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The Distribution of Life Expectancy Within U.S. States

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ABSTRACT

Previous studies on life expectancy by U.S. county have found large differences among counties in life expectancy at birth for both males and females. Various determinants of these differences have been identified, including economic, education, demographic, social, geographic, climatic, and environmental factors. This preliminary study uses life expectancy by county to calculate the relative inequality in life expectancy within states. Gini coefficients for life expectancy are calculated for each state, and separate Gini coefficients are calculated for men and for women. The Gini coefficients are obtained from county average life expectancies by weighting each county life expectancy by county population, then calculating the Gini coefficient from the resulting Lorenz curve. A model of the determinants of within-state life expectancy inequality is identified and tested using regression analysis. Dependent variables in the model include Gini coefficients for various economic, demographic, and social factors calculated from county data in the same manner as are the life-expectancy Gini coefficients. Economic variables in the model include Gini coefficients for income and poverty level. Demographic variables include Gini coefficients for percent of county population white, percent urban, and age. Social variables include Gini coefficients for educational attainment. Environmental variables include pollution incides. Separate regressions are also run for male and female life expectancy Gini coefficients. It is found that relative inequality in population

life expectancy within states increases with relative inequality within states in poverty rate, urbanization, percent white, air pollution and age. Relative inequality in female life expectancy within states increases with relative inequality in poverty rate, percent white, and air pollution; and relative inequality in male life expectancy within states increases with relative inequality in poverty rate, education, and percent white.

THE DISTRIBUTION OF LIFE EXPECTANCY WITHIN U.S. STATES[1]

Previous studies on life expectancy in the U.S. have tended to look at national or state-level data, or have consisted of relative small samples of individuals. Most of these studies have concentrated on demographic, geographic, or behavioral factors, and have used simple correlation or comparison, simple regression, or small-model multiple regression techniques. An exception is the recent study by Israelsen, Israelsen, and Israelsen [2001] that examined the determinants of life expectancies for males and females in U.S. counties, using a large regression model including a economic, demographic, social, education, climatic, geographic, and environmental variables. That study found that the percentage of population on rural farms, the percentage of married households, the level of education, the percentage speaking a language other than English at home, the percentage foreign-born, and county elevation have significant positive effects on life expectancy for both males and females; while the percentage of population below the poverty level, violent crime rate, population density, unemployment rate, and latitude have significant negative effects. Income has a nonlinear effect on life expectancy, whereas household size has a positive impact on average male life expectancy, but a negative impact on average female life expectancy. The percentage of the population reporting Northern European ancestry increases mean county life expectancy, while the percentage black or Native American reduces life expectancy. State effects were also identified, including the Mason-Dixon Effect, the Cowboy Effect, and–for females–the Rust Belt Effect.

The current study takes a preliminary look at the determinants of the distribution of life expectancy within U.S. states. The study uses life expectancy by county to calculate the relative

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inequality in life expectancy within states. Gini coefficients for life expectancy are calculated for each state, and separate Gini coefficients are calculated for men and for women. The Gini coefficients are obtained from county average life expectancies by weighting each county life expectancy by county population, then calculating the Gini coefficient from the resulting Lorenz curve. A model of the determinants of within-state life expectancy inequality is identified and tested using regression analysis. Dependent variables in the model include Gini coefficients for various economic, demographic, and social factors calculated from county data in the same manner as are the life-expectancy Gini coefficients. Economic variables in the model include Gini coefficients for income and poverty level. Demographic variables include Gini coefficients for percent of county population white, percent urban, and age. Social variables include Gini coefficients for educational attainment. Environmental variables include pollution incides. Separate regressions are also run for male and female life expectancy Gini coefficients. It is found that relative inequality in population life expectancy within states increases with relative inequality within states in poverty rate, urbanization, percent white, air pollution and age. Relative inequality in female life expectancy within states increases with relative inequality in poverty rate, percent white, and air pollution; and relative inequality in male life expectancy within states increases with relative inequality in poverty rate, education, and percent white.

I. State Life Expectancy Gini Coefficients

Table 1 lists the life expectancy Gini coefficients calculated from mean county life expectancies for the entire population and for males and females separately. Alaska is not included in the study because it does not have counties. For the entire population, the Gini coefficients range from a low of .021 for Utah and New Hampshire to a high of .033 for Mississippi, Maryland, and Georgia, a relative difference of about 50 percent. For female life expectancy, the range is from .002 for several states to .017 in Maryland, a relative difference of 850 percent. For male life expectancy, the state Gini coefficients range from a low of .003 in several states to a high of .028 in Maryland, a relative difference of over 900 percent. The main purpose of this study is to identify the determinants of these large differences in the distribution of life expectancy by state.

II. The Model

A regression model for the distribution of life expectancy by state is shown below. The model was tested for the population life expectancy Gini coefficients, the female Gini coefficients, and the male Gini coefficients as dependent variables.

<u>The Regression Model</u>

G = G(INCOME, POVERTY, URBAN, WHITE, EDUC1, POLL_PM10, AGE), where

G = life expectancy Gini coefficient by state

INCOME = income Gini coefficient by state

POVERTY = percent in poverty Gini coefficient by state

URBAN = percent urban Gini coefficient by state

WHITE = percent white Gini coefficient by state

EDUC1 = percent over age 25 with at least 12 years' education Gini coefficient by state

POLL_PM10 = 10-micron level pollution Gini coefficient by state

AGE = age Gini coefficient by state

Table 1. Life Expectancy Gini Coefficients by State

STATE	CODE	LifexpGM	LifexpGF	LifexpG
Alabama	AL	0.011	0.007	0.031
Arizona	AZ	0.006	0.004	0.026
Arkansas	AR	0.013	0.010	0.031
California	CA	0.012	0.006	0.026
Colorado	CO	0.015	0.007	0.025
Connecticut	CT	0.005	0.002	0.023
Delaware	DE	0.003	0.002	0.023
Florida	FL	0.011	0.008	0.029
Georgia	GA	0.019	0.011	0.033
Hawaii	HI	0.003	0.002	0.022
Idaho	ID	0.007	0.004	0.023
Illinois	IL	0.016	0.009	0.029
Indiana	IN	0.011	0.007	0.027
Iowa	IA	0.009	0.007	0.026
Kansas	KS	0.014	0.009	0.027
Kentucky	KY	0.010	0.006	0.029
Louisiana	LA	0.015	0.008	0.032
Maine	ME	0.005	0.003	0.023
Maryland	MD	0.028	0.017	0.033
Massachusetts	MA	0.010	0.005	0.025
Michigan	MI	0.019	0.011	0.029
Minnesota	MN	0.007	0.006	0.024
Mississippi	MS	0.013	0.009	0.033
Missouri	MO	0.018	0.010	0.031
Montana	MT	0.011	0.007	0.027
Nebraska	NE	0.008	0.007	0.026
Nevada	NV	0.004	0.002	0.024
New Hampshire	NH	0.003	0.002	0.021
New Jersey	NJ	0.018	0.011	0.028
New Mexico	NM	0.012	0.006	0.028
New York	NY	0.022	0.009	0.032
North Carolina	NC	0.014	0.008	0.031
North Dakota	ND	0.007	0.004	0.026
Ohio	OH	0.008	0.005	0.025
Oklahoma	OK	0.012	0.006	0.028
Oregon	OR	0.012	0.007	0.025
Pennsylvania	PA	0.018	0.011	0.029
Rhode Island	RI	0.007	0.002	0.024
South Carolina	SC	0.014	0.009	0.032
South Dakota	SD	0.016	0.011	0.032
Tennessee	TN	0.010	0.008	0.030
Texas	TX	0.011	0.007	0.029
Utah	UT	0.009	0.004	0.021
Vermont	VT	0.004	0.003	0.023
Virginia	VA	0.023	0.012	0.031
Washington	WA	0.007	0.004	0.023
West Virginia	WV	0.012	0.007	0.029
Wisconsin	WI	0.012	0.007	0.025
Wyoming	WY	0.007	0.005	0.024

III. Results

Table 2 show regression results for the population, female, and male life expectancy Gini coefficient models.

Table 2. Regression results for population, female, and male models

Life Expectancy Gini Coefficients for Total Population:
The REG Procedure Model: MODEL1

Dependent Variable: LifexpG

Number of Observations Read	49
Number of Observations Used	49

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	0.000547	7.82E-05	61.12	<.0001
Error	41	5.24E-05	1.28E-06		
Corrected Total	48	0.0006			

Root MSE	0.00113	R-Square	0.9125
Dependent Mean	0.02709	Adj R-Sq	0.8976
Coeff Var	4.17501		

Parameter Estimates

Variable	Signif.	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept		0.0067	0.00395	1.7	0.0971
INCOME	***	0.0316	0.01021	3.1	0.0035
POVERTY	**	0.00745	0.00356	2.09	0.0427
URBAN	***	0.00714	0.00245	2.91	0.0058
WHITE	***	0.05158	0.00653	7.9	<.0001
EDUC1	**	-0.02206	0.01023	-2.16	0.037
POLL_PM10	***	0.00754	0.00244	3.09	0.0036
AGE	**	0.03168	0.01536	2.06	0.0455

Significance: * = .10
** = .05
*** = .01

Table 2. Continued

Life Expectancy Gini Coefficients for Female Population:
The REG Procedure Model: MODEL1

Dependent Variable: LifexpGF

Number of Observations Read	49
Number of Observations Used	49

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	0.000417	5.96E-05	39.86	<.0001
Error	41	6.13E-05	1.49E-06		
Corrected Total	48	0.000478			

Root MSE	0.00122	R-Square	0.8719
Dependent Mean	0.00675	Adj R-Sq	0.85
Coeff Var	18.1066		

Parameter Estimates

Variable	Signif.	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept		0.00626	0.00427	1.47	0.1504
INCOME	**	-0.02256	0.01103	-2.04	0.0474
POVERTY	***	0.01756	0.00385	4.56	<.0001
URBAN		-0.00094	0.00265	-0.36	0.7238
WHITE	***	0.03946	0.00706	5.59	<.0001
EDUC1	*	0.01868	0.01105	1.69	0.0987
POLL_PM10	***	0.00614	0.00263	2.33	0.0248
AGE		0.01162	0.0166	0.7	0.488

Significance:
* = .10
** = .05
*** = .01

Table 2. Continued

Life Expectancy Gini Coefficients for Male Population:
The REG Procedure Model: MODEL1

Dependent Variable: LifexpGM

Number of Observations Read	49
Number of Observations Used	49

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	0.00128	0.000183	48.91	<.0001
Error	41	0.000154	3.74E-06		
Corrected Total	48	0.00144			

Root MSE	0.00194	R-Square	0.893
Dependent Mean	0.01138	Adj R-Sq	0.8748
Coeff Var	17.0028		

Parameter Estimates

Variable	Signif.	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept		0.000161	0.00676	0.02	0.9811
INCOME		-0.00751	0.01747	-0.43	0.6697
POVERTY	***	0.0429	0.0061	7.03	<.0001
URBAN		-0.00373	0.0042	-0.89	0.3791
WHITE	***	0.05441	0.01118	4.87	<.0001
EDUC1	**	0.03691	0.0175	2.11	0.0411
POLL_PM10		0.00621	0.00417	1.49	0.1443
AGE		-0.03636	0.02629	-1.38	0.174

Significance:

*	= .10
**	= .05
***	= .01

The regression results can be summarized as follows:

1. Relative inequality in life expectancy within states increases with relative inequality within states in poverty rate, urbanization, percent white, air pollution, and age.
2. Relative inequality in female life expectancy within states increases with relative inequality in poverty rate, percent white, and air pollution.
3. Relative inequality in male life expectancy within states increases with relative inequality in poverty rate, education, and percent white.
4. Multicollinearity between the Gini coefficients for income and education makes it difficult to determine the independent effects of relative inequality in income and in education on relative inequality in life expectancy within states.
5. Environmental factors are statistically significant determinants of relative inequality in female life expectancy within states, but not for relative inequality in male life expectancy. This result is consistent with earlier studies on the determinants of life expectancy in U.S. counties.

References

Israelsen, L. Dwight, Ryan D. Israelsen, and Karl E. Israelsen. Determinants of Life Expectancies in U.S. Counties. Economic Research Institute Study Paper #2001-17, June 2001 (62 pages).