SS-AAEA Journal of Agricultural Economics
Econometric Analysis of Childhood Poverty in Georgia
By Virginia L. Allison

Abstract

Childhood poverty is one of the greatest threats to America's youth. It threatens their future educational and economic opportunities. The goal of this research is to determine what social, educational, and economic factors are associated with childhood poverty in Georgia. Data were collected and analyzed to investigate factors associated with child poverty for all 159 counties in the state. The results indicate that the teen birth rate, percent of single parent households, access to healthy food, percent uninsured, illiteracy rate, percent of the population with a bachelor's degree, rural residence, and percent of grandparents raising grandchildren were associated with higher childhood poverty rates at the county level. Factors associated with lower child poverty rates included median household income, the percentage of households raising their own children, population percentage not proficient in English, and the percent unemployed.

Acknowledgements: I would like to thank my advisors, mentors, and professors, Dr. Jeffrey Dorfman, Dr. Glenn C. W. Ames, Dr. Wesley Burnett, and Dr. Warren Kriesel. Your encouragement and support are appreciated more than you know.

Almost 15 million, or 21 percent of all U.S. children, live in poverty (Aratani 2010). Living in poverty makes it difficult for children to focus in school and contributes to physical, social, mental, and behavioral problems (NCCP 2010). Poverty is one of the greatest threats to children's well being because it significantly influences potential future opportunities that may not always be possible to regain. For example, malnutrition in children can affect their mental and physical development in the long run, ultimately putting them at a disadvantage for the rest of their lives (FRAC 2008).

Currently, 20 percent of Georgia's children live in poverty (Georgia County Health Rankings). Over the past 30 years the number of children living in poverty has increased while the percentage of children living in poverty has slightly declined. The standards indicating the poverty level are set by the U.S. Census Bureau; for a family of four, any combined household income at or below $22,050 is living below the federal poverty level. According to UNICEF, "children living in poverty are those who experience deprivation of the material, spiritual and emotional resources needed to survive, develop and thrive, leaving them unable to enjoy their rights, achieve their full potential or participate as full and equal members of society." Children in poverty in Georgia clearly fit UNICEF's definition.

Exploring the determinants of child poverty benefits not only those living in that condition, but other Georgia residents, taxpayers, and policy makers as well. Georgia policy makers must monitor social indicators to determine what policies may be appropriate to address the situation and contribute to solutions. States are competing to attract new businesses while companies look at the social conditions in a given area before deciding to locate in a given area. High childhood poverty rates are generally associated with low income families, and with a poorly educated population. This realization may turn businesses away for fear of not finding adequate skilled labor.

Childhood poverty also affects students' performance in school; poor academic achievement between elementary and high school years is directly related to success in college

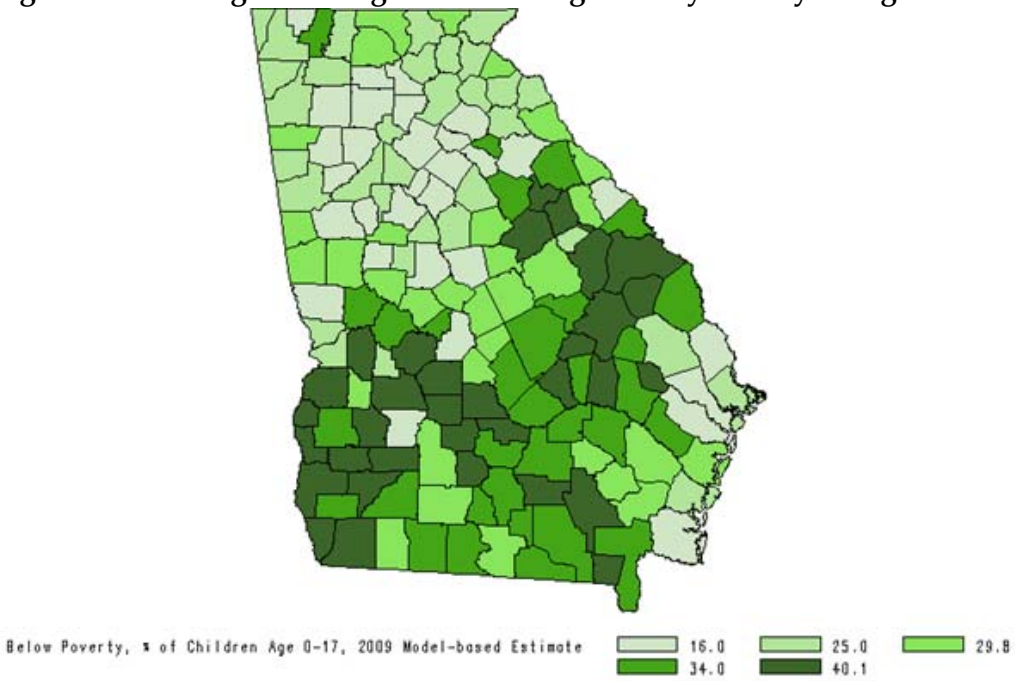
and whether students even decide to attend a college or not. Increased childhood poverty in counties implies that more social services are demanded from government and nonprofit organizations to address these problems.

The objective of this research project is to determine what factors are associated with childhood poverty in Georgia. The factors associated with poverty are broken into three categorical measures of income, education, and social structure. Understanding the variables that have a positive association with child poverty will help policy makers focus their efforts not on just the problem of poverty itself, but also on the factors that contribute to it, thus making an even greater impact on the reduction of childhood poverty.

Introduction to Childhood Poverty in Georgia

Georgia counties with the highest and lowest percentage of children living in poverty are Clay (50 percent) and Forsyth (six percent), respectively. Clay County is located in southwest rural Georgia where economic opportunities are mostly limited to farming and forestry. In general counties with the higher poverty rates are located in rural counties south of the metro Atlanta region. This region of the state has been associated with persistent poverty in the last five decades (Figure 1).

Figure 1. Percentage of Georgia Children Age 0-17 by County living Below Poverty



Another issue associated with childhood poverty is the lack of access to healthy food. According to Dr. Monica Taylor-Jones, access to healthy foods and liquor store density rates are important factors in determining people's health status (2011). Poorer neighborhoods have a higher density of liquor stores and are often in areas identified as food deserts (Bitler 2011). The

Center for Disease Control and Prevention (CDC) defines food deserts as "areas that lack access to affordable fruits, vegetables, whole grains, low-fat milk, and other foods that make up the full range of a healthy diet." Grocery stores are often located on the outskirts of towns which makes it difficult for downtown and lower income neighborhoods to buy nutritious food, especially if residents do not have reliable transportation. The same applies to rural communities as well. If food is available in these areas it is from fast food restaurants or convenience stores, neither of which are the healthiest nor most economical option (Taylor-Jones 2011). Liquor store density rates by county are not included in this model due to a variety of laws around the state that allow some counties to prohibit the sale of alcohol completely, limit the sale to only beer and wine in super markets, or like most counties, give residents complete access to liquor and package stores. Georgia counties are small given that there are only 159 in the state, which allows residents to easily commute between counties. Liquor store accessibility is not straightforwardly measured for the state and therefore may not provide a representative relationship to poverty.

The recent recession may have contributed to more childhood poverty in Georgia due to higher rates of unemployment and declining wage rates in the state. Policy makers must be prepared to provide more services to address the situation. As mentioned before, poverty affects children's ability to focus, therefore schools will need more resources to implement tutoring and mentoring programs if poor children are expected to learn. Data on factors associated with poverty in Georgia's 159 counties is found in Table 1.

Table 1. Simple Statistics for Variables, 159 Counties in Georgia, 2009

Variable	Mean	Std Dev	Variable	Mean	Std Dev
Poverty (%)	26.70	8.66	Rurality (0, 1)	0.44	0.50
Teen Birth Rate	66.33	21.34	Income ($)	41,186	11,400
Uninsured (%)	22.58	4.01	Illiteracy Rate	19.56	5.38
Unemployed (%)	10.45	2.18	Race (% white)	69.56	16.85
Single parent (%)	37.70	11.77	Education[1] (%)	8.92	4.82
Food access	63.97	27.77	Grandparent (%)	52.06	9.33
English prof (%)	3.002	3.33	Own Children[2] (%)	47.29	5.15

Model Specifications and Methodology

This model represents the determinants of childhood poverty at the county level in Georgia, the dependent variable. The independent variables are all measured at the county level. They are median household income in 2008 (income), percent unemployment ages 16 and older who are looking for work in 2009 (unemployed), teen birth rate per 1,000 females ages 15

[1] Percent of population in county with a bachelor's degree

[2] Percent of total families with own children in household less than 18 years old

to 19 in 2007 (teen birth), percent of the population not proficient in English 2009 (English prof), percent of the population younger than 65 years old who are uninsured in 2000 (uninsured), percent of total families with own children in household less than 18 years old 2000 (children), percent of single parent households 2009 (single parent), access to healthy foods calculated by zip codes in the county with healthy food outlets 2008[3] (food access), and county illiteracy rates in 2003 (illiteracy) (County Health Rankings). Variables collected from the Georgia Statistics System include: percent of the population with a bachelor's degree in 2000 (education), percentage of white people in the county 2009 (race), and percentage of grandparents raising children in 2000 (grandparents). Rurality was assigned as the dummy variable where metro or urban counties according to the Economic Research Service 2003 Continuum labeled one through three were given a value of one; non-metro or rural counties labeled four through nine were assigned the dummy value of zero. The predicted hypotheses for each of the variables with respect to county percentage of child poverty are shown in Table 2.

Table 2. Hypothetical Relationship between Childhood Poverty and Socioeconomic Indicators

Variable	Hypothesis	Variable	Hypothesis
Teen pregnancy rate	Positive	Income	Negative
Percent Uninsured	Positive	Illiteracy Rate	Positive
Percent Unemployed	Positive	Race	Negative
Single Parent Household	Positive	Education	Negative
Access to Healthy Food	Negative	Grandparent raising children	Positive
Percent not Proficient in English	Positive	Own Children in house	Positive
Rurality	Positive		

By estimating the four functional forms—linear-linear, log-log, log-linear, and linear-log—different elements of each regression were examined including the R-squared values, p-values, and the expected signs for the parameter estimates (or beta coefficients, β). From the analysis, the log-log functional form was chosen. This was determined by running a model specification search through the Statistical Analysis Software (SAS). This search determines the correct functional form in order to arrange the independent and dependent variables. The R-squared term, sum of squared residuals, is an important factor in determining the correct econometric model because it measures the "goodness of fit" for fitting the ordinary least squares regression line; it quantifies the dependent variable's variation explained by the model.

[3] Healthy Food Outlets include grocery stores with more than four employees and available produce stands and farmers markets (Census Zip Code Business Patterns).

The regression equation for this econometric model in log-log form is:

(1)

$$ln(\hat{y})=\beta_1 ln(\text{teen births})+\beta_2 ln(\text{uninsured})+\beta_3 ln(\text{unemployed}) +\beta_4\ ln(\text{single parent household})+\beta_5\ ln(\text{healthy food})+\beta_6\ ln(\text{English Proficiency}) +\ \beta_7(\text{Rurality})+\beta_8\ ln(\text{income})+\beta_9\ ln(\text{illiteracy})+\beta_{10}\ ln(\text{race}) +\beta_{11} ln(\text{education})+\beta_{12}\ ln(\text{grandparent})+\beta_{13} ln(\text{children in house})$$

Table 3. Parameter Estimates for Coefficient Values for Childhood Poverty in Georgia

Parameter Estimate	Coefficient Value	Standard Error	Parameter Estimate	Coefficient Value	Standard Error
β_1	0.159	0.038	β_8	-0.951	0.106
β_2	0.236	0.073	β_9	0.121	0.076
β_3	0.022	0.061	β_{10}	-0.169	0.062
β_4	0.129	0.051	β_{11}	0.052	0.039
β_5	0.007	0.023	β_{12}	0.231	0.067
β_6	-0.025	0.012	β_{13}	-0.409	0.105
β_7 [4]	0.060	0.025	R^2: 0.9215	N = 159	Condition Index: 698

Empirical Results

After choosing the functional form, diagnostic tests were performed on the model. When using cross sectional data it is important to test for heteroscedasticity, the violation of an ordinary least squares assumption that variance of the error is constant across the data. The plotting of least squares residuals is an informal way of detecting heteroscedasticity. After examining the plotted squared residuals for each variable, the heteroscedasticity seems to be the most related to the teen birth rate. The second step in detecting heteroscedasticity is to perform the Goldfeld-Quandt Test by dividing the data into two groups. The variances of the two groups are divided to calculate the Goldfeld-Quandt F-statistic:

(2) Goldfeld-Quandt F-statistic = $\frac{\hat{\sigma}^2_{high}}{\hat{\sigma}^2_{low}} = \frac{0.01406}{0.01291} = 1.089078$

This F-statistic is compared to the F-critical value for the model and the null hypothesis is rejected. It can be concluded that there is heteroscedasticity in the results. To correct for this problem, the teen birth rate variable was weighted, producing a Generalized Least Squares model. Table 4 shows the parameter estimates for the weighted model. Though the R-squared

[4] Note that the rurality dummy variable is not in log form. Since the log of zero cannot be computed, the dummy variable must be in linear form.

value is slightly lower than the original OLS model at 0.901, as to be expected, the GLS parameter estimates are the coefficients used in the calculations when testing the model.

Table 4. GLS Coefficient Estimates for childhood poverty in Georgia

Variable (log form)	Beta	Parameter Estimate	Standard Error	T-stat	P-values
Teen Pregnancy Rate	β_1	0.1424	0.04209	3.38	0.0009
Percent Uninsured	β_2	0.2014	0.07395	2.72	0.0073
Percent Unemployed	β_3	-0.0009	0.05865	-0.02	0.9879
Single Parent Household	β_4	0.11084	0.05028	2.20	0.0291
Access to Healthy Food	β_5	0.00398	0.02183	0.18	0.8556
Percent not Proficient in English	β_6	-0.0237	0.0115	-2.06	0.041
Rurality	β_7	0.06158	0.02457	2.51	0.0133
Income	β_8	-1.0202	0.11016	-9.26	<0.0001
Illiteracy Rate	β_9	0.08174	0.07723	1.06	0.2917
Race	β_{10}	-0.1662	0.0597	-2.78	0.0061
Education	β_{11}	0.06805	0.03898	1.75	0.083
Grandparent Raising children	β_{12}	0.22916	0.06499	3.53	0.0006
Children in House	β_{13}	-0.3883	0.11141	-3.49	0.0007

After testing for heteroscedasticity and collinearity, the model was tested for misspecification by using the Ramsey Error Specification and Estimation Test (RESET). Testing for misspecification indicates if important variables were omitted from the model or if the wrong functional form was used. The RESET test requires two regressions: an unrestricted model including all variables and an additional important omitted variable ($y2$) and a restricted model, the original log-log functional form. To conduct the RESET test an F-test is used where the null hypothesis sets the restricted model equal to zero; if this hypothesis is supported the model does not have misspecification. In this model the calculated F-statistical value is 15.304 which is less than the critical F-value, therefore the null hypothesis is accepted and it can be concluded that the model does not have misspecification.

The last test to check the full significance of the model is an F-test. In an F-test the null hypothesis is the regression equation set equal to zero, and the alternative hypothesis says that at least one β is not equal to zero. In this model the statistical F-value is 96.56, much larger than the critical F-value, therefore at least one β does not equal zero. This allows the rejection of the null hypothesis, concluding the full model does have significant explanatory power.

Discussion of Results

Overall the results from the model were as expected with the exceptions of the parameter estimates for the percentage of people not proficient in English (β_6) and percentage of households with their own children less than 18 years (β_{13}). Theoretically it would be expected that as the percentage of people not proficient in English increases, meaning the smaller ratio of native to foreign born, the percentage of children in poverty would increase. This positive relationship is expected because proficiency in English is typically a determinant of how well people are able to find well paying jobs. Workers with poor English skill usually work labor intensive jobs at low pay. Possible explanations for the negative relationship found by the model include that foreign workers who do not have legal status are less likely to report information to statistical surveys and thus they may not be included in the data while those with legal status may be counted in the survey.

One of the significant variables included in the model is the teen birth rate per 1,000 females between the ages of 15 and 19. The t-test agreed with the hypothesis that as teen birth rate increases so does child poverty (Tomal). This can be attributed to the fact that many teens are not self-sufficient and dependents of their parents. Teen birth rates are higher in the less educated population, a positive relationship also supported by this model.

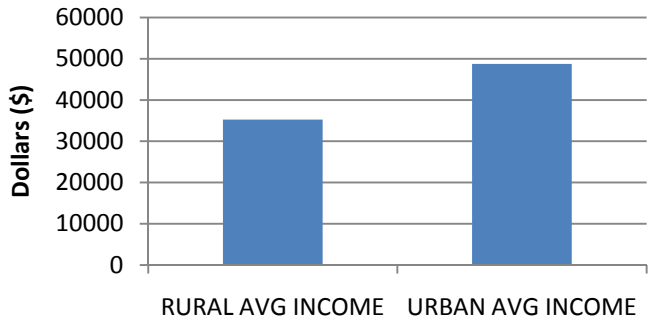
The variable describing the percentage of grandparents raising their grandchildren is another significant variable supported by economic theory. As hypothesized, as the percentage of grandparents raising grandchildren increases so does the percentage of children in poverty in the county. Since people do not typically anticipate raising their children's children, they do not have the financial means necessary to adequately support the family. Often, by the age of grand-parenthood, peoples' energy and health begin to decline resulting in lower incomes and increased child poverty.

The negative relationship between median household income and percentage of child poverty is evident from other data. The disparity between rural and urban incomes are evident from the data. Average urban incomes are $48,739, while rural incomes are $35,245--27.6 percent lower (Figure 2). Needless to say, as median household income for a county increased, the county childhood poverty rate decreases, hence the inverse relationship as expected.
The objective of this analysis was to investigate factors associated with childhood poverty at the county level in Georgia. The model included thirteen variables divided into social, educational, and economic categories which had been hypothesized to be associated with poverty in the literature. The four functional forms of the model were tested. After deciding on the log-log functional form, the full model was tested for heteroscedasticity, multicollinearity, misspecification and the overall full significance of the model.

The analysis of factors associated with childhood poverty in Georgia are complex, involving social issues, educational and economic achievement. The median household income and teen birth rate were found to be significant determinants of childhood poverty in Georgia. Therefore, programs that address teen pregnancies in Georgia will have a significant impact on the percentage of childhood poverty in the state. These factors need further in depth analyses to

ascertain which policy prescriptions may be suitable to address these multifaceted societal issues.

Figure 2. Rural and Urban Average Household Incomes in Georgia



References

Aratani, Yumiko, Michelle Chau, and Vanessa R. Wright. "Who are America's Poor Children?" March 2011. National Center for Children in Poverty. Web. 27 April 2011. http://www.nccp.org/publications/pdf/text_912.pdf

Bitler, Marianne, and Steven J. Haider. 2010. "An Economic View of Food Deserts in the United States." *Journal of Policy Analysis and Management* 30: 153-176.

"Childhood Under Threat ." 2004. UNICEF. Web. 5 April 2011.

National Center for Children in Poverty (NCCP). 2010. "Child Poverty." Web. 16 March 2011. http://www.nccp.org/topics/childpoverty.html

Cross Sectional Analysis. Georgia County Statistics System. 2011. Web. 17 April 2011. http://www.georgiastats.uga.edu/crossection.html

Ferriss, Abbott L. 2006. "Social Structure and Child Poverty." *Social Indicators Research*. 78: 453-472.

Food Research and Action Center. 2008. "Fresh from the Farm: Using Local Foods in Afterschool and Summer Nutrition Programs." Food Action and Research. Web. 14 April 2011. http://frac.org/newsite/wp-content/uploads/2009/09/produceguide.pdf

Georgia County Health Rankings. 2011. County Health Rankings. Web. 10 April 2011. http://www.countyhealthrankings.org/Georgia/downloads-and-links

Taylor-Jones, Monica. 2011. "Social Determinants of Health: Environmental, Social, and Policy Change." Unpublished lecture at the University of Georgia. Athens, Georgia. 17 April 2011.

Tomal, Annette. 1999. "Determinants of Teenage Birth Rates as an Unpooled Sample: Age Matters for Socioeconomic Predictors." *American Journal of Economics and Sociology* 58.1: 57-69.