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ABSTRACT

Utilizing Louisiana State Bureau of Vital Statistics and U.S. Census data, longevity trends with residence comparisons were examined for all persons 65 or over who died between 1962 and 1974, who were Louisiana residents at the time of death, and whose death was not due to external violence. Every third year in the 12 year period was arbitrarily selected as a sample year. Altogether, 14,420 deaths of persons over 65 were recorded in 1962; 15,528 in 1965; 16,207 in 1968; 16,018 in 1971; and 16,893 in 1974. The Comparative Mortality Index (CMI), the General Index of Longevity (GIL), and the Level of Longevity of the Elderly (LLE) were constructed for analytical purposes. The findings were: the CMI indicated that for Louisiana aged as a group and for urban Louisiana aged, mortality rates decreased during the period 1962-74; for the rural Louisiana aged the CMI showed a decreasing pattern from 1962 to 1971 with a slight increase between 1971-74; the GIL definitely showed that Louisianians were living longer and that rural Louisianians had a substantial longevity advantage between 1962-74 over urban Louisianians; the LLE showed an increase in longevity for Louisianians over 60 years old as a whole and especially for rural Louisianians, while urban Louisianians over 60 were surviving at a decreasing rate, according to their LLE. (JC)

rec May 1977

LONGEVITY TRENDS IN THE OLDER POPULATION OF LOUISIANA WITH RESIDENCE COMPARISONS*

by

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Introduction

With the coming of the Industrial Revolution and advances in science, there has been a general improvement in socio-economic status and particularly in levels of living in the Western world. In the United States, one of the most obvious changes accompanying this trend has been the dramatic increase in the numbers of older people. Because of this fact, it is significant and relevant to study the aged population phenomenon.

Because of the rapid social and economic development and accompanying technological change of recent years, it is inevitable that there should be some impact on life expectancy. Urbanization, following on the heels of industrialization, obviously introduced many factors which could affect length of life, some positively, others negatively.[1] Studies have in fact, been initiated in several countries with a view to ascertaining the influence of environmental and social factors on the life-span of humans (Ciuca, 1967; Blender, 1967). However, to date there is very little reliable environmental factors, such as residence. The research reported in this paper is an attempt to determine trends or patterns in longevity for the total population of Louisiana over a 12 year period 1962-1974 and to compare differentials between the rural and urban components of the population.

Research Procedures

Population. For this report longevity is defined as the age at death. The population universe for the study except for residence comparisons consisted of all those persons 65 or over who died in Louisiana between 1962 and 1974, who were Louisiana resident at time of death, and whose death was not due to external violence (i.e., accident, suicide, and homicide). Every third year in the 12 year period of study was arbitrarily selected as a sample year. Altogether, 14,420 deaths of persons over 65 were recorded in 1962, 15,528 in 1965, 16,207 in 1968, 16,018 in 1971, and 16,893 in 1974. For residence comparisons, the population universe consisted of all those persons 60 or over who lived in Louisiana between 1962 and 1974.

Individuals were divided into three groups as follows: those persons who died between age 65 to 72, defined as having a low level of longevity; those persons who died between the ages of 73 and 80, defined as having a medium level of longevity; and those persons who died after reaching 81 years of age defined as having a high level of longevity.

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[1] George Braclay (1958:159) points out that urban conditions have created a less favorable environment for man.

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Research Setting. The setting for the present study was the State of Louisiana. The source of data were the Certificate of Deaths on file with the Louisiana State Bureau of Vital Statistics and U.S. Census. The period covered by the study was 1962 to 1974.

Analytical Methodology. Three different indices were constructed for analytical purposes. They were: the Comparative Mortality Index (CMI), the General Index of Longevity (GIL), and the Level of Longevity of the Elderly (LLE).

(1) The Comparative Mortality Index (CMI): The CMI is a measure of mortality, usually employed to indicate changes over time in the overall mortality experience of a population. A shifting pattern of population weights is used to overcome the problems of prolonged use of a single standard age distribution (Shryock and Siegel, 1973:423). The formula for the CMI is:

$$CMI = \frac{\Sigma w_a m_a}{\Sigma w_a M_a}$$

where M_a represents the age-specific death rates in the standard or initial year, m_a represents the age-specific death rates in the later years, and

$$w_a = \frac{1}{2}\left(\frac{P_a}{P} + \frac{P_a}{p}\right)$$

where P_a and P are populations of the standard or initial year and p_a and p are populations of later years.

The formula calls for taking a ratio of the weighted sum of age-specific death rates in each year to the similarly weighted sum of age-specific death rates of the initial year. The weights are the average of a) the proportion of the total population in the age group in the initial year and b) the corresponding proportion in each later year. Since a different weighting pattern is used for each year, the CMI's for the various years are not fully comparable with one another. The weighting pattern is so similar from year to year, however, that the ratios of CMI's may be considered satisfactory measures of relative mortality over short periods.

Along with the calculation of CMI (see Appendix A), an interpolation technique is used for inferring intermediate values in a given series of data and an extrapolation technique is used for inferring values that go beyond the given series of data. The formula used is the Waring Formula, also known as the Lagrange Formula or the Waring-Lagrange Formula (Shryock and Siegel, 1973:681-684). This formula is used to derive the multipliers to interpolate for the f(x) value corresponding to a given x value. The results obtained in the present study are presented in Appendix A.

(2) The General Index of Longevity (GIL):-The GIL is the percentage of persons 80 or 90 years old and over in the total population. The source of data for the General Index of Longevity is the age distributions for census population data (Sachuk, 1970:262-263). Interpolation and extrapolation techniques are used for establishing values that cannot be obtained from the census data (see Appendix B). The GIL was calculated for the total Louisiana, the rural Louisiana, and the urban Louisiana population for each of the sample years.

(3) The Level of Longevity of Elderly (LLE):-The last index computed, the Level of Longevity of Elderly, (Sachuk 1970:262-263) - utilizes census data as criteria of longevity. The LLE differs from the General Index of Longevity in that the proportion of persons 80 (or 90) years and over is related not to the total population but to the number of elderly, i.e., persons 60 years and over. This criterion depends on the birthrate and migration to a lessor degree than does the General Index of Longevity (see Appendix B). The LLE is presented in terms of percentages.

Findings

A look at Table 1 shows that the CMI for the total Louisiana aged, in 1965 (.99) reflects a slightly lower level of mortality than in 1962. However, the decline between 1962 and 1974 of mortality is quite noticeable--the 1974 level is only 84 percent of the level in 1962. The same trend existed for urbanites in the Louisiana population. For this residence group the CMI for 1965 was (.98), for 1968 it was (.92), for 1971 it was (.83), and for 1974 it was (.80). When attention is focused on the rural segment of the Louisiana population, the pattern is the same to 1971 when it is reversed to an extent. The above findings can be interpreted as follows: This pattern holds for both urban and rural dwellers although, there appears to be a slight reversal of the trend between 1971 and 1974 in rural areas. This may simply be the manifestations of a "leading effect" since ruralites were found to have greater longivity than urbanites once they reached age 65. The picture which emerges can be seen in Figure 1.

Table 1. Comparative Mortality Index (CMI) by residence, Louisiana Aged, Sample Years, 1962-1974.

Population	1962	1965	1968	1971	1974
Louisiana	1.00	.99	.96	.86	.84
Rural	1.00	.99	.98	.92	.93
Urban	1.00	.98	.92	.83	.80

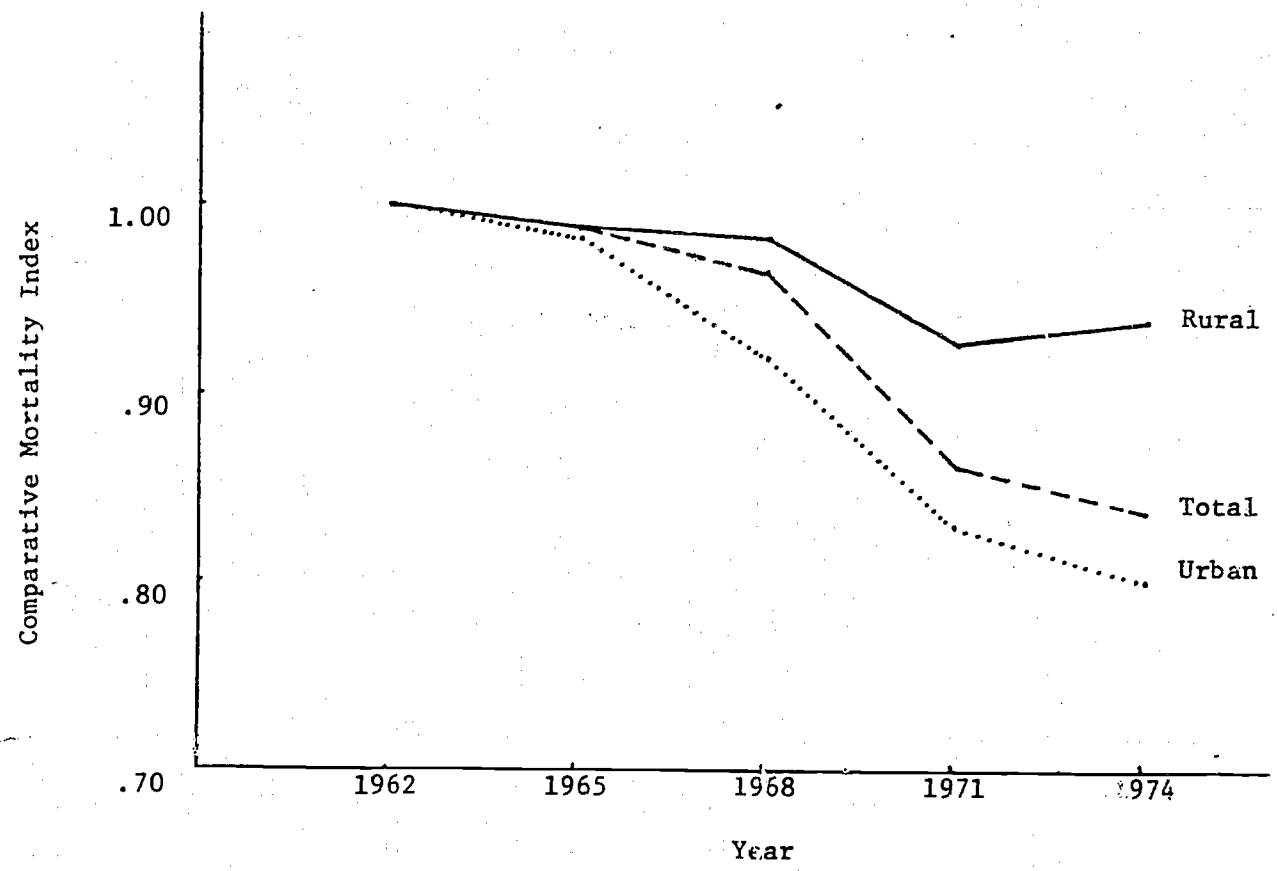

Figure 1. Comparative Mortality Index (CMI), by Residence: Louisiana, 1962-1974.

The pattern which emerged when the GIL was computed is shown in Table 2. For the total Louisiana population this index gradually increased during the study period--from 1.15 percent in 1962 to 1.6 percent in 1974. Similarly, the longevity of Louisiana rural people as measured on this index increased steadily from 1.42 percent in 1962 to 2.77 percent in 1974. The GIL increased among the urban dwellers of the state from 0.99 percent in 1962 to 1.02 percent in 1974, but there was a slight decrease in the index during the period 1962-1968. Comparatively speaking, we can see that longevity for rural Louisianians increased by 1.35 percent, but by only .45 percent for all Louisianians and a mere .03 percent for urban Louisianians. It is thus possible to conclude that the rural people of the State tended increase their life-spans more than did the urban people during this 12 year period. Figure 2 shows how these trends appear in graphic format.

Table 2. General Index of Longevity (GIL) by Residence, Louisiana Population, for Sample Years, 1962-74

Population	1962	1965	1968	1971	1974
Louisiana	1.15	1.25	1.35	1.49	1.60
Rural	1.42	1.77	2.11	2.44	2.77
Urban	0.99	0.97	0.97	1.01	1.02

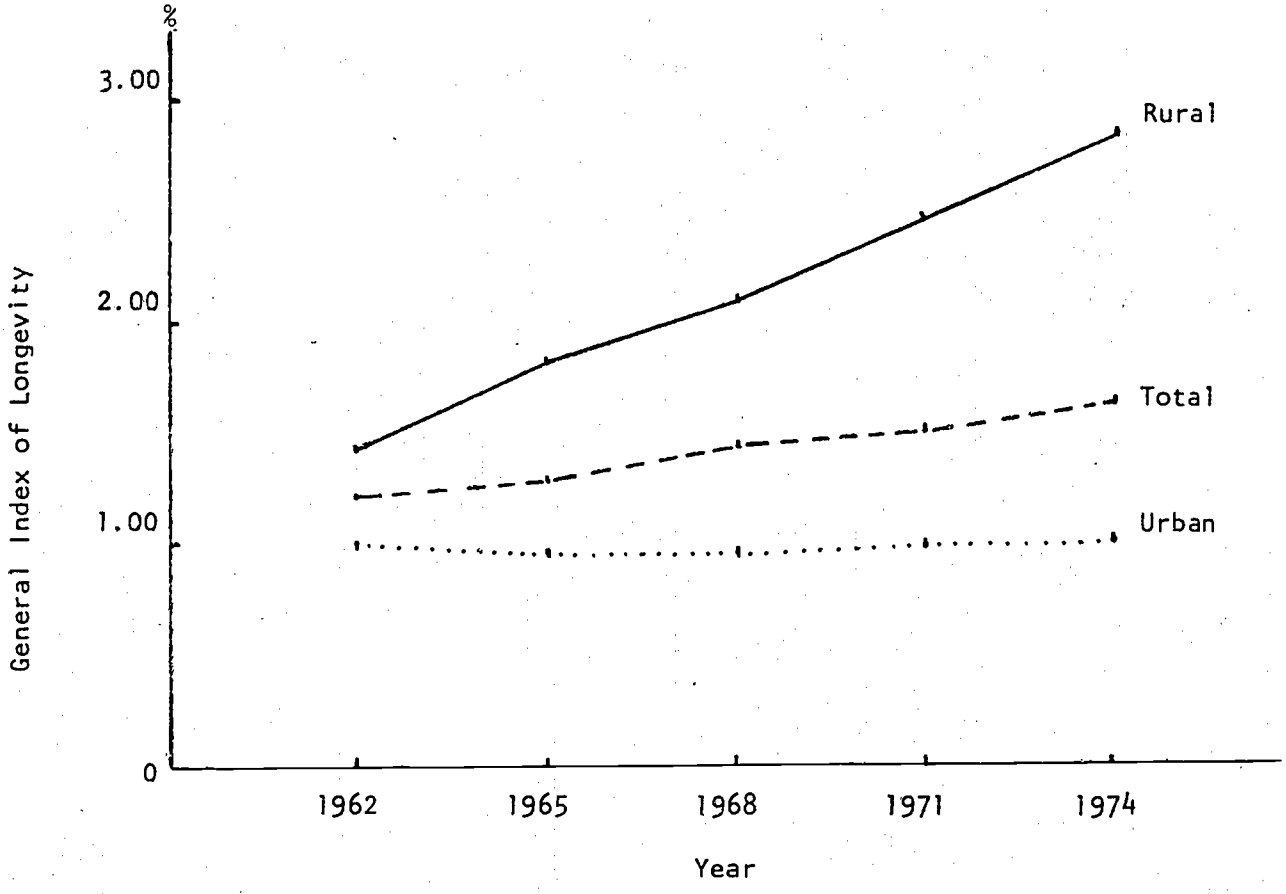

Figure 2.-General Index of Longevity (GIL), by Residence: Louisiana, 1962-1974.

Table 3 shows the LLE for the total Louisiana population, the rural Louisiana population, and the urban Louisiana population. For the total population, the LLE increases gradually from 1962 (10.56 percent) to 1974 (12.26 percent). This indicates and increasing percentage of older persons among the total Louisiana aged, and indicates that generally the elderly are living longer than in previous years. For the rural Louisiana elderly, the LLE shows a more substantial increase through the years, 12.46 percent in 1962, to 20.80 percent in 1974. The total increase of the LLE for the rural aged is 8.34 percent, compared to only 1.7 percent increase for the total Louisiana aged population. A different pattern exists for the urban Louisiana aged population. The LLE actually shifts to a decreasing trend, from 9.42 percent in 1962 to 7.9 percent in 1974, with a total decrease of 1.52 percent. This suggests that the urban aged, in comparison with the rural aged, may have a shorter life-span than in the past. Figure 3 illustrates the LLE trends computed.

Table 3. Level of Longevity of Elderly (LLE) by Residence, Louisiana Population on Sample Years, 1962-74.

Population	1962	1965	1968	1971	1974
Louisiana	10.56	11.09	11.54	11.92	12.26
Rural	12.46	14.85	17.02	18.99	20.80
Urban	9.42	8.93	8.53	8.19	7.90

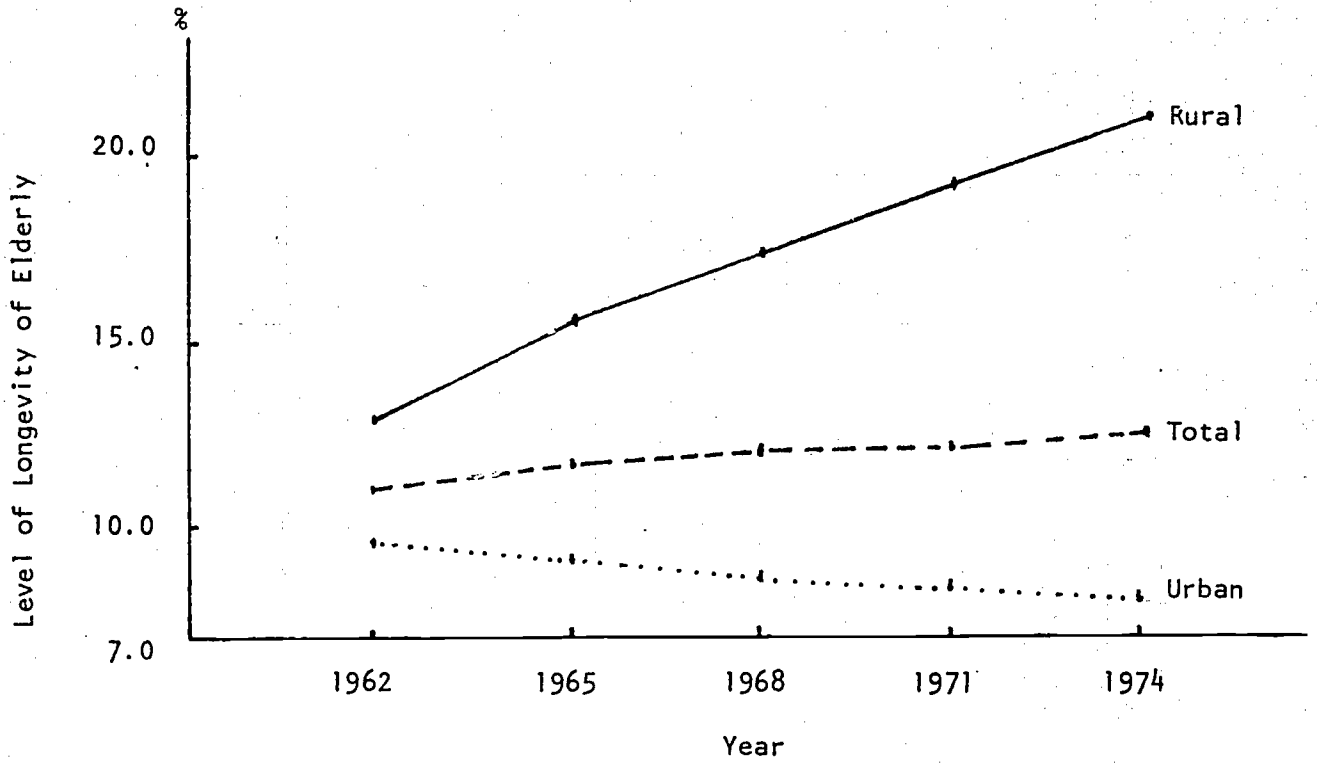

Figure 3.-Level of Longevity of Elderly (LLE), by Residence: Louisiana, 1962-1974.

Summary and Conclusion

In summary, the Comparative Mortality Index (CMI) indicated that for Louisiana aged as a group and for urban Louisiana aged, mortality rates decreased during the period 1962-1974. For the rural Louisiana aged the CMI also showed a decreasing pattern from 1962 to 1971, but slight increase from 1971 to 1974. The nature of the CMI precludes direct comparison of the three different curves, but generally speaking, it is possible to state that the mortality rate of Louisianians 65 years of age and over has decreased.

The General Index of Longevity (GIL) definitely shows that Louisianians are tending to live longer, and that rural Louisianians had a substantial longevity advantage through the period 1962-1974 over urban Louisianians.

The Level of Longevity of Elderly (LLE) was used to determine whether there was a pattern or trend in the longevity of Louisianians. This measure showed an increase in longevity for Louisianians over 60 years old as a whole and especially for rural Louisianians in this age group. By contrast, urban Louisianians over 60 are surviving at a decreasing rate, according to their LLE.

From the above findings, it is clear that longevity is increasing in Louisiana. It is also evident that residence had a pronounced effect on longevity. This finding is in keeping with previous studies and highlights the importance of life environment for longevity.

Youmans (1967:113-115), after studying the disengagement of elderly men in three areas of life: economic, family relationships, and leisure-time activities, concluded that decline in economic status occurred more sharply with age in urban than in rural areas. He concluded that urban men evidenced somewhat stronger feelings of rejection by their families than did rural men, a finding which probably reflects the greater prevalence of family cohesion in rural areas. Rural males also revealed stronger informal attachments to other persons than family members in the community than did urban males.

In a study of counties with extreme death rates, and to the degree of persistence of extreme rates through time and space, and in different age-sex groups, Sauer and Parke (1974:258-264) found that men in low-rate counties tended to be more closely associated with agriculture than their counterparts in the high-rate counties. Herbert Sauer (1976:41) also found that rural areas generally tended to have lower death rates in middle-age populations than did urban areas, although this difference seemed to be decreasing.

The implication of the above seems to be that rural life and living does not place as great a stress on people, and consequently increases their life expectancy. This findings if corroborated will have considerable significance for programs for the aged and for societal planning.

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APPENDIX A

CALCULATION OF THE COMPARATIVE MORTALITY INDEX

Table A1. Population and Number of Deaths by Age Classes, Louisiana for Selected Years

Population	1960	1962	1965	1968	1970	1971	1974
Total	3257022[1]	3375807[5]	3539903[5]	3674849[6]	3643180[1]	3693000[3]	3764000[8]
65 Years and Over	238205[2]	251905[10]	272456[10]	274084[6]	306707[4]	315830[10]	337000[1]
Number of Deaths 65 Years and Over	13351[9]	14420	15527	16207	17963[7]	16018	16893
65 Years to 72 Years	136887[2]	143568[10]	153589[10]	163608[10]	170289[4]	173631[10]	183652[10]
Number of Deaths 65 Years to 72 Years	5015[10]	5126	5550	5632	5568[10]	5528	5789
73 Years to 80 Years	72331[2]	76165[10]	81915[10]	87664[10]	91498[4]	93419[10]	99169[10]
Number of Deaths 73 Years to 80 Years	4719[10]	4889	5186	5483	5324[10]	5440	5541
81 Years and Over	28987[2]	32174[10]	36954[10]	41733[10]	44920[4]	46516[10]	51296[10]
Number of Deaths 81 Years and Over	4114[10]	4405	4792	5092	5177[10]	5050	5563

Sources:

1. U.S. Bureau of Census, Census of Population: A Century of Population Growth; Statistical Abstract of the United States; 1970 Census of Population, Advance Report PC(V2)-1.
2. U.S. Bureau of Census, U.S. Census of Population: 1960, Detailed Characteristics, Louisiana, Final Report PC(1)-20D.
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5. Louisiana State Board of Health, 1965 Statistical Report of the Division of Public Health Statistics. p.4.
6. Louisiana State Department of Health, 1968 Statistical Report of Bureau of Vital Statistics, p.4.
7. Louisiana State Department of Health, 1970 Statistical Report of the Bureau of Vital Statistics. p.62.
8. U.S. Bureau of Census. 1974 Current Population Reports. Series P-26, No.97.
9. Louisiana State Board of Health, 1960 Public Health Statistics. Series No.1-4.
10. H. S. Shryock, J. S. Siegel, et. al., The Methods and Materials of Demography, Vol.2 (Washington, D.C.: U.S. Government Printing Office, 1973). pp.683-684. Computed from the Waring Formula (Lagrange Formula):

$$f(x) = f(a)\frac{(x-b)}{(a-b)} + f(b)\frac{(x-a)}{(b-a)}$$

11. P. W. Ryan, The State of the State in 1976: An Economic and Social Report to the Governor (Louisiana: State Planning Offic 1976), p.3.

Table A2. Population and Number of Deaths by Age Classes, Rural Louisiana for Selected Years

Population	1960	1962	1965	1968	1970	1971	1974
65 Years and Over	92750[1]	95708[3]	100146[3]	104584[3]	107542[2]	109019[3]	113456[3]
65 Years to 72 Years	52397[1]	53556[3]	55293[3]	57029[3]	58188[2]	58760[3]	60608[3]
Number of Deaths 65 Years to 72 Years	1948[3]	2011	2111	2171	2263[3]	2155	2389
73 Years to 80 Years	28669[1]	29489[3]	30719[3]	31948[3]	32768[2]	33181[3]	34412[3]
Number of Deaths 73 Years to 80 Years	2004[3]	2033	2071	2273	2150[3]	2239	2208
81 Years and Over	11684[1]	12664[3]	14135[3]	15606[3]	16586[2]	17074[3]	18543[3]
Number of Deaths 81 Years and Over	1851[3]	1907	2066	2118	2130[3]	2083	2241

Sources:

1. U.S. Bureau of Census, U.S. Census of Population: 1960, Detailed Characteristics, Louisiana, Final Report PC(1)-20D (Washington, D.C.: U.S. Government Printing Office, 1962), p.248.
2. U.S. Bureau of Census, Census of Population: 1970, Vol.1, Detailed Characteristics, Louisiana, Part 20-D (Washington, D.C.: U.S. Government Printing Office, 1973), pp.415-416.
3. H. S. Shryock, J. S. Siegel, et. al., The Methods and Materials of Demography, Vol.2 (Washington, D.C.: U.S. Government Printing Office, 1973), pp.683-684. Computed from the Waring Formula (Lagrange Formula):

$$f(x) = f(a)\ \frac{(x-b)}{(a-b)} + f(b)\frac{(x-a)}{(b-a)}$$

Table A3. Population and Number of Deaths by Age Classes, Urban Louisiana for Selected Years

Population	1960	1962	1965	1968	1970	1971	1974
65 Years and Over	145455[1]	156197[3]	172311[3]	188423[3]	199165[2]	204535[3]	220647[3]
65 Years to 72 Years	84490[1]	89308[3]	96536[3]	103763[3]	108581[2]	110989[3]	118216[3]
Number of Deaths 65 Years to 72 Years	3068[3]	3115	3439	3461	3305[3]	3373	3400
73 Years to 80 Years	43662[1]	46961[3]	51908[3]	56865[3]	60154[2]	61804[3]	66752[3]
Number of Deaths 73 Years to 80 Years	2776[3]	2856	3115	3210	3174[3]	3201	3333
81 Years and Over	17303[1]	19928[3]	23867[3]	27805[3]	30430[2]	31742[3]	35679[3]
Number of Deaths 81 Years and Over	2360[3]	2498	2726	2974	3048[3]	2967	3322

Sources:

1. U.S. Bureau of Census, U.S. Census of Population: 1960, Detailed Characteristics, Louisiana, Final Report PC(1)-20D (Washington, D.C.: U.S. Government Printing Office, 1962), p.248.
2. U.S. Bureau of Census, Census of Population: 1970, Vol.1, Detailed Characteristics, Louisiana, Part 20-D (Washington, D.C.: U.S. Government Printing Office, 1973), pp.415-416.
3. H. S. Shryock, J. S. Siegel, et. al., The Methods and Materials of Demography, Vol.2 (Washington D.C.: U.S. Government Printing Office, 1973), pp.683-684. Computed from the Waring Formula (Lagrange Formula):

$$f(x) = f(a)\frac{(x-b)}{(a-b)} + f(b)\frac{(x-a)}{(b-a)}$$

Table A4. Computation of the Comparative Mortality Index (CMI), for Louisianians: 1962, 1965, 1968, 1971, and 1974

Age	Population					Weights				Death Rates				
	1962 $\frac{P_a}{P}$	1965 $\frac{p_a}{p}$	1968 $\frac{p_a}{p}$	1971 $\frac{p_a}{p}$	1974 $\frac{p_a}{p}$	1965	1968 $w_a = \frac{1}{2}\left(\frac{P_a}{P} + \frac{p_a}{p}\right)$	1971	1974	1962 M_a	1965 m_a	1968 m_a	1971 m_a	1974 m_a
65-72	.5699	.5863	.5969	.5600	.5740	.5781	.5834	.5650	.5720	35.7	36.1	34.4	31.8	31.5
73-80	.3024	.3127	.3198	.3013	.3099	.3076	.3111	.3019	.3062	64.2	63.3	62.5	58.2	55.9
81 and Over	.1277	.1411	.1523	.1500	.1603	.1344	.1400	.1389	.1440	139.9	129.7	122.0	108.6	108.4
(1) $\Sigma(w_a \times m_a)$										57.24	57.77	56.59	50.62	50.75
(2) $\Sigma(w_a \times M_a)$										57.24	58.39	59.21	58.98	60.23
CMI = (1) ÷ (2)										1.00	.99	.96	.86	.84

Source: H. S. Shryock, J. S. Siegel, et. al., The Methods and Materials of Demography, Vol.2 (Washington, D.C.: U.S. Gov. Printing Office, 1973), p.423.

Table A5. Computation of the Comparative Mortality Index (CMI), for Rural Louisianians: 1962, 1965, 1968, 1971, and 1974

Age	Population					Weights				Death Rates				
	1962	1965	1968	1971	1974	1965	1968	1971	1974	1962	1965	1968	1971	1974
65-72	.5596	.5521	.5453	.5390	.5333	.5559	.5525	.5493	.5465	37.5	38.2	38.1	36.7	39.5
73-80	.3081	.3067	.3055	.3044	.3033	.3074	.3068	.3063	.3057	68.9	67.4	71.1	67.5	64.2
81 and Over	.1323	.1411	.1492	.1566	.1634	.1367	.1408	.1445	.1479	150.6	146.2	135.7	122.0	120.9
(1) $\Sigma(w_a \times m_a)$										62.14	61.95	61.97	58.47	59.10
(2) $\Sigma(w_a \times M_a)$										62.14	62.62	63.07	63.46	63.82
CMI= (1) ÷ (2)										1.00	.99	.98	.92	.93

Table A6. Computation of the Comparative Mortality Index (CMI), for Urban Louisianians: 1962, 1965 1968, 1971, and 1974

Age	Population Weights					Death Rates				
	1962	1965	1968	1971	1974	1962	1965	1968	1971	1974
5-72	.5718	.5602	.5507	.5426	.5358	34.9	35.6	33.4	30.4	28.8
3-80	.3007	.3012	.3018	.3022	.3025	60.8	60.0	56.4	51.8	49.9
1 and Over	.1276	.1385	.1476	.1552	.1617	125.4	114.2	107.0	93.5	93.1
1) $\Sigma(w_a \times m_a)$						54.24	53.41	50.46	45.88	44.47
2) $\Sigma(w_a \times M_a)$						54.24	54.74	55.17	55.51	55.82
MI= (1) ÷ (2)						1.00	.98	.92	.83	.80

APPENDIX B

CALCULATION OF THE GENERAL INDEX OF LONGEVITY AND THE LEVEL OF LONGEVITY OF ELDERLY

Table B1.-Population of Louisiana by age classes, for Selected Years

Population	1960	1962	1965	1968	1970	1971	1974
Total	3257022[1]	3375807[3]	3539903[3]	3674849[3]	3643180[2]	3693000[3]	3764000[3]
80 & Over	35098[1]	38702[3]	44110[3]	49516[3]	53121[2]	54920[3]	60326[3]
60 & Over	345617[1]	366520[3]	397874[3]	429228[3]	450131[2]	460584[3]	491938[3]

Table B2.-Population of Rural Louisiana, by age classes for Selected Years

Population	1960	1962	1965	1968	1970	1971	1974
Total	1196416[1]	1204198[3]	1215871[3]	1227543[3]	1235325[2]	1239217[3]	1250890[3]
80 & Over	14223[1]	17133[3]	21498[3]	25863[3]	28773[2]	30228[3]	34593[3]
60 & Over	132706[1]	137512[3]	144721[3]	151930[3]	156736[2]	159139[3]	166348[3]

Table B3-Population of Urban Louisiana by age classes for Selected Years

Population	1960	1962	1965	1968	1970	1971	1974
Total	2060606[1]	2171609[3]	2324032[3]	2447306[3]	2407855[2]	2453783[3]	2513110[3]
80 & Over	20875[1]	21569[3]	22612[3]	23653[3]	24348[2]	24692[3]	25733[3]
60 & Over	212911[1]	229008[3]	253153[3]	277298[3]	293395[2]	301445[3]	325590[3]

Source:

1-U.S. Bureau of the Census, U.S. Census of Population: 1960, Detailed Characteristics, Louisiana, Final Report PC(1)-20D, p.248.

2-U.S. Bureau of the Census, Census of Population: 1970, Vol. 1, Detailed Characteristics, Louisiana, Part 20-D, 1973, pp.415-416.

3-Shryock, H.S., J.S. Siegel, et. al., The Methods and Materials of Demography, Vol. 2, (U.S. Bureau of the Census, 1973), pp.683-684. Computed from the Waring Formula (Lagrange Formula):

$$f(x) = f(a)\frac{(x-b)}{(a-b)} + f(b)\frac{(x-a)}{(b-a)}$$

Table B4.-Indices of Longevity

	Formula	
General Index of Longevity (GIL)	$\frac{N_{80=}(N_{90+})}{\text{N-all ages}}$	(in %)
Level of Longevity of Elderly (LLE)	$\frac{N_{80+}(N_{90+})}{N_{60}}$	(in %)

Source: Sachuk, N. N., "Population Longevity Study: Sources and Indices", Journal of Gerontology 25 (No.3, 1970), pp. 262-264.