

USING THE GMAP PROCEDURE TO DISPLAY GEOGRAPHICAL DISTRIBUTION
OF SURGICAL MANPOWER AND POPULATION IN OKLAHOMA

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ABSTRACT

An example is presented which uses PROC GMAP to represent a map with two response variables. The first response variable is indicated by shading patterns while the second is indicated by block height. The resulting map simultaneously indicates the distribution of board-certified surgeons and population by county in Oklahoma. In addition, maps are produced using data from two points in time for comparison, and also for one surgical subspecialty, thoracic surgery.

INTRODUCTION

In order to examine the distribution of one quantity, such as number of surgeons, relative to another distribution, such as population, ratios may be derived (number of surgeons per 100,000 population). A visual examination is also made possible by displaying numbers of surgeons as blocks in each county, overlaying shading patterns representing population.

METHODS

For a graphical representation of the ratio of surgeons to population by county, SAS/GRAPH PROC GMAP was used. Within each county block height indicated surgeon count and shading patterns indicated population categories.

The following datasets were sorted and merged by county number:

- (1) response dataset containing county number, surgeon count, and population category; and
- (2) OK.COUNTIES, provided by the University of Oklahoma, containing digitized coordinates of the county boundaries and county number. The resulting dataset was specified as the MAP dataset.

In order to shade counties by population category, two id variables - county population category and county number - were used to define the unit area for the map. The area option indicated that the variable county population category was to be used with the pattern statements. Number of surgeons (range 0-82) was specified as a discrete response variable with 100 levels and midpoints at each level thus allowing up to 100 different heights of blocks. An additional pattern was defined for the characteristics of the block; the repeat option was included to specify that the pattern could be reused for each block height.

An annotate dataset was used to create the appropriate population legends since, by

default, the respective values for the variable number of surgeons would have been used.

The ratios of surgeons per 100,000 population were computed for each county and ranked from highest to lowest. These lists were produced for the years 1978 and 1985, and the distributions were compared using a paired t-test on the ranks. This procedure was completed for total surgeons and again for thoracic surgeons.

RESULTS

It is apparent from the maps, as would be expected, that the greatest numbers of surgeons are concentrated in the most populous counties. Far northwest and far southeast Oklahoma are the most sparsely populated regions and have very little coverage, although the situation seems to be improving gradually in the northwest. There was a slight but non-significant shift in the distribution of surgeons by county between 1978 and 1985. The two largest counties lost surgeons, while many of the smaller counties gained their first surgeons. There was very little change in distribution of thoracic surgeons.

CONCLUSIONS

Graphics are a powerful statistical tool that enables non-statistically oriented people to visualize the effect of several variables - surgeons per population by county over time.

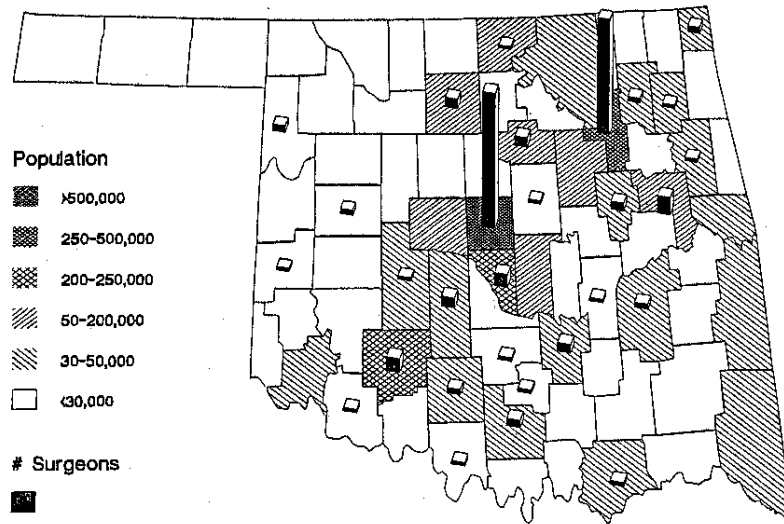
SOURCES

- (1) The Directory of Medical Specialists which listed, by cities within Oklahoma, all practicing ABS-certified surgeons and within this group, all board-certified Thoracic Surgeons; and
- (2) World Almanac and Book of Facts, 1985, which listed the 1980 census population of counties within Oklahoma.

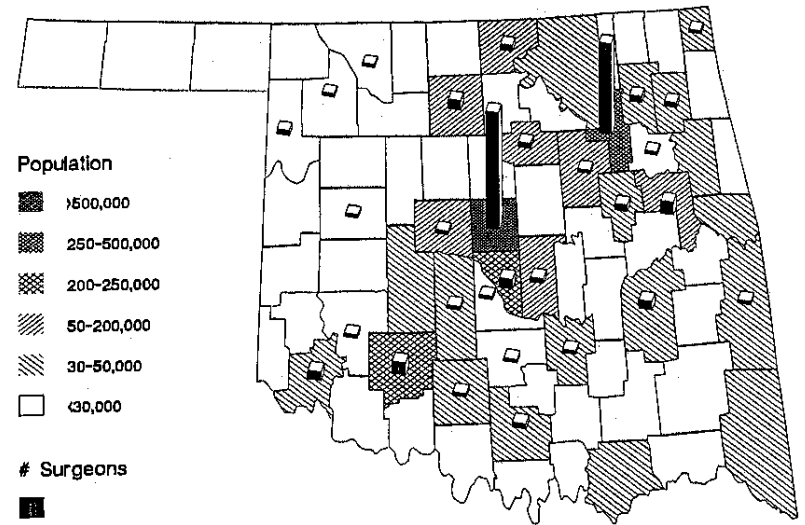
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Distribution of Board Certified Surgeons
by County in 1978

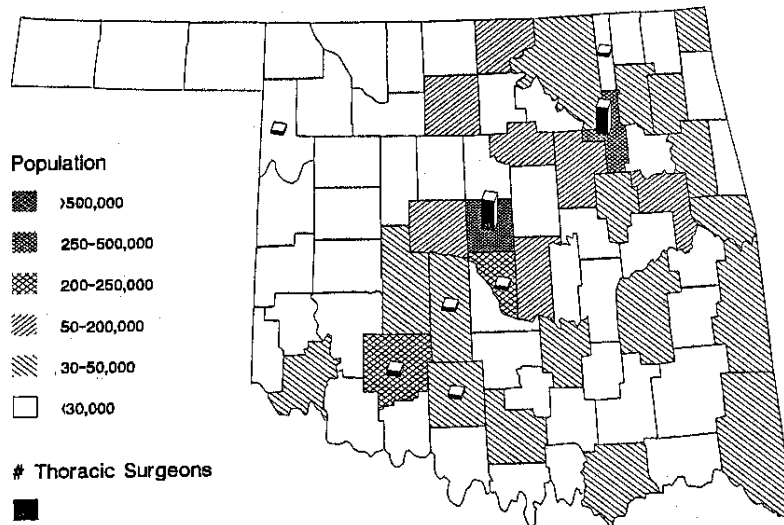


Distribution of Board Certified Surgeons
by County in 1985



776

Distribution of Board Certified Thoracic Surgeons
by County in 1978



Distribution of Board Certified Thoracic Surgeons
by County in 1985

