

# Changing Age Structure of Oklahoma Population Centers

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Technical Bulletin, No. T-102

August 1963

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## Summary

Results show that censal year, size of place, region, and county governmental function explain significant proportions of the variations in the percentage of the Oklahoma town and city population 15 to 64 years of age and 65 years of age and over in 1940, 1950, and 1960. Year, region, and county governmental function account for significant proportions of the variations in the relative number of children under 15 years of age. Size of place, as a main effect, is not an important factor in explaining variations in the proportionate number of children in population centers; however, it is significant in the year-size of place interaction.

There has been a reversal in the historic inverse relationship between size of place and the proportionate number of children under 15 years of age. In 1940, the relative number of dependent children increased as size of place declined, but by 1960 the disproportionately large numbers had disappeared in the hamlets and small villages.

The proportionate number of children is increasing in county seats while declining in noncounty seats. Generally, children are declining proportionately in the places of nonmetropolitan areas but increasing in those situated in the metropolitan areas. Children are relatively more numerous in county seats than in noncounty seats in Western Oklahoma; however, in Eastern and Central Oklahoma children comprise a larger percentage of the noncounty seat than of the county seat population. The four independent variables explain only ten percent of the variation in the proportionate number of children in Oklahoma population centers.

The study shows that the relative number of persons from 15 to 64 years old in Oklahoma population centers has declined each successive censal year from 1940 to 1960; that county seats have relatively more in the 15 to 64 age group than noncounty seats; that the relative number in the 15 to 64 age groups increases as size of place increases; that, generally, towns in the metropolitan areas have greater proportionate numbers of persons in the productive ages than those in nonmetropolitan areas; and, that the relative number of people 15 to 64 has decreased much more rapidly in county seats than in noncounty seats from 1940 to 1960.

Persons in the 65 and older age group have become relatively more numerous each censal year since 1940 and their relative number increases

as size of city decreases. People in the retirement ages are proportionately more numerous in noncounty seat than in county seat towns and they are more numerous in the places in nonmetropolitan areas than those in metropolitan areas. On the whole, the number of persons 65 years of age and over has risen much more rapidly in the population centers of the nonmetropolitan than in the places of the metropolitan areas. The proportionate number of aged persons diminished more rapidly as size of place increased in 1950 and 1960 than in 1940. The percentage of the total population 65 years of age and over did not decline as rapidly in county seats as in noncounty seats as size of place increased.

Region is a significant factor in explaining variations in the age structure of Oklahoma population centers, after first adjusting for the effects of the other three variables. Moreover, county governmental function explains a significant proportion of the variations of the percentages of inhabitants of the population centers under 15 years of age and 65 years of age and over, after adjustment for the other three variables. Differences in the relative numbers of persons 15 to 64 years between county seats and noncounty seats vanishes with adjustments.

The four independent variables explain nearly half of the variations in the relative number of persons 15 to 64 years of age and 65 years of age and over.

Year is by far the most important variable, accounting for about one-third of the variations in the proportionate number of persons in the productive and in the retirement ages.

# Changing Age Structure of Oklahoma Population Centers

by

*James D. Tarver and Susie Reardon Bedingfield\**

Research reported herein was made to determine the age composition of the population of all "places" in Oklahoma enumerated separately by the Bureau of Census. The population studied included everyone except those living in the open country and in unincorporated places of less than 1,000 inhabitants. It explains why the patterns and changes occur and what general uniformities they follow. The hypothesis tested was that size of place, censal year, county governmental status, and region exerted a selective influence on the age structure of Oklahoma's population centers in 1940, 1950 and 1960 (Figure 1).

## Objectives

The objective of the study is to explain the variations in the percentages of people in the 1940, 1950, and 1960 Oklahoma population centers in three age groups: dependent children (0-14 years of age); productive-age population (15-64 years of age); and retirement-age population (65 years of age and over).

## Methods

Four variables were selected to account for the proportionate number of persons under 15 years of age, 15 to 64 years of age, and 65 years of age and over: (1) size-of-place; (2) county governmental function or status; (3) censal year; and (4) regional location. For simplicity and brevity, the report hereafter uses the terms "size" to stand for size-of-place; "government" for local governmental status (county seat—non-county seat classification); "year" for censal year; and "region" for regional or geographic location.

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\*Professor and former graduate assistant, respectively. The authors are indebted to Professors Otis Durant Duncan and James S. Plaxico, Mr. David White, and Mrs. Maria Hamlin for their reviews of the manuscript, to Mmes Maria Hamlin and Evelyn Hargrove for computational assistance, Mrs. Pat Simpson and Miss Peggy Terry for secretarial assistance, and to Mrs. Memory Lewis for cartographic and secretarial assistance. In addition, grateful acknowledgment is made to William Granet, Director, Oklahoma State University Computing Center, for technical advice and extensive computational assistance.

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The research reported herein was done under Station Project 1154.

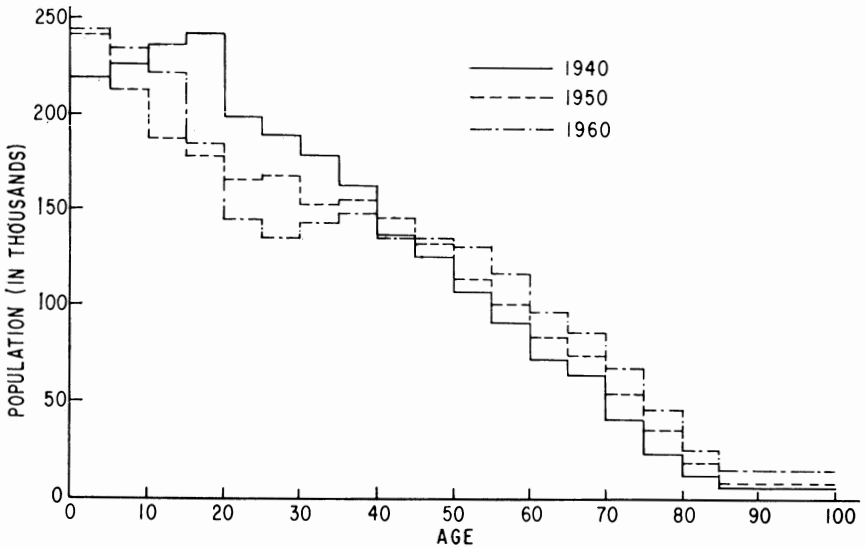


Figure 1. Age distribution of Oklahoma's Population, 1940, 1950, and 1960.

The assumption is that these four variables directly reflect the population change in the various age groups. Presumably, then the four variables chosen for study reflect the composite influences of the three factors: births, deaths, and migration [1, 2, 3, 4, 6, 7, 8, 9, 10, 12, 14, 18, 20].<sup>1</sup>

Proportions in the three broad age categories were computed for the 519 Oklahoma towns and cities in 1940, the 528 in 1950, and the 543 in 1960.<sup>2</sup> The population centers were divided into nine sizes (Table 1) but because of the small number of places in the largest groups of towns, the nine classes were combined into the following four groups in some of the detailed analyses: under 1,000 population; 1,000-4,999; 5,000-24,999; and 25,000 and over.

Population centers were classified as either county seats or non-county seats. There are 77 county seats or a total of 231 for the three decennial census years. Population centers were also classified by the respective year (1940, 1950, or 1960) to which the age data apply.

<sup>1</sup>Numerals refer to publications cited at the end of this report.

<sup>2</sup>Veterans Village, on the Oklahoma State University campus, was combined with Stillwater in the 1950 census to insure comparability with the 1960 census. In 1960, the census enumerated no residents in Sante Fe, thus giving only 543 places with age characteristics.

**Table 1. Distribution of places by size, Oklahoma, 1940, 1950, and 1960 combined.**

Size-Group	Population Interval	Number of Places
1	Under 500	791
2	500-999	295
3	1,000-1,499	124
4	1,500-2,499	132
5	2,500-4,999	106
6	5,000-9,999	72
7	10,000-24,999	52
8	25,000-49,999	11
9	50,000 and Over	7
	Total	1,590

Each place was assigned to one of 12 geographical areas, using the 1960 Census definitions of state economic and standard metropolitan statistical areas [5, 19]. The first nine are nonmetropolitan state economic areas; the last three (10, Comanche County; 11, Tulsa, Creek, and Osage Counties; and 12, Oklahoma, Canadian, and Cleveland Counties) are standard metropolitan statistical areas. Each of the last three areas contains a city of 50,000 population or more as the first SMSA qualification (Table 2 and Figure 2).

Graphs of all possible two-, three-, and four-factor interactions were prepared to identify those likely to be significant, after the percentage of the total population of each place in the three age brackets were computed and after the four variables were coded. All interactions which contained one or more blank cells were not considered.

## Hypotheses and Their Tests

The following five basic mathematical models were used to determine the effects of each of four independent variables and selected two-factor interactions on the proportions of the population in each of three age groups:<sup>3</sup>

<sup>3</sup>It was impossible to include the four independent variables and all probable two-factor interactions in one model, for they exceeded the storage capacity of the computer. Thus, the above five models analyze the four factors and interactions in various combinations. Models 1, 4, and 5 were altered somewhat for the three different age groups.

**Table 2. Oklahoma population centers in 1940, 1950, and 1960 combined, classified by the 1960 State Economic and Standard Metropolitan Statistical Areas.**

Area	Number of Places
1	149
2	201
3	128
4	200
5	189
6	83
7	159
8	159
9	112
10	27
11	111
12	72
Total	1,590

$$Y_{iajk} = \mu + \alpha_i + \beta_a + \tau_j + (\alpha\beta)_{ai} + (\alpha\tau)_{ij} + (\beta\tau)_{aj} + \epsilon_{iajk} \quad (1)$$

$$Y_{imk} = \mu + \alpha_i + \gamma_m + (\alpha\gamma)_{im} + \epsilon_{imk} \quad (2)$$

$$Y_{amk} = \mu + \beta_a + \gamma_m + (\beta\gamma)_{am} + \epsilon_{amk} \quad (3)$$

$$Y_{ank} = \mu + \beta_a + \tau_n + (\beta\tau)_{an} + \epsilon_{ank} \quad (4)$$

$$Y_{ainmk} = \mu + \beta_a + \alpha_i + \tau_n + \gamma_m + \epsilon_{ainmk} \quad (5)$$

where  $\alpha_i$  is the fixed effect of county governmental status, with  $i = 1$  and  $2$ ;  $\beta_a$  is the fixed effect of censal year, with  $a = 1, 2,$  and  $3$ ;  $\tau_j$  is the fixed effect of size of place, with  $j = 1, 2, 3,$  and  $4$  in model 1;  $\tau_n$  in models 4 and 5 is size of place, with  $n = 1, 2, \dots, 9$ ;  $\gamma_m$  is the fixed effect of state economic area, with  $m = 1, \dots, 12$ ;  $k = 1, \dots, 1590$ , with the subscript  $k$  identifying each of the population centers;  $(\alpha\beta)$ ,  $(\alpha\tau)$ ,  $(\beta\tau)$ ,  $(\alpha\gamma)$ , and  $(\beta\gamma)$  are two-factor interactions. All models assume the epsilons are independent and normally distributed, having a mean of zero and a variance of sigma square [ $\epsilon \sim \text{NID}(0, \sigma^2)$ ]. There are three dependent variables:  $Y_1$ , the percentage of the population under 15 years of age;  $Y_2$ , the percentage 15 to 64 years of age; and  $Y_3$  the percentage 65 years of age and older.



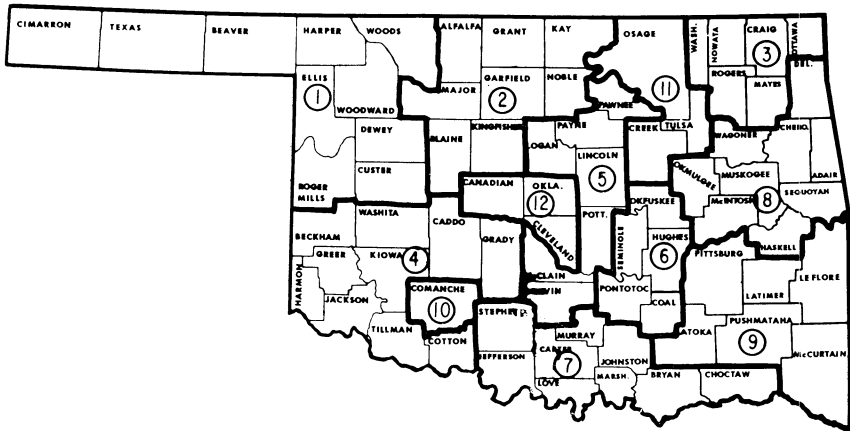


Figure 2. Oklahoma State Economic and Standard Metropolitan Statistical Areas, 1960.

Since the decennial censuses do not enumerate unincorporated centers of less than 1,000 population, the universe (population) of all Oklahoma towns and cities in 1940, 1950, and 1960 is unknown. For this reason the study considers the reported centers as samples of the total population of centers and proceeds to test stated hypotheses about the population parameters. When one is unable to examine the universe of towns and cities in its entirety, it is appropriate to test hypotheses that parameters for the population actually differ.

The assumption is that each of the four independent variables and selected interactions influences the age patterns of Oklahoma population centers. The study formulates the following 11 hypotheses:

1.  $\alpha_1 = \alpha_2.$
2.  $\beta_1 = \beta_2 = \beta_3.$
3.  $\tau_1 = \tau_2 = \tau_3 = \tau_4.$
4.  $\tau_1 = \tau_2 = \dots = \tau_8 = \tau_9.$
5.  $\gamma_1 = \gamma_2 = \dots = \gamma_{11} = \gamma_{12}.$
6.  $(\alpha\beta) = 0.$
7.  $(\alpha\tau)_{ij} = 0.$
8.  $(\beta\tau)_{aj} = 0.$
9.  $(\beta\tau)_{an} = 0.$
10.  $(\alpha\gamma) = 0.$
11.  $(\beta\gamma) = 0.$

Tests indicate that for  $Y_1$  the following eight hypotheses must be rejected: 1, 2, 5, 6, 8, 9, 10, and 11. The last five are significant two-

factor interactions shown in Figures 3, 4, 5, 6, and 7; F-tests, computed from the analysis of variance, are given in Table 6.<sup>4</sup>

For  $Y_2$  the first six hypotheses are rejected. F-tests reveal that none of the last five two-factor interactions are significant (Table 7). Figure 11 diagrams the year-government interaction.

For  $Y_3$  the first five hypotheses and hypotheses 7, 8, and 11 are rejected. The three significant two-factor interactions are shown in Figures 8, 9, and 10. Table 8 computes the F-tests for dependent variable  $Y_3$ .

In all, 11 hypotheses are not rejected, three for  $Y_1$ , five for  $Y_2$ , and three for  $Y_3$ .

## Results

The number of children less than 10 years of age has increased since 1940 over the entire State of Oklahoma, the number past 45 years of age has risen steadily, but the number in the middle-age group has declined (Figure 1). The most marked trends in the State's age structure between 1940 and 1960 are relative increases in the aged population and decreases in the balance of the adult population (Table 3).

### SIZE OF PLACE

In towns and cities the relative number of children is approximately constant among the size classes for the three censal years combined (Table 4). Thus, F-tests indicate that size of place, as an independent variable, is not a significant factor affecting the proportionate number of children (Table 6).

**Table 3. Percent of population by age groups, by censal years, Oklahoma, 1940-1960.**

Year	Age Group		
	Under 15	15 to 64	65 and over
1960	29.97	59.34	10.69
1950	28.63	62.69	8.68
1940	29.23	64.57	6.20

<sup>4</sup>Snedecor's (Fisher's) F and Student's (Gosset's) t are derived distributions, each evolving from the basic normal distribution. In linear models, both the variance ratio (F) and Student's t play crucial roles in tests of hypotheses.

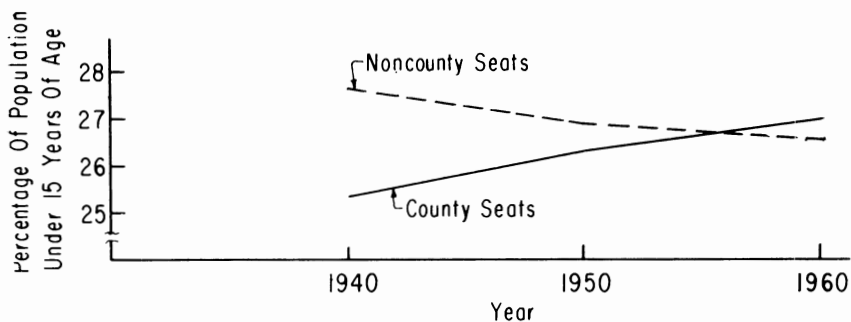


Figure 3. Proportionate number of children in Oklahoma population centers in 1940, 1950, and 1960, showing the interaction of year and county governmental status.

In contrast, the relative number in the productive ages of 15 to 64 increases consistently with size of place (Table 4). The disparities in gains are quite apparent in the four size groups of towns, for there are

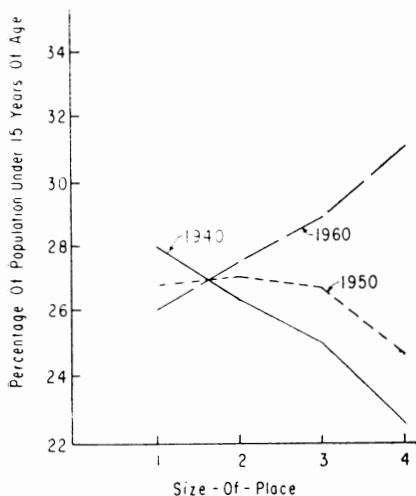


Figure 4. Proportionate number of children in Oklahoma population centers in 1940, 1950, and 1960, showing the interaction of year and size-of-place (Model 1).

significant differences between each of the six pairs of means (Tables 7 and 10). Of the 36 possible comparisons between pairs of means in the nine sizes of places, 31 differences are significant (Tables 7, 13, and 14). Only the following five pairs have no real differences: 3 and 4, 4 and 5, 7 and 8, 7 and 9, and 8 and 9.

The percentage of persons 65 years of age and over declines consistently as size of place increases (Table 4). All six differences between the means of the four sizes of population centers are significant (Tables 8 and 10). The inverse relationship between the relative number of aged and size of place is also evident in the nine classes of places, where 29 of the 36 pairs of means differ significantly (Tables 8, 13, and 14).

The seven pairs of means which have no actual differences are: 2 and 3, 3 and 4, 4 and 5, 6 and 7, 7 and 8, 7 and 9, and 8 and 9.

The relative number of persons 65 years of age and over drops quite sharply as city-size increases. Nevertheless, the decline is somewhat greater for noncounty seats than county seats, producing a significant size-government interaction (Figure 9).

**Table 4. Means of the relative number of persons in Oklahoma population centers in three age groups, by independent variables.\***

Variable	Percentage		
	Under 15	15 to 64	65 and Over
Total	26.9	58.7	14.3
Government			
County Seats	26.2	61.9	11.9
Noncounty Seats	27.1	58.2	14.7
Year			
1940	27.4	63.0	9.6
1950	26.8	58.2	15.0
1960	26.6	55.1	18.2
Size			
1	26.9	57.7	15.4
2	26.9	60.1	13.0
3	26.9	63.2	9.9
4	27.1	65.3	7.6
1	27.0	57.4	15.7
2	26.9	58.4	14.7
3	26.8	59.6	13.6
4	27.0	59.9	13.0
5	27.0	60.7	12.3
6	26.9	62.4	10.6
7	26.9	64.2	8.9
8	27.0	64.6	8.4
9	27.1	66.3	6.4
Area			
1	25.8	60.3	13.9
2	25.3	58.7	16.0
3	27.1	58.5	14.4
4	26.2	59.1	14.7
5	26.0	57.9	16.1
6	27.0	58.2	14.7
7	26.8	58.5	14.7
8	29.1	56.6	14.3
9	27.6	58.5	13.9
10	30.5	58.1	11.4
11	28.9	59.8	11.4
12	28.2	62.4	9.4

\*The percentages are unweighted averages of percentages; hence, they differ somewhat from those shown in Table 5.

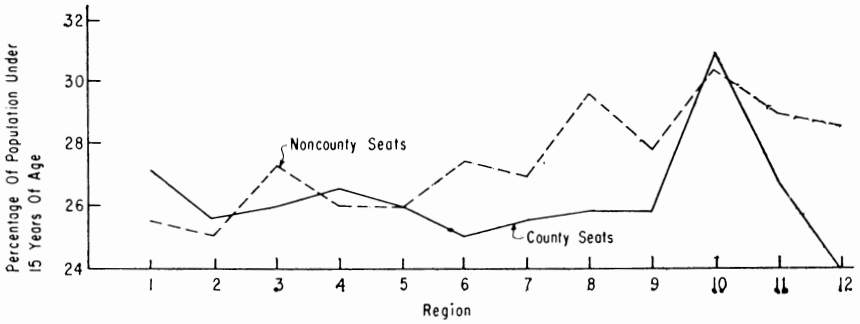


Figure 5. Proportionate number of children in Oklahoma population centers in 1940, 1950, and 1960, showing the interaction of county governmental status and region.

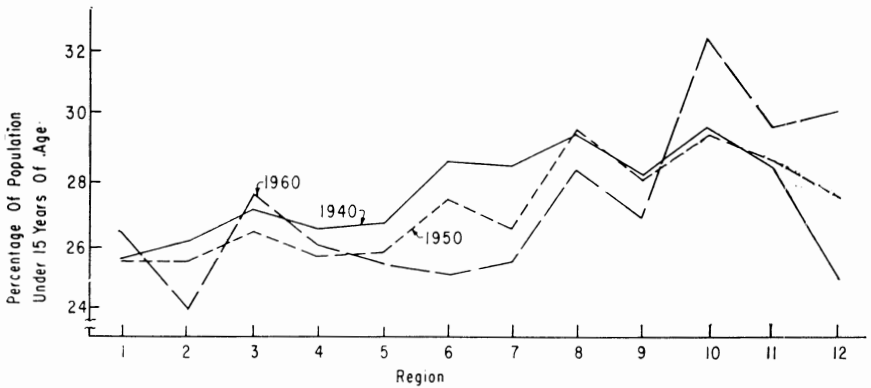


Figure 6. Proportionate number of children in Oklahoma population centers in 1940, 1950, and 1960, showing the interaction of year and region.

Moreover, the proportionate number of aged persons has risen in Oklahoma population centers of all sizes during 1940 to 1960, but the increases in the small centers have surpassed those of the large centers (Model 1, Table 8). The slopes of the percentages of the total population 65 years of age and over for each of the three years are not parallel, thus giving a significant year-size interaction (Figure 10).

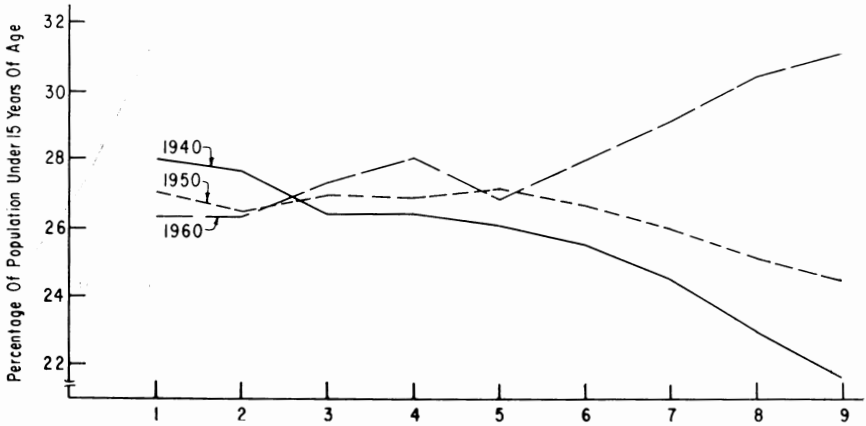


Figure 7. Proportionate number of children in Oklahoma population centers in 1940, 1950, and 1960, showing the interaction of year and size-of-place (Models 4 and 5).

Table 5. Percent of total population of towns and cities in three age groups by size-of-place, Oklahoma, 1940-1960.\*

Size of Place	Under 15			15 to 64			65 and Over		
	1960	1950	1940	1960	1950	1940	1960	1950	1940
	<i>(Percent)</i>			<i>(Percent)</i>			<i>(Percent)</i>		
Under 500	26.26	27.09	28.02	53.84	56.62	61.67	19.90	16.29	10.31
500-999	26.27	26.47	27.73	54.80	57.62	62.65	18.93	15.91	9.62
1,000-1,499	27.25	26.92	26.36	54.60	58.87	64.36	18.15	14.21	9.28
1,500-2,499	28.00	26.80	26.42	55.40	59.84	65.17	16.60	13.36	8.41
2,500-4,999	27.13	27.19	26.11	56.59	61.12	65.57	16.28	11.69	8.32
5,000-9,999	28.50	26.66	25.46	58.18	62.68	67.51	13.32	10.66	7.03
10,000-24,999	29.10	25.96	24.48	60.34	65.32	68.89	10.56	8.72	6.64
25,000-49,999	30.42	25.18	23.04	60.48	66.83	69.17	9.10	7.99	7.79
50,000 and Over	31.07	24.50	22.22	61.02	68.55	72.61	7.91	6.95	5.18
All Places	29.46	25.79	24.63	59.23	64.44	68.26	11.31	9.77	7.11

\*The percentages are weighted averages obtained by summing the population in the nine-size groups.

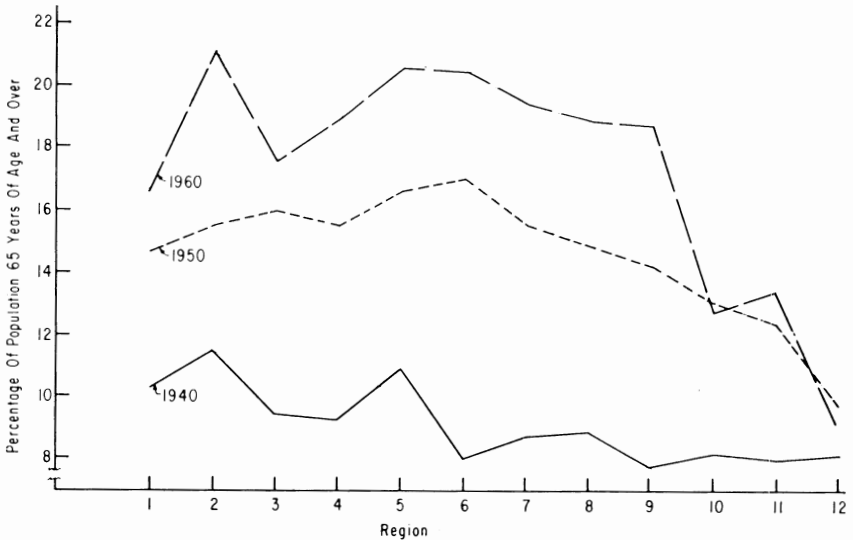


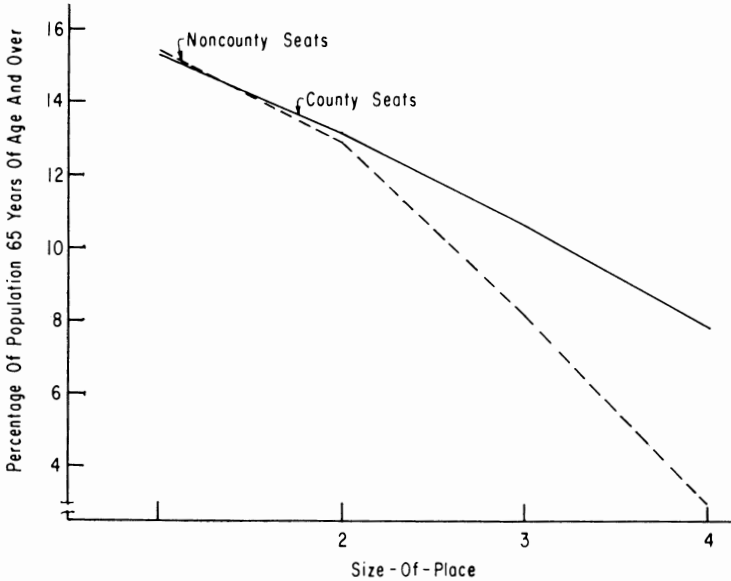
Figure 8. Proportionate number of aged persons in Oklahoma population centers in 1940, 1950, and 1960, showing the interaction of year and region.

## YEAR

Table 4 shows that the relative size of the child population in Oklahoma population centers has diminished gradually each censal year since 1940.<sup>5</sup> The relationship between year and the proportionate number of children is somewhat intricate, for three significant two-factor interactions enter into the association: year-size, year-region, and year-government (Table 6).

The year-size interaction indicates that both factors operate jointly in affecting the relative number of children. In 1940, dependent youths were more plentiful in small places, for the percentages decline successively as size of town increases (Figures 4 and 7). By 1960, there was a complete reversal in the association of the two factors: large places had a relatively greater predominance of children. This is an unprecedented shift in traditional demographic patterns, for the hamlets and villages are devoid of their previously high concentrations of youths [2, 3, 4]. The appreciable increases of fertility in urban areas and the exodus of

<sup>5</sup>Table 4 indicates a declining trend in the relative child population of Oklahoma population centers, whereas Table 5 shows an ascending trend. The apparent discrepancy arises from the simple, unweighted means computed from the data in Table 4.



**Figure 9.** Proportionate number of aged persons in Oklahoma population centers in 1940, 1950, and 1960, showing the interaction of county governmental status and size-of-place.

people from small towns contribute to this abrupt change in age structure [15].

Persons in the productive ages constitute a smaller percentage of the total population each successive censal year from 1940 to 1960 (Tables 4 and 7). Moreover, the t-tests reveal significant differences between each of the three pairs of years (Tables 10, 12, 13, and 14). The proportionate number of persons in the productive ages has dwindled in the population centers of all sizes during 1940 to 1960. The decline has been much steeper in the county seats than in the noncounty seats (Figure 11). Since the slopes of the lines are not parallel, there is a significant year-government interaction (Model 1, Table 7).

The attrition in the Oklahoma adult population is due, in part, to the low birth rates in the depression years. Furthermore, the shrinkage has occurred in Oklahoma population centers of all sizes, with a somewhat greater decline in the largest places (Figure 12). Accordingly, the range in the proportionate number of persons 15 to 64, by size of place, is much smaller in 1960 than in 1940.

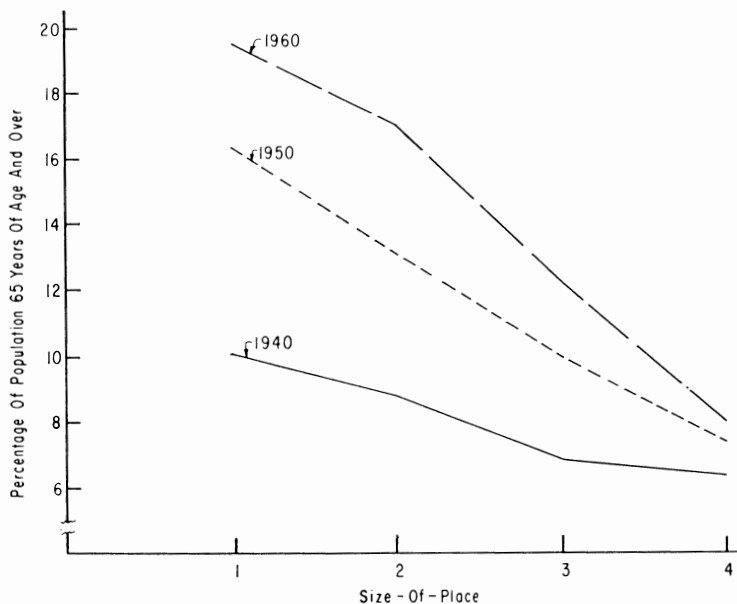


**Table 6. Analysis of variance of the percentage of the Oklahoma town and city population under 15 years of age, 1940 to 1960 (Models 1, 2, 3, 4a, and 5).**

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Calculated Variance Ratio
<i>Model 1</i>				
Total	1,589	39,414.20		
Government ( $\alpha \mu$ )	1	151.39	151.39	6.31*
Year ( $\beta \mu, \alpha$ )	2	158.74	79.37	3.31*
Size ( $\tau \mu, \alpha, \beta$ )	3	113.15	37.72	1.57
Interactions	(11)	(1,296.72)	(117.88)	(4.92**)
( $\alpha\beta \mu, \alpha, \beta, \tau$ )	2	270.89	135.44	5.65**
( $\alpha\tau \mu, \alpha, \beta, \tau, \alpha\beta$ )	3	152.00	50.67	2.11
( $\beta\tau \mu, \alpha, \beta, \tau, \alpha\beta, \alpha\tau$ )	6	873.83	145.64	6.07**
Error	1,572	37,694.20	23.98	
<i>Model 2</i>				
Total	1,589	39,414.20		
Government ( $\alpha \mu$ )	1	151.39	151.39	6.59*
Region ( $\gamma \mu, \alpha$ )	11	2,707.09	246.10	10.71**
Interaction ( $\alpha\gamma \mu, \alpha, \gamma$ )	11	569.62	51.78	2.25**
Error	1,566	35,986.10	22.98	
<i>Model 3</i>				
Total	1,589	39,414.20		
Year ( $\beta \mu$ )	2	156.62	78.31	3.43*
Region ( $\gamma \mu, \beta$ )	11	2,723.73	247.61	10.86**
Interaction ( $\beta\gamma \mu, \beta, \gamma$ )	22	1,093.81	49.72	2.18**
Error	1,554	35,440.04	22.81	
<i>Model 4a</i>				
Total	1,589	39,414.20		
Year ( $\beta \mu$ )	2	156.62	78.31	3.23*
Size ( $\tau \mu, \beta$ )	8	7.12	.89	.04
Interaction ( $\beta\tau \mu, \beta, \tau$ )	16	1,299.22	81.20	3.34**
Error	1,563	37,951.24	24.28	
<i>Model 5</i>				
Total	1,589	39,414.20		
Year ( $\beta \mu$ )	2	156.62	78.31	3.38*
Government ( $\alpha \mu, \beta$ )	1	153.52	153.52	6.63*
Size ( $\tau \mu, \beta, \alpha$ )	8	185.40	23.18	1.00
Region ( $\gamma \mu, \beta, \alpha, \tau$ )	11	2,631.24	239.20	10.33**
Error	1,567	36,287.42	23.16	

\*Five percent significance level.  
 \*\*One percent significance level.

The relative number of persons in the retirement age bracket has risen greatly between 1940 and 1960 (Tables 4 and 8). Thus, t-tests provide significant differences between each of the three pairs of years (Tables 10, 13, and 14).



**Figure 10.** Proportionate number of aged persons in Oklahoma population centers in 1940, 1950, and 1960, showing the interaction of year and size-of-place.

The proportionate number of persons 65 years old and over has increased in each size-of-city group during 1940 and 1960, with the most pronounced gains in the smallest towns (Figure 13). Several factors contribute to the rapidly mounting number of persons in the advanced ages [11, 13]. Thousands of the State's senior citizens came in the land runs before statehood; the survivors of this group are swelling the numbers in the past-65 age group. Declines in the birth rates during the late 1920's and 1930's, declines in mortality rates, the movement of retired persons from farms to towns, and the emigration of youths and young adults are accentuating the proportionate numbers of aged in the State, particularly in the hamlets and small villages.

Two significant interactions appear in the trends of the aged population in which year is one of the two factors. *First*, the proportionate number of aged decreased much more rapidly in 1950 and 1960 than in 1940 as size of place increased. This reflects a significant year-size interaction (Figure 10). *Second*, trend lines of the relative number of aged persons in the metropolitan areas intersect in 1950 and 1960, giving a significant year-region interaction (Figure 8).

## COUNTY GOVERNMENTAL STATUS

Taking the three years 1940, 1950, and 1960 as a whole, county seats have proportionally fewer children than noncounty seats, this differential being especially noticeable in places over 500 population (Tables 4 and 6). More thorough examination of this association reveals a two-factor interaction of year and local political function (Figure 3 and Table 6). Children have been increasing proportionately in county seats, especially in those with less than 1,000 inhabitants, whereas their numbers have been dwindling proportionately in noncounty seats. In 1960, children accounted for a larger percentage of the total population of county seat than of noncounty seat towns for the first time during 1940 to 1960. The precise influence of local governmental status on variations in the proportionate numbers of children is meaningful only when taking the two interacting variables (year and region) into account.

County seats have larger proportionate numbers of people 15 to 64 years of age than noncounty seats, 61.9 percent compared to 58.2 percent, respectively (Tables 4 and 7). On the other hand, there are relatively fewer aged persons in county seats than in noncounty seats, the percentages being 11.9 and 14.7, respectively (Tables 4 and 8).

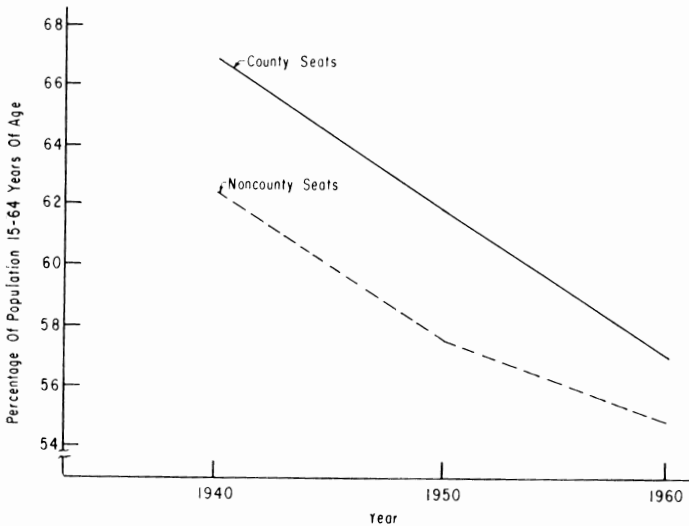


Figure 11. Proportionate number of adults and older youths in Oklahoma population centers in 1940, 1950, and 1960, showing the interaction of year and county governmental status.

The relative number of persons 15 to 64 years of age declined much more rapidly in county seats than in noncounty seats from 1940 to 1960, giving a significant year-government interaction (Figure 11).

**Table 7. Analysis of variance of the percentage of the Oklahoma town and city population 15 to 64 years of age, 1940 to 1960, (Models 1, 2, 3, 4a, 4b, and 5).**

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Calculated Variance Ratio
<i>Model 1</i>				
Total	1,589	50,379.70		
Government ( $\alpha \mu$ )	1	2,654.88	2,654.88	150.16**
Year ( $\beta \mu, \alpha$ )	2	16,641.63	8,320.82	470.63**
Size ( $\tau \mu, \alpha, \beta$ )	3	2,844.24	948.08	53.62**
Interactions	(11)	(449.26)	(40.84)	(2.31**)
( $\alpha\beta \mu, \alpha, \beta, \tau$ )	2	257.99	129.00	7.30**
( $\alpha\tau \mu, \alpha, \beta, \tau, \alpha\beta$ )	3	41.66	13.89	.79
( $\beta\tau \mu, \alpha, \beta, \tau, \alpha\beta, \alpha\tau$ )	6	149.61	24.94	1.41
Error	1,572	27,789.69	17.68	
<i>Model 2</i>				
Total	1,589	50,379.70		
Government ( $\alpha \mu$ )	1	2,654.88	2,654.88	93.02**
Region ( $\gamma \mu, \alpha$ )	11	2,502.94	227.54	7.97**
Interaction ( $\alpha\gamma \mu, \alpha, \gamma$ )	11	533.87	48.53	1.70
Error	1,566	44,688.01	28.54	
<i>Model 3</i>				
Total	1,589	50,379.70		
Year ( $\beta \mu$ )	2	16,739.60	8,369.80	428.34**
Region ( $\gamma \mu, \beta$ )	11	2,939.22	267.20	13.67**
Interaction ( $\beta\gamma \mu, \beta, \gamma$ )	22	332.62	15.12	.77
Error	1,554	30,368.26	19.54	
<i>Model 4a</i>				
Total	1,589	50,379.70		
Year ( $\beta \mu$ )	2	16,739.60	8,369.80	476.37**
Size ( $\tau \mu, \beta$ )	8	5,736.09	717.01	40.81**
Interaction ( $\beta\tau \mu, \beta, \tau$ )	16	440.81	27.55	1.57
Error	1,563	27,463.20	17.57	
<i>Model 4b</i>				
Total	1,589	50,379.70		
Size ( $\tau \mu$ )	8	5,485.16	685.64	38.80**
Year ( $\beta \mu, \tau$ )	2	16,990.51	8,495.26	480.77**
Error	1,579	27,904.03	17.67	
<i>Model 5</i>				
Total	1,589	50,379.70		
Year ( $\beta \mu$ )	2	16,739.60	8,369.80	511.29**
Government ( $\alpha \mu, \beta$ )	1	2,556.92	2,556.92	156.20**
Size ( $\tau \mu, \beta, \alpha$ )	8	3,179.81	397.48	24.28**
Region ( $\gamma \mu, \beta, \alpha, \tau$ )	11	2,253.76	204.89	12.52**
Error	1,567	25,649.61	16.37	

The aged constitute a larger proportion of the total population in noncounty seats than in county seats. However, the relative number of aged persons declines much more rapidly in noncounty seats than in county seats as size of place increases. These divergent trends show a significant government-size interaction (Figure 9).

**Table 8. Analysis of variance of the percentage of the Oklahoma town and city population 65 years of age and over, 1940 to 1960 (Models 1, 2, 3, 4a, 4b, and 5).**

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Calculated Variance Ratio
<i>Model 1</i>				
Total	1,589	63,245.90		
Government ( $\alpha \mu$ )	1	1,543.90	1,543.90	65.98**
Year ( $\beta \mu, \alpha$ )	2	19,980.20	9,990.10	426.93**
Size ( $\tau \mu, \alpha, \beta$ )	3	4,080.09	1,360.03	58.12**
Interactions	(11)	(858.54)	(78.05)	(3.34**)
( $\alpha\beta \mu, \alpha, \beta, \tau$ )	2	79.35	39.68	1.70
( $\alpha\tau \mu, \alpha, \beta, \tau, \alpha\beta$ )	3	187.60	62.53	2.67*
( $\beta\tau \mu, \alpha, \beta, \tau, \alpha\beta, \alpha\tau$ )	6	591.59	98.60	4.21**
Error	1,572	36,783.17	23.40	
<i>Model 2</i>				
Total	1,589	63,245.90		
Government ( $\alpha \mu$ )	1	1,543.90	1,543.90	42.40**
Region ( $\gamma \mu, \alpha$ )	11	4,376.91	397.90	10.93**
Interaction ( $\alpha\gamma \mu, \alpha, \gamma$ )	11	305.36	27.76	.76
Error	1,566	57,019.73	36.41	
<i>Model 3</i>				
Total	1,589	63,245.90		
Year ( $\beta \mu$ )	2	20,061.28	10,030.64	430.13**
Region ( $\gamma \mu, \beta$ )	11	4,961.72	451.07	19.34**
Interaction ( $\beta\gamma \mu, \beta, \gamma$ )	22	1,983.17	90.14	3.87**
Error	1,554	36,239.73	23.40	
<i>Model 4a</i>				
Total	1,589	63,245.90		
Year ( $\beta \mu$ )	2	20,061.28	10,030.64	425.93**
Size ( $\tau \mu, \beta$ )	8	5,793.92	724.24	30.75**
Interaction ( $\beta\tau \mu, \beta, \tau$ )	16	589.51	36.84	1.56
Error	1,563	36,801.19	23.55	
<i>Model 4b</i>				
Total	1,589	63,245.90		
Size ( $\tau \mu$ )	8	5,484.89	685.61	28.95**
Year ( $\beta \mu, \tau$ )	2	20,370.32	10,185.16	430.12**
Error	1,579	37,390.69	23.68	
<i>Model 5</i>				
Total	1,589	63,245.90		
Year ( $\beta \mu$ )	2	20,061.28	10,030.64	472.03**
Government ( $\alpha \mu, \beta$ )	1	1,462.82	1,462.82	68.84**
Size ( $\tau \mu, \beta, \alpha$ )	8	4,283.89	535.49	25.20**
Region ( $\gamma \mu, \beta, \alpha, \tau$ )	11	4,136.29	376.03	17.70**
Error	1,567	33,301.62	21.25	

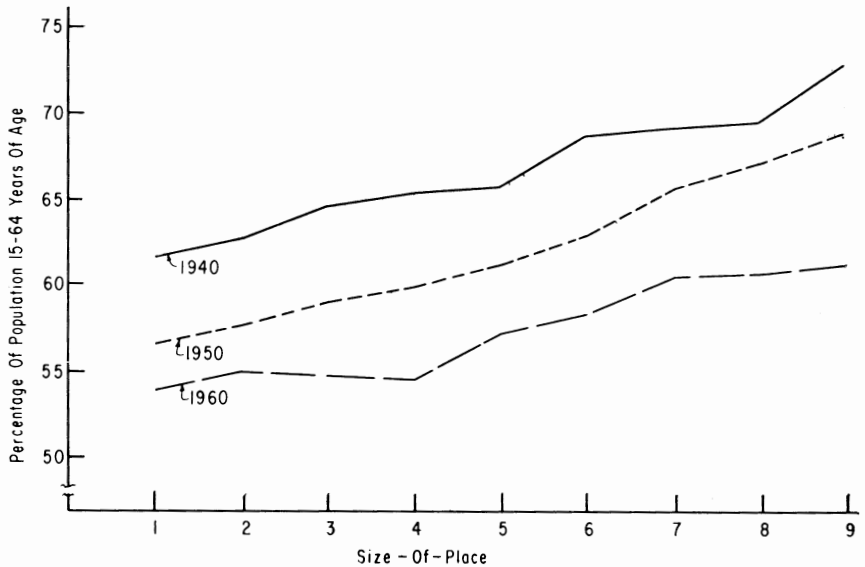


Figure 12. Proportionate number of productive-age adults in Oklahoma population centers, 1940, 1950, and 1960, by size-of-place.

The significant county seat-noncounty seat differences in proportionate numbers of children and aged persons remain after first adjusting the population centers for the effects of year, size of place, and region.<sup>6</sup> However, the significant differences in the relative number in the ages of 15 to 64 in county seats and noncounty seats disappear after adjustment.

<sup>6</sup>By placing county governmental status last in Model 5, the following results for the three age brackets were obtained in the analysis of variance:

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	Calculated Variance Ratio
<i>Population Under 15 Years of Age</i>				
Government ( $\alpha \mu, \beta, \tau, \gamma$ )	1	181.68	181.68	7.84**
Error	1,567	36,287.41	23.16	
<i>Population 15 to 64 Years of Age</i>				
Government ( $\alpha \mu, \beta, \tau, \gamma$ )	1	3.78	3.78	.23
Error	1,567	25,649.63	16.37	
<i>Population 65 Years of Age and Older</i>				
Government ( $\alpha \mu, \beta, \tau, \gamma$ )	1	130.23	130.23	6.06*
Error	1,567	33,653.12	21.48	

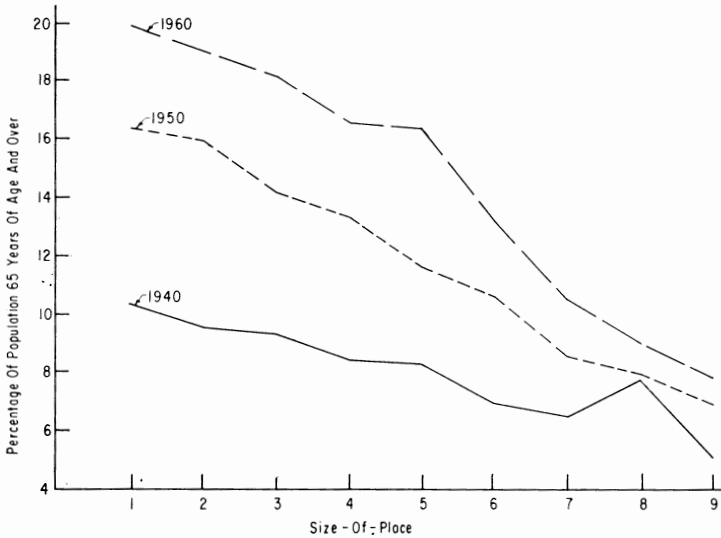


Figure 13. Proportionate number of aged persons in Oklahoma population centers in 1940, 1950, and 1960, by size-of-place.

## REGIONAL LOCATION

The proportionate numbers of dependent children and persons in the productive and retirement ages living in the Oklahoma population centers vary significantly among the economic areas of the State. Nevertheless, a year-region interaction for the child and aged populations and a region-government interaction for children complicate the relationship of region with the relative number of persons in the three age brackets.

### Population in the Young Dependent Ages

For all three years 1940, 1950 and 1960 combined, there are large disparities in the relative number of children in the 12 economic areas of the State (Tables 4 and 6). The region-government interaction reveals that in Western Oklahoma (Areas 1, 2, 4, and 10) children are proportionally more numerous in county seat towns than in noncounty seat towns (Figure 5). In the remaining sections, excluding Area 5, they are relatively more numerous in noncounty seats than in county seats. Thus, there is a significant difference in the age structure of Western and Eastern Oklahoma county seats and noncounty seats.

**Table 9. Degrees of freedom for t-tests with less than 120 degrees of freedom for significant differences between all possible pairs of means for four variables in three age groups.\***

Pairs	Degrees of Freedom
<i>Area</i>	
6 and 10	108
10 and 12	97
<i>Size</i>	
5 and 8	115
5 and 9	111
6 and 8	81
6 and 9	77
7 and 8	61
7 and 9	57
8 and 9	16

\*All other comparisons for the tests of significant differences between pairs of means have more than 120 degrees of freedom; infinity is employed for the degrees of freedom.

In Western Oklahoma, where the population is rather sparse, population centers are small and widely dispersed. Even so, county seats exercise a somewhat more dominant role than noncounty seats, for their growth has exceeded places lacking county courthouses. In this area of wide expanses, county seats tend to be the largest trade and service centers and several have as many, or more, municipal and federal employees as county workers. Altogether, the governmental functions, including municipal, county, state, and federal, exert a considerable impact on the population and, therefore, influence the age structure.

Oklahoma City and Tulsa, the State's two largest metropolitan centers, are in Central and Eastern Oklahoma, where suburbanization has proceeded farthest. These two areas account for most of the net civilian migration increase in the State, for they receive thousands of residents from outlying towns and farms. The migrants to the suburbs are mostly families with young children, while those attracted to the central part of the cities are primarily young single adults going to apartments and rooming-houses [16].

Thus, in the two major metropolitan areas, the proportionate number of children has increased much more rapidly in the noncounty seat



suburban communities than in the central cities where county seats are located. Obviously, federal, state, and municipal offices outweigh the influence of county courthouses upon age structure in the two largest population centers.

The State's third largest metropolitan area, Comanche County, has not yet experienced the demographic movements of highly urbanized areas. Here, children are relatively more numerous in the county seat of Lawton than in other population clusters. Fort Sill, the State's largest military base, influences the age structure of Lawton, where population gains in the county seat surpass those of outlying places.

Year has a divergent influence upon trends in the distribution of children among the 12 geographic areas (Figure 6). In seven areas (2, 4, 5, 6, 7, 8, and 9), the proportionate numbers decline. On the other hand, children have become relatively more numerous in Areas 1, 3, 10, 11, and 12, with the percentage gains in Area 12 surpassing all others and with Area 10 registering the second largest proportionate gains.

**Table 10. T-tests for differences between all possible pairs of means for years and size-of-place (Model 1).**

Variable	Calculated t Values				
	Year		Size		
	2	3	2	3	4
Year	15 to 64				
1	18.72**	30.80**			
2		12.02**			
Size					
1			-7.88**	-11.00**	-7.52**
2				-6.63**	-5.53**
3					-2.55*
Year	65 and Over				
1	-18.28**	-29.30**			
2		-10.97**			
Size					
1			8.21**	11.41**	7.88**
2				6.86**	5.81**
3					2.72**

Table 11. T-tests for differences between all possible pairs of means of State Economic Areas, adjusted for the effect of government (Model 2).

Variable	Calculated t Values											
	Area											
	2	3	4	5	6	7	8	9	10	11	12	
	15 to 64											
Area												
1	2.23*	2.41*	1.65	3.53**	2.65**	2.76**	5.88**	2.45*	1.66	.07	—3.22**	
2		.43	— .64	1.44	.93	.68	4.04**	.54	.52	—1.97*	—5.13**	
3			— .99	.85	.52	.20	3.21**	.12	.27	—2.17*	—5.11**	
4				2.06*	1.41	1.28	4.64**	1.08	.83	—1.43	—4.67**	
5					— .19	— .68	2.63**	— .68	— .19	—3.17**	—6.14**	
6						— .36	2.28*	— .39	— .07	—2.44*	—5.13**	
7							3.18**	— .07	.16	—2.47*	—5.47**	
8								—2.96**	—1.55	—5.35**	—7.98**	
9									.20	—2.22*	—5.09**	
10										—1.58	—3.59**	
11											—3.12**	
	65 and Over											
Area												
1	—2.94**	— .46	— .92	—2.94**	— .90	—1.06	— .46	.20	2.17*	3.84**	5.50**	
2		2.32*	2.18*	— .05	1.49	1.85	2.50*	2.91**	3.76**	6.77**	8.06**	
3			— .39	—2.33*	— .48	— .55	.03	.63	2.40*	4.15**	5.74**	
4				—2.20*	— .18	— .20	.45	1.06	2.70**	4.92**	6.47**	
5					1.51	1.87	2.51*	2.92**	3.77**	6.74**	8.03**	
6						.01	.52	1.03	2.60**	4.17**	5.67**	
7							.61	1.19	2.76**	4.88**	6.41**	
8								.63	2.43*	4.32**	5.93**	
9									2.00*	3.41**	5.06**	
10										.14	1.49	
11											2.03*	

**Table 12. T-tests for differences between all possible pairs of means for years and State Economic Areas, adjusted for the effect of years, for the population 15 to 64 years of age (Model 3).**

Variable	Calculated t Values												
	Year		Area										
	2	3	2	3	4	5	6	7	8	9	10	11	12
Year													
1	17.77**	31.22**											
2		11.72**											
Area													
1			3.40**	3.33**	2.37*	5.03**	3.29**	3.52**	7.36**	3.01**	2.40*	1.26	— 4.84**
2				.29	—1.11	1.81	.64	.32	4.45**	.08	.66	—1.78	— 7.73**
3					—1.27	1.31	.35	.01	3.70**	— .18	.48	—1.88	— 7.43**
4						2.90**	1.49	1.36	5.49**	1.02	1.20	— .84	— 6.92**
5							— .76	—1.39	2.68**	—1.46	— .23	—3.29**	— 8.98**
6								— .36	2.87**	— .51	.24	—2.02*	— 7.11**
7									3.90**	— .20	.49	—1.97*	— 7.71**
8										—3.75**	—1.62	—5.52**	—10.79**
9											.59	—1.64	— 7.09**
10												—1.61	— 5.31**
11													—5.62**

## **Population in the Productive Ages**

Geographic location explains a significant amount of the variation in the relative distribution of productive-age adults in Oklahoma population centers (Table 7). Persons 15 to 64 have increased in Area 12, for it has both numerically and proportionally more individuals in that age group than each of the other areas (Tables 4, 11, and 12). Area 8 has proportionately the fewest persons of working age of all state economic areas; Area 5 the next fewest; and Area 10 the next fewest.

Areas 1 and 11 also have relatively high percentages of persons in the active working ages (Table 4). After adjusting for the influence of year (Model 3), Areas 11, 12, and 1 have proportionally more persons 15 to 64 years of age than each of the other areas (Table 12). Area 11 has a significantly larger percentage than Areas 5, 6, 7, and 8.

## **Population in the Retirement Ages**

For the years 1940, 1950, and 1960 combined, the relative distribution of elderly persons varies considerably among the economic areas, ranging from 9 percent in Area 12 and 11 percent in Areas 10 and 11 to 16 percent in Areas 2 and 5 (Tables 4 and 8). The metropolitan areas have smaller proportionate numbers of old people than each of the nonmetropolitan areas; Areas 2 and 5 have larger proportions than the rest of the areas.

A graph of the percentages of people of retirement age for each of the three years shows clearly that the population centers of various areas have contrasting trends which intersect, resulting in a significant year-region interaction (Figure 8 and Table 8). Aged persons have become relatively more plentiful in all places in each of the geographic areas from 1940 to 1960. Areas 2 and 5 have had comparatively high proportions throughout the period. Population centers in Areas 6 and 9 have experienced large proportionate increases in their aged residents; both have suffered large population losses and projections of future numbers of inhabitants suggest a continuation of the trends [16, 17].

Increases in the relative number of persons in the retirement ages has not been as rapid in the population centers located in the metropolitan as those in the nonmetropolitan areas between 1940 and 1960 (Figure 8). Areas 10 (Lawton SMSA) and 12 (Oklahoma City SMSA) actually had a decline in the proportionate number of senior citizens during 1950 to 1960. Ostensibly, increases in the military personnel stationed at Fort Sill pared the proportionate size of the population 65

Table 13. T-tests for differences between all possible pairs of means for years and size-of-place, adjusted for the effect of years (Model 4a).

Variable	Calculated t Values										
	Year		Size								
	2	3	2	3	4	5	6	7	8	9	
15 to 64											
Year											
1	18.75**	30.90**									
2		12.10**									
Size											
1			—2.58**								
2				—4.44**							
3				—2.37*	—6.48**						
4					—4.14**	—7.99**					
5					—1.44	—3.00**	—9.93**				
6						—1.66	—7.96**	—11.26**			
7							—4.18**	—7.15**	—6.46**		
8								—6.12**	—4.87**	—5.83**	
								—4.30**	—5.81**	—5.33**	
								—3.58**	—4.87**	—4.59**	
								—2.28*	—4.30**	—4.14**	
								—1.05	—3.56**	—3.56**	
								—2.14*	—2.51*	—2.51*	
									—1.50	—1.50	
										— .52	
65 and Over											
Year											
1	—18.16**	—29.15**									
2		—10.94**									
Size											
1			1.96*								
2				3.42**							
3				1.84	5.75**						
4					3.89**	6.91**					
5					1.68	2.90**	8.55**				
6						1.33	6.99**	9.64**			
7							4.87**	5.67**			
8							3.45**	5.17**			
							2.21*	4.42**			
								3.77**			
								3.18**			
								1.80			
									2.07*		
										1.51	
											.55



Table 15. T-tests for differences between all pairs of means for region, adjusted for the effect of year, government, and size for the population under 15 years and 15 to 64 years of age (Model 5).

Variable	Calculated t Values										
	Area										
	2	3	4	5	6	7	8	9	10	11	12
	Under 15										
Area											
1	1.34	—1.96*	— .57	— .01	—1.68	—1.58	—5.87**	—2.92**	—4.58**	—4.52**	—3.14**
2		—3.38**	—2.06*	—1.45	—2.87**	—3.06**	—7.67**	—4.32**	—5.39**	—6.02**	—4.30**
3			1.55	2.06*	.04	.47	—3.65**	—1.00	—3.42**	—2.62**	—1.49
4				.59	—1.30	—1.11	—5.71**	—2.58**	—4.37**	—4.32**	—2.83**
5					—1.75	—1.67	—6.20**	—3.06**	—4.66**	—4.79**	—3.25**
6						.37	—3.23**	— .93	—3.29**	—1.97*	—1.41
7							—4.36**	—1.51	—3.74**	—3.18**	—1.93
8								2.46*	—1.28	.72	1.44
9									—2.76**	—1.57	— .61
10										1.77	2.21*
11											.78
	15 to 64										
Area											
1	3.47**	4.08**	3.19**	5.82**	4.60**	4.26**	8.40**	3.80**	2.73**	2.73**	—2.75**
2		1.03	— .30	2.61**	1.95	1.04	5.48**	.84	.96	— .22	—5.57**
3			—1.29	1.30	.99	— .11	3.93**	— .12	.38	—1.09	—6.01**
4				2.90**	2.18*	1.32	5.75**	1.10	1.10	.03	—5.36**
5					— .08	—1.44	2.94**	—1.38	— .33	—2.42*	—7.44**
6						—1.07	2.41*	—1.07	— .26	—1.59	—6.38**
7							4.21**	— .08	.41	—1.09	—6.16**
8								—3.91**	—1.85	—4.85**	—9.41**
9									.45	— .94	—5.75**
10										—1.04	—4.33**
11											—4.98**





years of age and beyond in Comanche County between 1950 and 1960, and suburbanization in the fringe areas of Oklahoma City contracted the relative size of the aged population in Area 12.

Recapitulating, region accounts for a significant portion of the variations in relative numbers of children, adults, and elderly persons living in the population centers of the State in 1940, 1950, and 1960. In fact, region overshadows the other independent variables in accounting for variations in the proportionate number of children in the towns and cities of the State. The region-government interaction shows that, generally, western county seats have proportionately more children than eastern county seats. The year-region interaction reveals that, on the whole, children have declined in the population centers of the non-metropolitan areas but have increased in those of the metropolitan areas; aged persons have become proportionately more numerous in places in each area between 1940 and 1960, but the trends of places in the economic areas have divergent slopes which intersect.

The significant regional differences remain, even after adjusting the population centers for the influence of year, county governmental function, and size of place (see the results for Model 5 in Tables 6, 7, and 8). In fact, the t-tests show that of the 66 possible pairs of means among the 12 economic areas, the following numbers of pairs of means differ significantly after adjustment:  $Y_1$ , 38;  $Y_2$ , 33;  $Y_3$ , 42 (Tables 15 and 16).

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## Oklahoma's Wealth in Agriculture

Agriculture is Oklahoma's number one industry. It has more capital invested and employs more people than any other industry in the state. Farms and ranches alone represent a capital investment of four billion dollars—three billion in land and buildings, one-half billion in machinery and one-half billion in livestock.

Farm income currently amounts to more than \$700,000,000 annually. The value added by manufacture of farm products adds another \$130,000,000 annually.

Some 175,000 Oklahomans manage and operate its nearly 100,000 farms and ranches. Another 14,000 workers are required to keep farmers supplied with production items. Approximately 300,000 full-time employees are engaged by the firms that market and process Oklahoma farm products.