 10,678 feet, helping maintain a mild year-round climate for the city and its environs.

Albuquerque is a unique combination of the very old and the highly contemporary, the natural world and the man-made environment. It is a national center of nuclear weapons work and is home to the internationally known Indian Pueblo Cultural Center. It is a harmonious blend of extremely diverse cultures, rich in history, with evidence of habitation dating back at least 25,000 years.
The City Perspective

By address matching IHS clients in Albuquerque, the target population can be mapped. Of the 564 IHS clients who accessed services from the IHS Albuquerque hospital between January 1 to September 15, 1995, 81 were diagnosed with diabetes, 83 with respiratory disease, 121 with eye problems, 61 with joint problems, and 107 with heart conditions. Patients can have multiple diagnoses.

In eastern Albuquerque, where the largest proportion of the city population resides, the project focused on a single distinct cluster, or concentration, of clients who have recently utilized IHS services.

This area is adjacent to the State Fairgrounds, south of Interstate 40 and north of Route 66 (Central Avenue). It is highlighted by a circle on the diagram and is referred to as the neighborhood.

Focusing on this neighborhood, the analytic application of GIS technology permits the layering of diverse socioeconomic and health data from disparate sources, resulting in a unique, detailed view of the area's living conditions.
The federal government has been collecting data on America’s population since 1790. This systematic nation-wide enumeration is part of an international endeavour to conduct national censuses every decade. In the U.S., the 1990 Census is the most recent. That year, for the first time, the Bureau of the Census, in cooperation with the U.S. Geological Survey (USGS), created an automated, seamless geographic data base covering the United States, Puerto Rico, and other outlying areas. This base, known as the TIGER (Topologically Integrated Geographic Encoding and Referencing) system, made it possible to automate geographic support activities. In particular, an address anywhere in the nation can now be matched to a spatial location. This project is feasible only because of this recent development and its public access.

In addition to printed reports, the Census Bureau provides the results of the 1990 Census on summary tape files (STFs) and public use microdata sample (PUMS) files. The STFs are designed to provide statistics with greater subject and geographic detail than feasible or desirable in the printed reports, while PUMS files provide users with the flexibility to prepare customized tabulations.

These files are available on all populations, for all areas in the U.S., and are available for public use at most public and university libraries.

In addition to these generic files, the Bureau of the Census also releases several special computer tape files showing data on AI/AN populations. These files relate to voting districts, equal employment opportunity, county-to-county migration, work destinations, and special older populations.

For this project, four key economic indices were mapped for the city of Albuquerque to characterize block groups. These relate to rates of unemployment and poverty, households without vehicles, and houses without complete plumbing facilities. The project layers the health conditions of elderly IHS clients onto this matrix.
**Percent Unemployed**
Unemployment rates within Albuquerque are not spread evenly across the city. Apart from the cluster near the fairgrounds and to the southeast, the concentration of unemployment lies primarily in the south valley. Within the neighborhood, the highest concentration of unemployment occurs along Central Avenue (to the south) with moderate unemployment (10%-20%) scattered throughout the area.
Poverty

Poverty is defined by the Census Bureau according to the average per capita income for the state. For this analysis, a similar picture to the rate of unemployment emerges, with the south valley of the city showing the highest concentration of poverty. Within the neighborhood, the highest concentration of poverty resides along Central Avenue. Again, all levels of poverty, from high to low, are represented in the neighborhood.
Access to a Vehicle

Households without vehicles also helps to characterize a population. Surprisingly this indicator does not seem to correlate with the areas of unemployment or poverty in Albuquerque. Areas where more than 36% of all households report not having access to a vehicle lie outside of the neighborhood. However, two of the five block groups that comprise the neighborhood include 18-36% of households that report not having access to a vehicle.
Within the neighborhood, the highest concentration of households with incomplete kitchen or bathroom plumbing facilities (less than 2% of all houses in the area) falls in the center. Higher concentrations of households lacking complete plumbing reside outside this area to the south of Central Avenue.
Having identified an area within Albuquerque (the neighborhood) with a high concentration of elderly Indian IHS clients, a GIS analysis reveals that the area also exhibits high rates of unemployment and poverty, with some lesser degree of incomplete plumbing facilities and households reporting not having access to a vehicle. On a national basis, AI/ANs are the second-poorest ethnic group. Living in one of the lowest-income states in the nation, New Mexican AI/ANs face additional hardships.

The 1990 Census indicates that for the families with elderly householders (60-plus) living in New Mexico, the median annual income in 1989 was the lowest for AI/ANs. Families with an Indian elder report an average of $12,218, with Asian/Pacific Islanders reporting $34,087, followed by Whites with $28,305, Blacks with $17,972, and Hispanics with $16,540.

As found with IHS data on page 22, however, New Mexico IHS patient registrations show a discrepancy of 146% with the Census population count. When Census data is used to identify characteristics of American Indians, this level of inaccuracy must be respected.

The project’s utilization of different data sources minimizes the possibility of misinterpretation because conclusions are based on multiple sources. The project’s characterization of an area within Albuquerque is made possible by using GIS technology to synthesize data from multiple sources, including Census, state, and IHS data. The resulting matrix can increase understanding of the living conditions of some of these Indian elders and others in the neighborhood.

The results can be interpreted in different ways. It could be that this area has a high turnover of residents and the maps portray a transient population. It could also mean that this area is in a point of economic transition. Alternatively, the maps could accurately characterize the neighborhood’s Indian population by showing the diverse economic status of neighbors. Geographic information has enabled the project to characterize substantial diversity in what would have otherwise been classified one-dimensionally as an impoverished area. It is also possible to map the incidence of specific diseases onto this economic layer, resulting in a micro view of specific disease diagnosis within the neighborhood.
Diabetes

By accessing IHS patient records, the incidence of disease for Indian elders in the neighborhood could be mapped. Within this area, there exists a group of IHS elderly clients who suffer from diabetes. Although the disease can be managed, diabetes—if left unchecked—can have debilitating—even fatal consequences. These include blindness, kidney disease, heart disease, and amputations. Although no cure exists for this disease, it can be controlled with proper diet, exercise, medication, education, and therapy. Comparison of death rates of AI/ANs and the general population, however, indicates that diabetes is the main differentiating factor, killing 80% more Indians. A modest increase in the diabetes death rate among Indians in recent years (IHS, 1989) indicates that the disease may become a more prominent cause of death in the future. Recent figures show that 4.5% of all AI/AN deaths are due to diabetes (John, 1994), compared with 1.9% for the general population (NCHS, 1990).

For AI/ANs, diabetes therefore is an appropriate and highly relevant subject for a demonstration of GIS as an analytical tool. Since this technology permits analyses at different levels—national, regional, state, zip, city, tract, block group, block—even down to the individual—it can be tailored to meet the needs of the researcher or the service provider. This analyses is generated by combining multiple databases from disparate sources, for the first time, to examine the pattern of diabetes and to explore some of the characteristics of the affected AI/ANs in their environment.
Health Care Facilities

Geographically, hospital and elder care facilities in Albuquerque are evenly dispersed. An important question is the extent to which these facilities are accessible to the local community. A detailed look at the neighborhood reveals that the area offers only one health-related facility—a private nursing home. It houses 396 patients at a minimum daily cost of $90. For diabetic Indian elders living in or near poverty, proximity to the facility does not necessarily mean that it is easily accessible.

Diabetic patients need substantial support to control the disease. In addition to education and dietary control, other medical and clinical interventions may be necessary, including physiotherapy (lacking within IHS in Albuquerque) and podiatric care. Without such support diabetes can develop into a debilitating condition or cause of death.

The detailed map shows that the four private podiatric services are located some distance away, across a freeway, from the neighborhood. By presenting this data spatially, GIS technology could be used to advocate for better access to services.
**Diabetes Complications**

The distribution of diabetics and the locations of health facilities within the neighborhood shows a high concentration of diabetics in the area who live some distance from health facilities.

The economic analyses revealed some households without access to a vehicle and some in poverty. These factors indicate that the residents of this neighborhood are an "at risk" population. All diabetic Indian elders in the neighborhood were diagnosed with one or more complications which might have been avoided with proper care. GIS has made possible the identification of this at-risk neighborhood and pointed to issues of access related to the neighborhood's proximity to essential services.
**Discussion**

The use of GIS technology to focus on diabetes has characterized factors that can be shown to contribute to decreased health status. Whether this is a causal relationship or whether these events are coincidental is outside the scope of this analysis. However, GIS, can be used to support the testing of hypotheses or to investigate the living conditions of a group of people. The depth and sophistication of the analyses are only limited by the detail of the database.

For this demonstration project, one specific health diagnosis was selected for a relatively small ethnic group.

"Reduce diabetes among American Indians and Alaska Natives to a prevalence of no more than 62 per 1,000"

"Reduce end-stage renal disease due to diabetes to no more than 1.9 per 1,000 American Indians and Alaska Natives with diabetes"

"Reduce diabetes-related deaths among American Indians and Alaska Natives to no more than 48 per 100,000"

17,10b,17,11a,17,9b Healthy People 2000

The GIS used several different databases, and for the first time unified them in order to explore spatial relationships in an interactive environment. This capacity of GIS is not easily conveyed in a publication. Yet it is the key to its effective use by planners, researchers, academics and service providers. Within this digital environment, new or more recent databases can be incorporated and analysed with ease.
Conclusion

This project and its outcomes demonstrate existing technologies, showing how these can be used to compare health, economic, social, and geographic indicators to analyse a population.

The resulting products can support plans to identify needs, manage services, and review priorities. In the example used for this study, the GIS analyses can support management plans to tackle diabetes complications. Healthy People 2000, the publication of the Public Health Service which establishes goals for American health care, identifies three main objectives to reduce diabetes for American Indian and Alaska Natives. In order to achieve these goals, future efforts need to be directed in a much more channeled, focused, and flexible manner. The potential of GIS represents a significant step in that direction.
PART IV

Technical notes
Diabetes mellitus, known colloquially as “sugar diabetes,” is a disease in which the body does not metabolize food adequately, resulting in high blood sugar levels. When diabetes is not well controlled, high blood sugars can result in serious complications such as blindness, kidney disease, heart disease, or foot amputation. Many of these complications can be prevented by keeping blood sugars close to normal. Although there is no cure for diabetes, with proper diet, exercise, medication, education and therapy, diabetes can be controlled.

The project focused on diabetes for a number of reasons. It is one of the ailments which affects more American Indians than other ethnic groups. It is controllable and therefore many of the disease’s complications can be eliminated.

Geographic Characteristics

The geographic focus of this study (the “neighborhood”) is a square mile area of Albuquerque, New Mexico, adjacent to route 66 (now Central Avenue) immediately east of the state fairgrounds. IHS data characterizes the average Indian person as Navajo, male, and with an average of five health problems. He is 62 years old and suffers from diabetes. He is likely to live in a household without a vehicle and is living below the poverty level. The Indian Health Service serves 70 registered clients (55+) within this tract.

The zip code for the area is 87108 with a census tract number of 35001000602. General characteristics of this area from the 1990 Census, STF3A include:

- Average travel time to work for workers 16 years and over who did not work at home was 17.3 minutes;
- Mobility and self-care limitation status for civilian, non-institutionalized persons aged 16 to 64 years, 9.7% of the total population;
- Mobility and self-care limitation status for civilian, non-institutionalized persons aged 16 years and over, 10.8% of the total population;
- Mobility and self-care limitation status for civilian, non-institutionalized persons aged 65 to 74 years, 8.8% of the total population;
- Mobility and self-care limitation status for civilian, non-institutionalized persons aged 75-plus, 16.4% of the total population;
- Percentage of the civilian labor force of persons 16 years and over who were reported to be unemployed, 12%;
- Median household income in 1989 was $14,474;
- Percentage of the population, for whom poverty status was determined, who reported earning below the federally determined level of poverty in 1989 was 34.7%.

NOTE: Although anecdotal data indicates that urban Indians tend to migrate within the metropolitan area, the 1990 US Census does not support such a conclusion. Nevertheless, because of the high error margins in enumerating Indians and in particular, urban Indians, it could be that these migration movements by Indians are undetected by Census methodologies.

Census Migration Data

Table 1: Residents in New Mexico in 1990 who reported a different residence in 1985

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>Black</th>
<th>AI/AN</th>
<th>API</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL</td>
<td>436,268</td>
<td>29,496</td>
<td>34,170</td>
<td>3,757</td>
<td>59,134</td>
</tr>
<tr>
<td>Moved from Abroad</td>
<td>17,592</td>
<td>1,458</td>
<td>272</td>
<td>2,579</td>
<td>3,000</td>
</tr>
<tr>
<td>Other States</td>
<td>165,179</td>
<td>6,213</td>
<td>7,632</td>
<td>2,433</td>
<td>11,304</td>
</tr>
<tr>
<td>Other County</td>
<td>82,608</td>
<td>1,595</td>
<td>8,303</td>
<td>638</td>
<td>14,145</td>
</tr>
<tr>
<td>Within County</td>
<td>258,246</td>
<td>8,084</td>
<td>24,848</td>
<td>2,862</td>
<td>51,429</td>
</tr>
<tr>
<td>Non Movers</td>
<td>539,847</td>
<td>9,482</td>
<td>76,480</td>
<td>4,599</td>
<td>89,220</td>
</tr>
<tr>
<td>Moved to Other States</td>
<td>163,828</td>
<td>7,500</td>
<td>9,464</td>
<td>3,904</td>
<td>19,522</td>
</tr>
</tbody>
</table>

Table 2: Proportion of Residents in New Mexico in 1990 who reported a different residence in 1985

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>Black</th>
<th>AI/AN</th>
<th>Asian</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moved from Abroad</td>
<td>1.5</td>
<td>4.9</td>
<td>0.2</td>
<td>17.9</td>
<td>1.6</td>
</tr>
<tr>
<td>Other States</td>
<td>14.4</td>
<td>20.8</td>
<td>5.7</td>
<td>16.9</td>
<td>6</td>
</tr>
<tr>
<td>Other County</td>
<td>7.2</td>
<td>5.3</td>
<td>6.2</td>
<td>4.4</td>
<td>7.5</td>
</tr>
<tr>
<td>Within County</td>
<td>22.5</td>
<td>27.1</td>
<td>18.5</td>
<td>19.9</td>
<td>27.3</td>
</tr>
<tr>
<td>Non Movers</td>
<td>47</td>
<td>31.8</td>
<td>57.1</td>
<td>32</td>
<td>47.4</td>
</tr>
<tr>
<td>Moved to Other States</td>
<td>14.3</td>
<td>25.2</td>
<td>7.1</td>
<td>27.2</td>
<td>10.4</td>
</tr>
</tbody>
</table>
I. H. S. Data

Diagnoses were obtained for all IHS clients who were born before 10/1/94 and made a visit since 1/1/95.

<table>
<thead>
<tr>
<th>Total Clients</th>
<th>55 years+ seen this year</th>
<th>55 years+ lives in area</th>
<th>55 years+ lives in area + seen this year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuquerque</td>
<td>5905</td>
<td>1491</td>
<td>1707</td>
</tr>
<tr>
<td>ACL</td>
<td>2694</td>
<td>1210</td>
<td>1731</td>
</tr>
<tr>
<td>Mescalero</td>
<td>470</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Diagnosis Average Per Patient

\[ \Sigma(\text{cd}) \]

\[ \bar{x} \]

<table>
<thead>
<tr>
<th>Diagnosis (ICD code)</th>
<th>n=1210</th>
<th>n=470</th>
<th>n=1491</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuquerque</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mescalero</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average diagnosis per patient

\[ \bar{x} = 9.8 \]

\[ \bar{x} = 11.4 \]

\[ \bar{x} = 4.3 \]

Average diagnosis for one patient

\[ < 110 \]

\[ < 225 \]

\[ < 89 \]

Diabetes mellitus (250)
Hypertension (401)
Chronic renal failure (585)
Eye-problems include disorders of the iris and ciliary body (364), glaucoma (365), cataract (366), disorders of refraction and accommodation (367), visual disturbances (368) and, disorders of conjunctiva (372).
Heart disease includes essential hypertension (401), hypertension heart disease (402), other forms of chronic ischemic heart disease (414), acute pulmonary heart disease (415) and, heart failure (428).
Respiratory infections include acute upper respiratory infections (465), chronic sinuitis (473), other diseases of upper respiratory tract (478), emphysema (492), asthma (493) and, bronchiectasis (494).
Joints/Osteoarthrosis includes osteoarthroses and allied disorders (715), other and unspecified arthopathies (716), other and unspecified disorders of joint (719), and other and unspecified disorder of the back (724).

Diabetes with complications was formed as a composite of the following ICDs:
250.40 - 250.41
250.50 - 250.51
362.01
362.02
585
736.81
V49.7 Limbs and other problems

Comparative rates for the US Population of Major Chronic Health Conditions for Elderly (65+)

Americans, 1992

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis</td>
<td>48.2%</td>
</tr>
<tr>
<td>Hypertension</td>
<td>35.8%</td>
</tr>
<tr>
<td>Heart Disease</td>
<td>32.5%</td>
</tr>
<tr>
<td>Hearing loss</td>
<td>32%</td>
</tr>
<tr>
<td>Orthopedic</td>
<td>18.6%</td>
</tr>
<tr>
<td>Cataracts</td>
<td>16.6%</td>
</tr>
<tr>
<td>Chronic sinusitis</td>
<td>15.9%</td>
</tr>
<tr>
<td>Cerebrovascular</td>
<td>11%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>8.7%</td>
</tr>
<tr>
<td>Visual impairment</td>
<td>7.4%</td>
</tr>
</tbody>
</table>

Note: Rate calculated for persons not living in a nursing home or other institution. People may have multiple health conditions

Address Matching

Geographic Information System is dependent on the ability to match an address along spatial coordinates. Spatial coordinates can be obtained from street addresses, Geographic Positioning System (GPS), satellite images, TIGER lines (from Census) and zip codes. When there is only a post office box for location, as is the case in the majority of rural settings, GIS requires additional raw data to assign coordinates to a residence address.

Throughout New Mexico, a significant proportion of addresses relevant to the project were post office boxes. Analyses, however, were based on zip codes. In urban Albuquerque, however, where more specific geographic detail was required, analysis by zip code was deemed to be too general. For this project, post office box addresses within the Albuquerque city limits have been eliminated from the analyses. Because of the semi-rural nature of Albuquerque residence, street addresses constituted a smaller proportion than P.O. boxes. The total addresses matched within Albuquerque were less than 58%, as the following table itemizes:

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Total Population from IHS Sample</th>
<th>Matched</th>
<th>% matched</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>204</td>
<td>81</td>
<td>39</td>
</tr>
<tr>
<td>Respiratory</td>
<td>202</td>
<td>83</td>
<td>41</td>
</tr>
<tr>
<td>Eyes</td>
<td>273</td>
<td>121</td>
<td>44</td>
</tr>
<tr>
<td>Joints</td>
<td>147</td>
<td>61</td>
<td>42</td>
</tr>
<tr>
<td>Heart</td>
<td>271</td>
<td>107</td>
<td>40</td>
</tr>
<tr>
<td>Diab. Compl.</td>
<td>137</td>
<td>80</td>
<td>58</td>
</tr>
</tbody>
</table>

Terms

An Indian reservation is an area of land where the boundaries have been established by treaty, statute, and/or executive or court order. These can be reservations, pueblos, rancherias, and communities, held in trust by the federal government through the Secretary of the Interior. The Bureau of Indian Affairs (BIA) is responsible for administering and managing these lands. Nationally, 278 reservations are federally recognized.

A total of 56.2 million acres of land are held in trust by the United States for various AI/AN tribes and individuals. Eleven million acres are individually owned. No general law permits the selling of trust land by a tribe. The Rancherias of California comprise Indian trust lands of less than one acre while the Navajo Nation occupies more than 17 million acres.

Indian Health Service (IHS) of the Public Health Service (PHS) of the Department of Health & Human Services (DHHS), is responsible for providing Federal health care to AI/ANs. The IHS is comprised of 12 Area Offices nationally, with 140 Service Units (64 of which were operated by tribes under PL 93-638). In 1993, the IHS operated 42 hospitals (an additional eight operated by tribes), 66 health centers (99 by tribes), four school health centers (three by tribes), and 53 health stations (59 by tribes). Tribes operated the 172 Alaska village clinics exclusively.

National AI/AN Census Data

Out of a total American elderly (60+) population of 41,831,037 in the 1990 Census, American Indian, Eskimo, or Aleuts constitute 0.4%. These 171,763 elderly form the smallest ethnic elder group in the United States.

General Characteristics

- There is less discrepancy in the distribution of male and female American Indian elderly than for other ethnic groups (except Asians);
- As with other groups and countries, elderly females comprise the highest proportion of the elderly population (57% for American Indian elders).

Economic Characteristics

- American Indian elders are one of the poorest ethnic groups in America;
- Unemployment is high among AI/ANs. Variability among Pueblos and reservations is very high however, with some tribes reporting between 4% and 25% of the total population as unemployed;
- 81% of American Indian elders report not being in the labor force, the highest proportion for any ethnic group;
- 8% of American Indian elders have an income of less than $5,000;
- 84% American Indian elders report income of less than $20,000, the highest percentage of any ethnic group;
- 19% of American Indian elders receive Supplemental Security Income (SSI) and other public assistance. A proportion higher than for any other group.

Health, Living Arrangements & Education
One in ten American Indian elders reports some mobility limitation but not self-care limitation; one in five American Indian elders lives in a housing unit without a telephone; American Indian elders are more likely to live in a house than other identified ethnic group; one in every eight American Indian elders received less than a fifth grade education; the Census reports no major distinguishing characteristics in living arrangements among American elders.

All figures, except where indicated, are from the 1990 Census as published by the U.S. Bureau of the Census.

Glossary

Total refers to all U.S. elderly (60+) population covered by the Census (En=41,831,037).
White refers to all Caucasian elderly as self-reported in the Census (En=37,052,929).
Black refers to all black elderly as self-reported in the Census (En=3,468,107).
American Indian refers to all American Indian, Eskimo, or Aleut elderly as self-reported in the Census (En=171,763).
Asian refers to all Asian or Pacific Islander elderly as self-reported in the Census (En=657,850).
Hispanic refers to all Mexican, Puerto Rican, Cuban and Other elderly as self-reported in the Census (En=1,595,058).

References


Other Citations


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5. UNM, Maxwell Museum
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Photographer, Pennington Studio
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Manser Collection
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30. UNM, Maxwell Museum, man wearing blanket
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31. UNM, Maxwell Museum, Robin Quintana with blanket
32. UNM, Maxwell Museum, Maria Martinez, potter
33. UNM, Maxwell Museum, Eskimo woman
Manser Collection
34. Indian Pueblo Cultural Center
Photographer, Joe Sando
35. UNM, Maxwell Museum, Navajo woman
Photographer, Snow

National Indian Council on Aging, Inc.
Prepared by the University of New Mexico Earth Data Analysis Center & American Center for Indian Aging
The National Indian Council on Aging is committed to bringing about improved, comprehensive services to American Indian and Alaska Native elders. The specific objectives which follow are based on recommendations formulated at the 1976 and 1978 National Indian Conference on Aging.

These objectives range from disseminating information to federal advocacy to establishing and maintaining relationships within the National Aging Network.

**Objectives**

Communication and cooperation with service provider agencies and advocacy organizations within the aging network.

Dissemination of information about available resources to the national Indian community.

Intercession with appropriate agencies, as necessary, to ensure access for elders to these services.

Provision of information and expert testimony requested by Congress.

Serving as a national clearinghouse for issues affecting American Indian and Alaska Native elders.
Proportion of American Indian, Eskimo and Aleut Elders (55+) by County

Elderly AI/AN as % of U.S. Population

<table>
<thead>
<tr>
<th>Elderly AI/AN %</th>
<th>U.S. Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.9%</td>
</tr>
<tr>
<td>1</td>
<td>5.9%</td>
</tr>
<tr>
<td>6</td>
<td>10.0%</td>
</tr>
</tbody>
</table>
Summary

Seeking answers to myriad questions about AI/AN elders—in particular, questions having to do with where they live, how many there are, which states and counties have the largest populations, how they live, and what their most pressing needs are—has, at best, been difficult. Partly, this is because their numbers are small. In proportion to the total U.S. population or even in proportion to the total U.S. elderly population, tens and hundreds versus thousands and millions, they are easily overlooked.

Moreover, there is considerable debate about the accuracy of 1990 Census figures. And a large number of tribes maintain their own counts in an effort to offset and balance real or perceived inaccuracies.

These problems will not be resolved by any single effort or in the short term.

Nevertheless, it is now possible to bring much greater precision to the examination and study of populations. Through the combined powers of computerized automated databases, satellite imagery, remote sensing and spatial analysis technology, conditions, locations, and numbers can be portrayed more accurately and quickly than at any other time in history. The map opposite is an example: prepared from entirely computerized data, it can be updated and corrected immediately upon receipt of new information. For those working to influence or set policy, improve outcomes, or enhance results, tested and mature technologies are available to help.
PART II

... a computerized snapshot of New Mexico's Indian reservations and trust lands
The State Perspective

Nineteen Pueblos and three Indian reservations are located in New Mexico. The Pueblo communities cradle the Rio Grande river as it meanders through New Mexico, from Colorado in the north to Texas in the south. Apart from the Mescalero Apache reservation in the southeastern part of the state, Indian land primarily lies in the state's northwest corner—in some cases extending into Arizona, Utah, and Colorado.

The Navajo Nation, with 220,000 enrolled members, is the state's—and the nation's—second largest tribe, while the state's most modest is Picuris Pueblo, with a population of 147. Apart from the Navajo tribal holdings (Navajo, Alamo, Canoncito, Ramah Community), the largest block of Indian trust land is held by the Jicarilla Apaches with 870,566 acres on the eastern edge of the San Juan Basin. More typically, Pojoaque Pueblo occupies a modest 1,842 acres.

New Mexico's pueblo culture is distinct from that of the state's reservations. For centuries, Pueblo Indians have developed extremely close-knit, relatively small, densely-populated farming communities. The Navajos and Apaches have been much more nomadic, and the desert and mountain lands that they occupy reflect these differences in culture and social structure.

New Mexico's Indian tribes enjoy a long history of social, economic, and religious interaction with the state's Hispanic and Anglo cultures. The result is a distinctive and complex cultural tapestry.

With a total land area of 121,510 square miles and a population, according to the 1990 Census, of 1,715,000, New Mexico is the nation's fifth largest state and one of the least populated. Its residents include 222,300 seniors (65-plus), 410,354 rural residents, and 1,104,755 urban residents. More than a third live in the Albuquerque metropolitan area.

In total, 154,000 AI/ANs reside in New Mexico, with 10% of this population (13,667) being 55 years and older (1990 Census). A third of the state's residents are of Hispanic origin (576,709), with 39,818 Blacks and 14,372 Asians or Pacific Islanders.
Pueblos & Reservations
1 ACOMA Pueblo
2 ALAMO Res.
3 CANONCITO Res.
4 COCHITI Pueblo
5 ISleta Pueblo
6 JEMEZ Pueblo
7 JICARILLA Res.
8 LAGUNA Pueblo
9 MESCALERO Res.
10 NAMBE Pueblo
11 NAVAJO Reservation
12 PICURIS Pueblo
13 POJOAQUE Pueblo
14 RAMAH Res.
15 SANDIA Pueblo
16 S. FELIPE Pueblo
17 ILDEFONSO Pueblo
18 S. JUAN Pueblo
19 S. ANA Pueblo
20 S. CLARA Pueblo
21 S. DOMINGO Pueblo
22 TAOS Pueblo
23 TESUQUE Pueblo
24 ZIA Pueblo
25 ZUNI Pueblo
Political and Administrative Jurisdictions

Trust and Reservation Lands. Although most AI/ANs live in urban areas, treaties with the U.S. government in the 1700s and 1800s created trust and reservation lands—specially-designated areas for tribal jurisdiction and use. Legal terms for these lands include reservations, off-reservation trust lands, tribal jurisdiction statistical areas (only in Oklahoma), tribal designated statistical areas, Alaska Native Regional Corporations and Alaska Native village statistical areas. In New Mexico, Indian lands include both reservations and off-reservation trust lands. The state’s 19 pueblos occupy just under two million acres, with two Apache reservations holding 1.2 million acres, and the four Navajo reservations encompassing 4.2 million acres in New Mexico. In all, Indian lands in New Mexico comprise 7.5 million acres, 10.4% of the entire state.

Albuquerque Area Office is one of 12 such offices served by the federal Indian Health Service (IHS)—a division of the U.S. Public Health Service. The Albuquerque Area Office operates seven service units, two of which extend into other states: Ysleta Del Sur, located in Texas, and Southern Colorado Ute. These are utilized by 27 tribes. Albuquerque Area IHS facilities include five hospitals, 12 health centers, seven health stations, a dental clinic and a regional treatment center. These facilities were utilized by an active population of 75,844 for FY93. That year, service unit outpatient visits totaled 274,350, an average of five visits per patient. The oldest facility was built in 1928 and still functions as the Taos Health Center. Tribally-operated facilities, including Ramah and Alamo Health Centers, are authorized under the Indian Self-Governance and Education Assistance Act (PL-93-638).

Zip Codes. More than 290 zip codes serve New Mexico’s 33 counties to guide the delivery of mail, help locate people and properties, and increase delivery system efficiency. The system tends to be more precise in urban areas where properties are generally smaller, populations more concentrated, and road systems much more extensive. Nevertheless, zip codes for rural areas are a valuable asset in conducting generalized population studies—especially where expansion or decline in populations is related to competition among cities, counties and states for federal appropriations based on population size.

Census tracts serve to subdivide most counties comprised of 2,500-8,000 inhabitants. One criterion used by the Census for designating an area as a Census tract is the economic homogeneity of the population, in terms of economic status and living conditions. New Mexico contains more than 390 tracts out of a total of 49,960 nationally. For non-metropolitan areas, block numbering areas (BNA’s) are used instead of Census tracts. In both cases these designations bring additional precision to the examination of populations in relation to geographic locations, both urban and rural.
Indian Health Service Data

Defining the AI/AN population, whether nationally, state-wide, or locally, presents a variety of problems. Some of these result from the incompatibility of Census data with other sources. Others relate to the inadequacy of rural addressing. Still others relate to the difficulty of obtaining relevant data from public domain sources.

Even federal agencies report diverse statistics for AI/ANs. For example in 1993, the U.S. Census estimated that a total of 72,076 AI/ANs lived in the seven New Mexico IHS service units. In contradiction to this, the IHS registered 105,118 patients during the same year. The IHS statistic, 146% of the Census count, reveals a disparity that brings into question the accuracy of Census data for AI/ANs.

Of direct consequence to tribes, these figures are used to partially determine federal funding levels.

This project accessed data on diagnoses from three hospitals: Acoma Canoncito Laguna (ACL), Mescalero Indian Hospital, and Albuquerque Indian Hospital.

Permission to utilize IHS data was required from IHS National and Area review boards, as well as tribal leaders. The data includes all patients who were aged 55 years and over and who received treatment at any of the three hospitals between January 1 and September 15, 1995. The data includes diagnosis as well as the address of each patient.

<table>
<thead>
<tr>
<th>Service Unit</th>
<th>Outpatients per Service Unit</th>
<th>Population from Census</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Acoma Canoncito Laguna</td>
<td>39,770</td>
<td>7,271</td>
</tr>
<tr>
<td>2 Albuquerque</td>
<td>96,975</td>
<td>24,302</td>
</tr>
<tr>
<td>3 Mescalero</td>
<td>22,133</td>
<td>3,976</td>
</tr>
<tr>
<td>4 Santa Fe</td>
<td>104,496</td>
<td>17,708</td>
</tr>
<tr>
<td>5 Zuni</td>
<td>51,138</td>
<td>11,069</td>
</tr>
<tr>
<td>6 South Colorado Ute</td>
<td>37,661</td>
<td>4,774</td>
</tr>
<tr>
<td>7 Yselta Del Sur</td>
<td>--</td>
<td>2,976</td>
</tr>
<tr>
<td>Tribal 638 Contracts*</td>
<td>22,177</td>
<td></td>
</tr>
</tbody>
</table>

* Alamo and Ramah Navajo Chapters.
**Diabetes**

Nationally, diabetes is the fifth most prevalent disease affecting AI/AN elders. Not all tribes however, exhibit uniform rates of the disease. Arizona’s Pima tribe, for example, report that 49.5% of their adults suffer from diabetes, compared with the national average of 8.7%. New Mexico AI/ANs also experience diabetes at variable rates. The areas surrounding Santa Fe and within the Navajo and Jicarilla Apache reservations report the highest proportion of diagnosis.

**Respiratory Problems**

Respiratory problems are the leading cause of outpatient visits for all IHS units in New Mexico, with a total of 181,685 visits in 1993. For the elderly, however, respiratory problems are not the leading complaint. The Mescalero Apache reservation, along with the northern and northwestern areas of the state report the highest frequency of respiratory problems.
Eye Problems
Diagnoses of iris and ciliary disorders to a large extent mirror the pattern of diagnoses of diabetes, with an additional increased incidence in the southwestern corner of the state and the area around T or C. These areas show a concentration of more than 30% of all IHS elderly patients (55-plus) being diagnosed with eye disorders. The association between the diagnoses of diabetes and eye problems is not superficial since there is a causal relationship between these two conditions.

Joint Problems
Diagnosis of osteoarthrosis or problems with joints and skeletal structure cluster within two geographic areas: one in the northwestern corner of the state, near Farmington, and the other in the southern part of New Mexico near the town of Truth or Consequences (T or C).