

Family change and poverty in Appalachia

Daniel Lichter

Professor of Sociology
Department of Policy Analysis and Management
and
Department of Sociology
Cornell University

Lisa Cimbula

Department of Development Sociology
Cornell University

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Author correspondence

Daniel Lichter, Cornell University, 249 MVR Hall, Ithaca, NY 14853. E-mail: DTL28@cornell.edu. Lisa Cimbula, Cornell University, Department of Development Sociology, 133 Warren Hall, Ithaca, NY 14853. E-mail: LAC75@cornell.edu.

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Family Change and Poverty in Appalachia

Introduction

The current economic and political climate provides a vivid contrast with the circumstances of the 1990s, when the passage of the 1996 Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) ushered in welfare reform during a period of unprecedented economic expansion and job growth (Blank 2002; Ziliak 2009).¹ This legislation sought to “end the dependence of needy parents on government benefits by promoting job preparation, work, and marriage.” Among PRWORA’s goals were to reduce out-of-wedlock births and encourage the formation of two-parent families. For most states, much of the initial emphasis on self-sufficiency was placed on “work first” programs (i.e., moving poor single mothers into the labor force) rather than on marriage promotion (Blank 2002; Lichter and Jayakody 2002). However, with the 2006 reauthorizing legislation (i.e., Deficit Reduction Act of 2005), the federal government now provides 150 million dollars annually for healthy marriage initiatives and fatherhood programs. An explicit goal is to increase the share of children living with both biological parents in a “healthy” marriage. Indeed, a stable marriage is often viewed as a pathway from poverty and welfare dependency (Lichter, Graefe and Brown 2003; Roberts and Martin 2010).²

¹ On September 11, 2009, the U.S. Census Bureau announced that the official poverty rate was 13.2 percent in 2008, up significantly from 12.5 percent in 2007 (DeNavas-Walt, Proctor and Smith 2009). Indeed, poverty in America is once again on the rise, hitting an 11-year high in 2008. Nearly 40 million people are currently below the government poverty line. This figure is likely to increase when new figures are released next year for 2009, when the poverty rate will better reflect family incomes at the height of the current recession.

² For reviews, see Dion (2005), Burstein (2007), and Kane and Lichter (2006).

In historically-disadvantaged rural regions of persistent and deeply-entrenched poverty, such as Appalachia, the Mississippi Delta, and Indian Reservations of the Southwest and Dakotas, family decline is often viewed as *consequence* rather than a *cause* of poverty and welfare dependence. Indeed, a large literature has documented sizeable effects of employment and earnings on marriage and family formation nationally (e.g., Burstein 2007; Lichter, McLaughlin and Ribar 2002; Ellwood and Jencks 2004). To its critics, the recent emphasis on marriage promotion seemingly puts the cart (i.e., a healthy marriage) before the horse (i.e., stable employment at decent wages). For people living in Appalachia, especially its remote rural parts, the current national economic crisis is nothing new or unusual; high rates of poverty have persisted over many decades (McLaughlin et al. 1999). The family is alternatively viewed as a source of strength during economic hard times or as a casualty of employment dislocations and chronic poverty. Not surprisingly, regional economic development strategies – rather than marriage promotion – have dominated policy discussions in the region. Two-thirds of its counties have unemployment rates (2001-2003) that exceed the U.S. average, often by 50 percent or more (Appalachian Regional Commission 2006).³

The goal of this paper is to take stock of recent changes in family structure and to evaluate the implications for changing patterns of rural and regional poverty in Appalachia and the rest of the nation. What is the link, if any, between the so-called “retreat from marriage” and family poverty? Specifically, we estimate regression models that evaluate the effects of changing county characteristics, including female headship and marital status, on changing rates

³ The Department of Labor recently reported that the August 2009 unemployment rate was 9.7 percent, its highest level since June 1983. Equally disquieting is that this figure undoubtedly underestimates labor force hardship, e.g., it does not account for unemployed workers who have given up looking for work or who are working involuntarily at part-time jobs. The policies of the Obama Administration have understandably focused on job growth and the national economy (e.g., stimulus package, bail outs, and “cash for clunkers”) rather than on marriage promotion.

of poverty, while controlling for state and county fixed effects. We update recent studies (Werner and Badagliacco 2004; Mather 2004) of spatial variation in poverty rates over the post-2000 period. This is accomplished using county data from the 1990 and 2000 decennial censuses, and from the 2006 Social Explorer Estimates. We then simulate sub-regional poverty rates in the absence of post-1990 changes in family patterns and compare them with observed rates in 2006. Our analyses of new data provide an empirical benchmark for research on changing patterns of poverty in Appalachia vis-à-vis the rest of the nation.

Background

Marriage is on the public policy agenda – for obvious reasons (Nock 2005; Cherlin 2009). Fewer people are getting married and those who marry are marrying at later ages (Lichter and Qian 2004). Divorce rates have remained at historically high levels over the past two decades (Teachman 2002). And a recently-released report by the National Center for Health Statistics now indicates that nearly 40 percent of all U.S. births are to unmarried women (Hamilton et al. 2009). The number of out-of-wedlock births – 1.7 million – hit an all-time high in 2007. Moreover, cohabitation has transformed recent patterns of partnering and parenting in the United States (Cherlin 2009; Seltzer 2000). The share of women who have ever cohabited increased from 45 percent to 54 percent between 1995 and 2002 (Kennedy and Bumpass 2008). In 2008, roughly 25 percent of all families with children were headed by single mothers (U.S. Census Bureau 2009e). Only 62.7 percent of U.S. children lived with both biological parents (U.S. Census Bureau 2009c).⁴

⁴ There are large differences across racial and ethnic groups in marriage and fertility patterns. For example, only 38 percent of black children in 2008 lived with two co-residential parents. This is driven in large part by nonmarital fertility; roughly 70 percent of all births to black women are nonmarital (DeLeone, Lichter and Strawderman 2009).

Recent changes in family structure have placed upward demographic pressure on poverty rates nationally (Martin 2006; McLanahan and Percheski 2008) and represent a behavioral mechanism that sometimes links poverty between parental and filial generations (Ludwig and Mayer 2006; McLanahan 2009). Indeed, poverty rates among single-parent families (with children) are exceptionally high. In 2008, for example, the poverty rate was 28.7 percent among female-headed families, compared with 5.5 percent among married-couple families. The poverty rate for all children living with a single mother was 43.4 percent (U.S. Census Bureau 2009a). For black and Hispanic children (of any race) living with single mothers, the poverty rates were even higher – 51.9 percent each (U.S. Census Bureau 2009d).

The economic implications of changing family structure nationally have been enormous.⁵ One approach used to establish this statistical connection is “shift-share” analysis – a kind of demographic standardization in which the distributions of families or children across family types (e.g., single-parent and married-couple families) are held constant at some baseline year and the rates of poverty by family type are allowed to vary over time.⁶ The difference between observed and expected poverty rates presumably reveals the “effects” of changing family structure on poverty trends. For example, Eggebeen and Lichter (1991) showed that child poverty rates would have declined from 25.7 percent in 1960 to 13.8 percent in 1988 if the distribution of children across family types (e.g., married-couple families, etc.) had remained at 1960 levels. Instead, the observed poverty rate among children in 1988 was 20.8 percent. Changing family structure clearly slowed the decline in child poverty over this period. More

⁵ Much of the debate often centers on whether family change is mostly a cause or consequence of poverty. For example, previous research shows that divorce leads to declining income and increases in the likelihood of poverty, but other studies also show that economic circumstances are strongly linked to marital disruption. Poverty and family decline are self-reinforcing.

⁶ Other scholars have used regression standardization or decomposition methods (Duncan and Rodgers 1991; Ross, Danziger and Smolensky 1987) to accomplish similar heuristic objectives and highlight the implications of family change for poverty.

recently, Thomas and Sawhill (2002) reported that the 1998 child poverty rate would have been 4.4 percentage points lower than the observed rate if the percentage of children living in female-headed families had remained unchanged since 1970. Cancian and Reed (2009) similarly reported – for the entire U.S. population – that 1969-2006 changes in family structure increased the poverty rate by 3.1 percentage points. Like previous studies, they concluded that changes in family structure have been “poverty-increasing” over the past several decades.⁷

A second approach is based on estimating place-based or areal (e.g., county or state) models of poverty (Partridge and Rickman 2006; Gundersen and Ziliak 2004; Ferriss 2006; Rodgers and Payne 2007). The emphasis on places (over people or populations) reflects the fact that poverty varies substantially over geographic space and that poverty is often highly concentrated in inner-city neighborhoods and in isolated or remote rural communities or regions (such as Appalachia or the Delta). Ecological studies also reflect a particular public policy orientation – one that emphasizes the need for *place-based* public policies that target economically-distressed communities or regions rather than *person-based* policies (Crandall and Weber 2004; Partridge and Rickman 2006). The emphasis, however, is typically on the role of labor demand (e.g., unemployment, job growth, etc.) or labor supply (e.g., education) rather than on the changing marital status or family structure of poor neighborhoods, counties, or states.⁸

Partridge and Rickman (2006), for example, showed that state employment growth reduced the poverty rate by about one-half percent, while the industrial composition (e.g., high-wage employment share) also significantly affected state to state variation in poverty rates (see

⁷ At the same time, Cancian and Reed (2009) recognize that the implications of countervailing factors, including the rise in maternal employment, especially among women with children. Moreover, family change itself may be the result of economic downturns or economic restructuring (Lichter et al. 2002).

⁸ A well-established neighborhood effects literature suggests that family behaviors – single motherhood and out-of-wedlock childbearing – may be normative in some communities (e.g., suggesting a “culture of poverty”) and may even be contagious (Hogan and Kitagawa 1985; Crane 1991). That is, the probability of their occurrence among some person may be heightened in communities with high rates of family disruption, independent of individual economic resources or risk factors.

also Gundersen and Ziliak 2004). The teen birth rate, however, was unrelated to state poverty rates in models controlling for state and year fixed effects. No other family-related variables were considered. Data at the state level are useful for identifying state policy effects, but arguably mask considerable within-state heterogeneity, especially between populous metropolitan areas (which dominate estimates) and rural “pockets of poverty.” Lichter and McLaughlin (1995), using county data from the 1980 and 1990 census, found that spatial differences (e.g., rural-urban) and relative increases in county poverty were most strongly associated with women’s employment and headship status. Like Partridge and Rickman’s (2006) analyses of state poverty rates, Lichter and McLaughlin (1995) showed that each one-percent increase in female headship in nonmetro counties was associated with roughly a .5 percent increase in the poverty rate.

Other county-level analysis implicitly controls for the state policy environment by focusing analyses on counties within a specific state or for a small number of states. For example, a study of counties in Georgia (Ferriss 2006) showed that the percentage share of families headed by mothers was highly correlated ($r = .70$) with county-to-county variation in child poverty rates in 2000. The model, however, did not include county economic indicators (e.g., unemployment) that are commonly linked to both family structure and poverty. Slack et al. (2009) compared the effects of employment and human capital (e.g., schooling) on poverty rates of married-couple and single-parent families in counties of the Lower Mississippi Delta and the Texas Borderland. Regional poverty differences could largely be explained by differences in economic factors.

Both approaches – shift-share analyses and place-based regressions – have documented wide disparities in poverty across family types and strong statistical relationships between family

structure and poverty. But these studies have generally been limited to the U.S. population rather than to specific economically-depressed regions, such as Appalachia. Poverty rates in Appalachia have declined substantially over the past 40 years, even as family change has continued apace in the region. This is an issue to which we now turn.

Appalachian Families and Poverty

Appalachia has always been one of America's most distinctive cultural regions – one with a fascinating history and an uneasy relationship with the rest of the country. McLaughlin et al. (1999) note that “the image of Appalachia's people has been one of a fiercely independent lot, who were strongly committed to family, and ultimately to the land they called home.” In remote rural and mountainous parts of Appalachia, generation after generation of social and cultural isolation has bred both suspicion of outsiders (including the government) and elaborate support networks rooted in interdependent family kinship structures (e.g., through intermarriage), cross-cutting friendship networks, strong faith traditions (e.g., Protestant Evangelism), entrenched political and job patronage systems (that reinforce inequality), and a common cultural heritage (e.g., Scots-Irish) (Porter 1981; Billings 1974). Negative stereotypes of the region as a cultural backwater also abound – a region saturated with uneducated Hillbillies and feuding family clans (e.g., Hatfields and McCoys), prone to ill-temperament and violence, and dependent on illegal activities and a vibrant underground economy (e.g., moonshining).

Most ethnographic accounts of Appalachia nevertheless point to family strength in the face of severe economic hardship (Hennon and Photiadis 1979; Keefe 1971; Schwarzweller, Brown and Magalam 1971). Perhaps paradoxically, decades of economic hardship may have made Appalachian families more resilient to economic conditions, including economic

downturns, than families living outside of Appalachia. But family change clearly has not bypassed Appalachia (Mather 2004; Werner and Badagliacco 2004). Nor have Appalachian families and children been immune to the economic consequences of declining marriage, high rates of nonmarital fertility, and rising numbers of female-headed families, especially in rural areas (McLaughlin, Lichter and Matthews 1999; Newsome et al. 2008).

Regional differences (i.e., Appalachia vs. non-Appalachia) in family structure nevertheless are not responsible for the higher poverty rates found in Appalachia than elsewhere. In fact, a slightly smaller percentage of all households in Appalachia (6.2 percent in 2000) than in the non-Appalachian U.S. (7.3 percent) are headed by “at risk” single mothers. In Appalachia, the poverty rate of female-headed households with children was higher (39.8 percent) in Appalachia than in non-Appalachia (35.7 percent) in 1999 (Werner and Badagliacco 2004).⁹ Poverty rates were also higher among married-couple families with children (7.7 vs. 5.6 percent outside Appalachia). The similarities – both in poverty and family structure – between Appalachia and non-Appalachia are more apparent than are the differences.

The demographic backdrop of changes in family and poverty in Appalachia nevertheless makes it an interesting regional case study. For example, despite changing family patterns since the 1960s, poverty rates have declined much more rapidly in Appalachia than elsewhere in the country (Newsome et al. 2008). Compared with other regions of the country, an accelerated pattern of spatial inequality now characterizes Appalachia, especially between Central Appalachia (e.g., Eastern Kentucky and West Virginia) and the rest of Appalachia, and between its isolated rural areas and burgeoning metropolitan regions (e.g., Atlanta and its northern suburbs) (McLaughlin et al. 1999). Moreover, family decline and single parenthood are usually

⁹ It is noteworthy that poverty rates of female-headed families were substantially higher (well over 50 percent) in 1999 for two other historically-disadvantaged but disproportionately minority sub-regions – counties in the Texas Borderland (55.2 percent) and Lower Mississippi Delta (52.2 percent) (Slack et al. 2009).

seen as big city problems that prey disproportionately and perhaps most visibly on America's racial and ethnic minorities (Lichter, Qian and Crowley 2008). Unlike the nation as a whole (U.S. Census Bureau 2009b), as well as in the Lower Mississippi Delta (Slack et al. 2009), the majority of Appalachian families living in poverty are headed by married couples (Mather 2004). The highest poverty rates in Appalachia also are found in remote rural areas (e.g., the isolated hollows and backwaters of Eastern Kentucky and West Virginia), where the overwhelming share of population, including its poor families, are white. Appalachian poverty also is highly concentrated and persistent over time and generations (Lichter et al. 2008; Peters 2009; Brown and Warner 1991). The exodus of the "best and brightest" from rural areas to the cities has left the undereducated, unemployed, and poor behind and reinforced patterns of concentrated and persistent rural poverty.

Current Study

This paper examines the association between family change since 1990 and poverty in Appalachia and the rest of the continental United States. This study makes several specific contributions. First, it highlights the role of family changes in a rural region where most previous studies have emphasized job growth, industrial restructuring, and economic development. Our study shows that family change has countervailing effects that diminish the economic benefits of job growth and declining unemployment. Second, our comparative analyses of Appalachian and non-Appalachian counties highlight the role of changing family patterns in accounting for shifting poverty in Appalachia. Our results address questions of whether marriage promotion (or even reducing non-marital fertility) can be a panacea of sorts in a region that has faced chronic poverty for decades. Third, we use new data from Social Explorer (2006) which provides new estimates of family "effects" for the post-2000 period.

Previous studies of family change in the Appalachian region have been based on 2000 or earlier data from the decennial census. Our analyses thus serve a didactic purpose, one that highlights the benefits of Social Explorer data for local-area or regional analyses of poverty.

Data and Methods

Census Data

Data for our analyses come from the summary files of the 1990 and 2000 decennial Censuses, and from the 2006 estimates provided by *Social Explorer* (see <http://www.socialexplorer.com/pub/home/home.aspx>) and based on the 3-year aggregated American Community Survey (ACS) for 2005-2007. Our analyses of changes in poverty during the 1990s and 2000s are based on the county as the unit of analysis. We distinguish between counties in Appalachia and the rest of the 48 contiguous states. Appalachia, as defined by the Appalachian Regional Commission, includes all or parts of 13 states encompassing roughly 205,000-square-miles from southern New York to northern Mississippi (for full description of the region, see <http://www.arc.gov/index.do?nodeId=2>). See Figure 1 for a map of the region. The Appalachia region includes 428 of the nation's 3109 contiguous counties. The region is disproportionately rural (42 percent), compared with 20 percent rural for the United States overall.

(Figure 1 about here)

Measurement

Our analyses focus on spatial and temporal variation in family poverty rates. Poverty income levels for families (and the individuals who live in families) are defined by the Office of Management and Budget, and are based on family income reported by all family members in the

years preceding the 1990 and 2000 decennial censuses (i.e., 1989 and 1999 family income). In 1999, the average poverty threshold for a family of four was \$17,029. Poverty rates for 2005-2007 are based on family incomes over the previous 12 month period. The 2005-2007 ACS poverty estimates are based on income data collected in 2005, 2006, and 2007. The ACS is an on-going monthly survey, which in practice means that the income accounting period for a specific year, say, from the 2005 ACS, covers a different 12 month period for each family over a two-year period from January 2005 through December 2006. The same income accounting procedures for determining poverty rates also obtain for the 2006 and 2007 ACS data. The 3-year data provides larger sample sizes than annual data; this fact alone reduces sampling variability and problems of data suppression for small population groups in the least populated counties. The ACS family poverty rate in 2005-2007 was 9.8 percent, with a margin of error of ± 0.1 percent. This estimate is similar in size to the family poverty rates from the 2006, 2007, and 2008 March Current Population Surveys, which were 9.9 (2005), 9.8 (2006), and 10.8 percent (2007), respectively.

Our county-based models include several independent variables that measure different aspects of the demographic and economic climate of counties. These variables are largely identified from previous county-level studies (Lichter and McLaughlin 1995; Slack et al. 2009; Partridge and Rickman 2006). Each variable is defined in full in Table 1, with descriptive statistics provided in Tables A1 and A2 for the United States and Appalachia, respectively (see appendix). Based on previous studies, we expect that Appalachian poverty rates will be affected by the racial and ethnic composition (e.g., percent African American and percent Hispanic), age structure (e.g., percent under age 18 and percent age 65 and over), education (as an indicator of human capital), foreign born (e.g., economically-disadvantaged Appalachian counties typically

have low in-migration rates of non-poor people), and industrial structure (e.g., dependence on low-wage industries, including extractive industries). We expect that poverty also will be higher in nonmetro than metro areas (Crandall and Weber 2004; Lichter and McLaughlin 1995; Weber et al. 2005).

(Table 1 about here)

Given our objectives, our analyses also focus on several family-related variables, measured at the county level: percent of family households that are female-headed with children, percent never-married, and percent divorced or separated. These variables measure the effects of delayed marriage, high divorce rates, and out-of-wedlock childbearing, and are expected to be associated with higher rates of poverty. For each family variable, Table 2 provides descriptive results for Appalachian and non-Appalachian counties in 1990, 2000, and 2006.

(Table 2 about here)

Our preliminary analyses provide some useful insights about Appalachian/non-Appalachian differences in family structure (see Table 2). For example, they indicate lower percentages of female headship in Appalachia than in non-Appalachia in 1990, 2000, and 2006. Although female headship has increased over the post-1990 period in Appalachia, the increases proceeded at a slower pace than in areas outside of Appalachia.¹⁰ Regional differences in percentages of never-married and divorced were small. There is evidence of increasing shares of never-married and divorced both within Appalachia and outside of Appalachian counties over 1990-2006. For the entire period, Appalachia had slightly smaller shares of never-married but higher percentages of divorced. In general, these data indicate that family structure may be less strongly associated with poverty – or changing poverty – than in the rest of the nation.

¹⁰ This conclusion is reinforced with some additional analyses of state nonmarital fertility in 2006. Kentucky (35.3 percent) and West Virginia (37.9 percent) – the heart of Appalachia and part of its poorest subregion – had lower shares of nonmarital births (i.e., nonmarital births as a percentage of all births) than the nation overall (38.5 percent).

Modeling Approach

Although counties are our unit of analysis, county-level processes are influenced by higher government units, in this case, the state. Data of this type are amenable to estimation methods that correct for state heterogeneity bias: the confounding effects of unmeasured state-level variables that are county-invariant within a state and omitted from the regression model. Heterogeneity bias can affect the independence of the error term and the ordinary least squares coefficient estimates.¹¹ Our analysis implements fixed effects modeling to deal with the issue of state heterogeneity.

Models of cross-sectional data face the challenge that units may be more heterogeneous across space than through time. The use of any spatial unit, such as counties or states, raises questions about spatial autocorrelation. Spatial autocorrelation is the extent to which counties are interdependent or a function of conditions that result from proximity to other counties. Its occurrence can produce inefficient and biased estimates unless adjustments are made. For example, when values are correlated geographically, the statistical assumption of independence is violated.¹² To correct the problem of spatial autocorrelation, national studies of counties typically use either state fixed effects or a spatial autocorrelation control variable, but not both. Empirically, a state variable and a spatial autocorrelation control variable cannot be jointly

¹¹ The fixed effect model and random effect model are commonly used estimation strategies that correct for unmeasured county-invariant factors. Both methods address the state heterogeneity problem by simulating the unmeasured county-invariant factors as state-specific intercepts. The fixed effect model treats the state-specific intercepts as equivalent to regression coefficients of indicator variables for each state. In contrast, the random effect model treats the state-specific intercepts as a random component of the error term. Because our study includes all contiguous counties in the U.S., it does not employ a random sample of counties from a larger population. As another consideration, the random effects model has been criticized for neglecting the correlation that may exist between the effects and the explanatory variables, which can lead to biased and inconsistent estimation. The random effects model may suffer from this inconsistency due to omitted variables.

¹² One source of spatial autocorrelation is measurement error whereby data are aggregated and miscalculations in one spatial unit spillover to neighboring units. Another cause is interdependence in space where high values in one unit are associated with low values in another unit creating a checkerboard pattern (negative autocorrelation), like values cluster together creating a lattice effect (positive autocorrelation), or values follow a gradient of diffusion.

included in a model because they create severe collinearity. Both are redundant to a degree, as most counties are closest in proximity to others in their same state. As expected from this collinearity, models using either a spatial autocorrelation control variable or state fixed effects yield similar results.¹³ Our analysis will employ state fixed effects to prevent any bias from spatial autocorrelation.

To illustrate our modeling approach (with counties), we begin with estimates from pooled county-level cross-sectional regression models of the family poverty rate. Let $y_{i(t)}$ denote the poverty rate in county i in year t . Let $x_i(t)$ denote the set of observed county- and year-specific economic and demographic variables (e.g., female headship), and let $d(t)$ be a dummy variable indicating the year of the observation (i.e., 2000 or 2006). The year dummy, $d(t)$, is used to account for “global” effects that alter the trend in poverty. With this notation, a standard regression of the relationship between poverty and local economic and demographic conditions can be written as

$$y_{i(t)} = \beta_0 + \beta_x x_i(t) + \beta_D d(t) + e_i(t), \quad (1)$$

where $e_i(t)$ represents unobserved county-specific determinants of poverty. This specification is estimated by applying OLS to the pooled county-level sample.

Estimates of the coefficients in model (1) are biased if the error term, $e_i(t)$, includes unobserved factors that are correlated with the variables in $x_i(t)$. To control for unobserved time-invariant factors, we will estimate models that incorporate county-specific (and state-specific) fixed effects. Using the notation from the specification above, such a model can be expressed as:

$$y_{i(t)} = \beta_0 + \beta_x x_i(t) + \beta_D d(t) + \mu_i + e_i(t), \quad (2)$$

¹³ One problem with a spatial autocorrelation control variable is that it requires the researcher to stipulate, a priori, the nature of the spatial relation.

where μ_i represents a county-specific effect (with β_0 suppressed, a county specific intercept). The inclusion of county fixed effects mitigates biases associated with unobserved county variables. This is important in understanding “effects” between our various observed indicators, including family variables, and poverty. All of the counties are coded as either Appalachian or non-Appalachian according to the list published on the Appalachian Regional Commission website in 2009. Because this dummy variable for Appalachia does not vary over time, it is nested in the county effects (i.e., FIPS code) for this model specification. If we did not take this step, the time-invariant Appalachia variable would drop out of the model.

Results

Poverty Trends in Appalachia

We begin by providing mean family poverty rates for Appalachian and non-Appalachian counties over the study period (Table 3). Using 1990 as the base year to make comparisons, these data indicate a decline in family poverty in 2000 and 2006, both in Appalachia and the rest of the nation. However, the magnitude of the decrease was larger in 2000 than in 2006. The Appalachian poverty rate declined on average across counties from 15.3 to 12.6 percent between 1990 and 2000. To compare 1990 with the post-2000 period, the average poverty rate dropped from 15.3 percent to 13.9 percent in Appalachia. There is little indication of regional convergence with the average poverty across the United States. For each period here, the average Appalachia family poverty rate was between 14.3 and 15.8 percent higher than the average across all U.S. counties.

(Table 3 about here)

These are the average rates of poverty for counties. But non-poor families may live disproportionately in highly populated counties, i.e., those with a larger number of families, such

as metropolitan areas, which may have comparatively low poverty rates. County averages may thus misrepresent the poverty experiences of the average Appalachian families. Table 4 therefore provides the overall family poverty rate for Appalachia, non-Appalachia, and the continental United States.¹⁴ Indeed, these poverty rates are lower than the Appalachian county averages for each of the three time periods, but still remain higher than poverty rates for the non-Appalachian United States. Moreover, the average family (i.e., identified as the median family if counties are arrayed by poverty rates from low to high) has an even lower poverty rate than the county average and the overall family poverty rate in Appalachia. This simply reflects the fact that the poverty rates are lower in highly populated areas than in remote rural areas.

(Table 4 about here)

Modeling Changes in Poverty for 1990-2006

National Estimates. Our initial model (shown in the first column of Table 5) provides national estimates from a pooled regression analysis including county data for 1990, 2000, and 2006 with no area effects. This conventional analysis indicates that the family poverty in Appalachia is .99 percentage points higher than in counties outside of Appalachia, even when we control for conventional social, economic, and demographic factors, including changes in family structure. Moreover, Appalachian poverty is especially high in nonmetropolitan areas in comparison to their county counterparts outside of Appalachia ($b = 1.18$).

(Table 5 about here)

The Appalachia-by-nonmetro interaction ($b = .92$) is statistically significant at the .001 level, a fact that indicates especially high rates of poverty in the rural parts of Appalachia as opposed to the rural parts of other regions. Moreover, percent female-headed households with children ($b = .70$) and percent never married ($b = .03$) are positively and significantly associated

¹⁴ This is simply the sum of the products of county family poverty rates and number of families across all counties.

with county poverty. Contrary to our expectations, percent divorced or separated ($b = -.09$) is negatively and significantly associated with county poverty. In the continental U.S., the percentage of family households that are female-headed with children increased by 1.5 percent from 1990-2000 and by 2.5 percent over 1990-2006. This means that the rise in female-headed households with children nationally was associated with a 1.05 ($.70 * 1.5$) percentage point increase in the family poverty rate from 1990 and 2000 and with a 1.75 ($.70 * 2.5$) percentage point increase between 1990 and 2006. Changing family structure, on balance, muted downward trends in family poverty rates over the 1990s and 2000s. Not surprisingly, counties with higher shares of elderly persons ($b = -.10$), foreign born ($b = -.12$), adults with a college education ($b = -.05$), and employed women ($b = -.34$) had lower family rates of poverty. Moreover, counties with a higher percentage of children ($b = .12$) and the unemployed ($b = .26$) had higher family poverty rates.

Some of our results, however, are inexplicable. Although the percent Hispanic in the county is positive and statistically significant ($b = .06$), the percent non-Hispanic black is negative and statistically significant ($b = -.01$), which is atypical in spatial regressions of the sort presented here. However, Slack et al. (2009) similarly found that the percent minority was negatively associated with female-headed family poverty rates in the Delta and the Lower Rio Grande Valley. One interpretation, of course, is that minority counties are actually “doing better” than one would expect on the basis of the actual social and economic composition of the counties. And, of course, our model controls for many family-related variables that provide an important axis of economic differentiation between minorities and non-Hispanic whites. Indeed, when we remove the three family variables from Model 1, the expected negative relationship between percent black and family poverty in counties is positive and significant ($b = 0.13$).

Of course, a criticism of previous research is that estimates of the effects of family structure may be spurious, a result from excluding state-level policy or sociocultural variables associated both with family structure and poverty, from the model. The model presented in the second column of Table 5 addresses this concern by including 48 state dummy variables as controls for unmeasured (time-invariant) state-level effects. Specification tests reveal that the state dummy variables are jointly significant at the .0001 level. In regards to the three family variables, the addition of state fixed effects leads to an increase in the estimated effect of percent never married (.03 to .09), a decrease in the estimated effect of female headship (.70 to .57), and the effect of percent divorced or separated becomes insignificant. All of the other variables previously discussed are similar in sign, magnitude, and significance to the no area effects model, with one exception: the effect of percent aged 65 and over was reduced to statistical insignificance. Substantive interpretations were not substantially altered with the inclusion of state fixed effects in the model. On balance, any concerns expressed in the existing literature about potential biases from omitted variables, even in models such as ours that are augmented by a relatively rich and detailed set of observed control variables, do not appear to be well founded.

Our results so far indicate that changing family structure significantly affects the family poverty rates, even when other unobserved state effects are controlled. These models do not, however, take full advantage of the longitudinal county-level data available to us. The possible effects of county-specific unobserved heterogeneity are addressed in the model presented in the final column of Table 5, which differences each of the county-level observations over time. This model provides an estimate of the effect of changing family structure on intradecade changes in family poverty rates at the county level, while controlling for unobserved heterogeneity between counties as well as for changes in other observed county characteristics, including local

demographic structure and economic opportunities (see Table 1). As with the previous specification, the additional fixed effect controls are jointly significant at the .0001 level and their inclusion leads to some substantive changes in several of the coefficients of interest.

For example, the size of the Appalachian effect increased substantially with additional controls, but the nonmetropolitan effect declined from .98 to .62 and the Appalachia-by-nonmetro interaction became insignificant. The effects of percent divorced or separated and percent never-married were both reduced to statistical insignificance. Furthermore, the effect of female headship decreased by almost one-half from .57 to .30. When we combine this point estimate with the actual increase in female headship over 1990-2000 and 1990-2006, the change in female headship increased poverty rates by .45 ($.30 * 1.5$) percentage points over 1990-2000 and by .75 ($.30 * 2.5$) percentage points during 1990-2006. Several other coefficients also changed sign or significance in comparison to the state effects model: percent Non-Hispanic Black remained statistically significant but changed sign from -.01 to .05, and percent aged 65 and over changed from insignificant to positive and significant ($b = .27$), while percent foreign born and percent bachelor's degree were statistically unrelated to inter-county variation in family poverty rates.

Finally, if the year effect is zero, the appropriate inference is that the observed 1990s and 2000s decline in family poverty was due entirely to changes in the county characteristics considered here. But, as shown in Table 5, the net year effects of -1.89 for 2000 and -1.09 for 2006 are statistically significant in the model. In contrast, the percentage of families in poverty declined by 2.4 percentage points, on average, between 1990 and 2000 and by 1.4 percent points between 1990 and 2006 in the continental U.S. (Table 3). The significant time coefficients mean that county compositional changes explain a sizeable share of the 1990s and 2000s decline in

family poverty. Moreover, in some additional analyses (Table A3), we evaluated the sensitivity of our results using two alternative measures of family poverty (poverty rate for all persons and poverty rate for all children). Our conclusions about the effects of changing family structure are robust to alternative specifications.

Appalachian Estimates. We next turn to the estimates in Table 6 from our pooled 1990, 2000, and 2006 data of all Appalachian counties. As before, we estimate models without (Model 1) and with state (Model 2) and county (Model 3) fixed effects. Our discussion here will focus largely on estimates from the model that includes county fixed effects.

(Table 6 about here)

The year 2000 dummy variable in Model 3 (Table 6) shows a -2.99 percentage point decline, on average, in family poverty rates over the 1990s, independent of unobserved time-invariant county variables and observed changes in the social and economic variables considered. Similarly, the year 2006 dummy variable indicates a -2.55 percentage point reduction in family poverty in comparison with the base year 1990. However, family poverty in Appalachia actually decreased by 2.7 percent between 1990 and 2000 and by 1.4 percent over 1990-2006. Clearly, the county effects model overestimates the influence of time. The year 2000 and 2006 coefficients for Models 1 and 2 are within the range of observed differences in family poverty.

The results show, as with the nation as a whole, the large effects of changing family structure. Female headship has a statistically significant positive effect ($b = .51$) on average county changes in family poverty. Thus, the observed increase in female headship in Appalachia during the 1990s (1.2 percentage points) and the 2000s (2.3 percentage points) clearly dampened the downward slide in family poverty by .61 ($.51 * 1.2$) percentage points from 1990-2000 and

1.2 (.51 * 2.3) percentage points during 1990-2006. This demographic effect of changing female headship is much larger than the effect for the nation as a whole ($b = .30$) (see Table 5).

Any effects of changing marital status composition were modest, however. The percentage of never-married, like the results show in the U.S. county effects model, was statistically insignificant. Moreover, the negative effect of percent divorced or separated ($b = -.16$) was wrong-signed and statistically significant. The percentage divorced or separated increased from 9.4 to 11.8 percent, on average, between 1990 and 2000, and from 9.4 to 13.5 percent over 1990-2006 across Appalachian counties. Such results give little evidence that a growing divorced population contributed to increases in family poverty rates. The breakup of a poor married-couple family, which then transitions into a poor single-parent family, will not change family poverty rates. Positive effects result primarily from transitions from non-poor married families to poor single-parent families (usually headed by mothers). On the other hand, if divorce mostly breaks up low-income couples without children, the married-couple families “left behind” would, in the aggregate, have lower rates of poverty, especially if most of these women were childless and did not form female-headed families.

The estimated effects of several other variables in Table 6 also require some additional discussion. For example, nonmetro counties in Appalachia were no more likely than metro counties to have high rates of poverty after unobserved county variables are controlled. Although the effect of Central Appalachia is very large and statistically significant ($b = 5.02$), the Central Appalachia-by-nonmetro interaction is not significant. Race, foreign born, and education also became statistically insignificant in Model 3 (Table 6). The presence of children and the elderly were highly associated with increases in county rates of family poverty ($b = .46$ and $.25$, respectively). On average, Appalachian counties had a .2 percentage point increase in the

percent age 65 or over between 1990-2000 and a .8 percentage point increase during 1990-2006, which means that aging had the effect of placing upward pressure on family poverty rates, but only by .05 ($.25 * .2$) percentage points over the 1990s and .2 ($.25 * .8$) percentage points over the 2000s. Moreover, in some additional analysis of poverty for all persons (rather than families), aging over the decade had a much larger offsetting impact on 1990s and 2000s declines in poverty ($b = .47$).

Not surprisingly, our results also make it clear that changing unemployment rates contributed to higher county rates of family poverty; a one-percentage point increase in the unemployment rate contributed to a .16 percentage point increase in family poverty. Increasing women's employment has the salutary effect of reducing poverty ($b = -.07$). As in previous studies (Lichter and McLaughlin 1995), the effects of female employment were large, which perhaps points to the poverty-reducing effects of recent increases in female employment that have been associated with welfare reform and perhaps a growing economy (at least until recently). Thus, the observed decline in unemployment over the 1990s, from 8.0 to 6.4 percent, had the effect of reducing poverty by .26 ($.16 * 1.6$) percentages, on average, in Appalachia. Similarly, the observed decrease in unemployment over the 2000s from 8.0 to 7.5 percent lowered family poverty in Appalachia by .08 ($.16 * .5$) percentage points. The effect of changing female employment was very similar – .17 ($.07 * 2.4$) percentage points in the 1990s and .18 ($.07 * 2.5$) percentage points in the 2000s.

This analysis of family poverty rates among counties in Appalachia does not indicate the effects of *changing* family structure. As a final exercise, we simulated the effects of changing family structure (i.e., for the three family variables considered here) by replacing the 2006 Appalachian county means on each family variable (e.g., female headship) in the 2006 cross-

sectional regression model for Appalachia (not shown) with county means on the same variables in 1990, but holding the other social and economic variables at 2006 levels. For simplification, our simulations are based on the model without state or county fixed effects. By comparing the expected (counterfactual) with the observed average family poverty rates, we can identify the implications of changing family structure. These results are reported in Tables 7 and 8.

(Tables 7 and 8 about here)

The results clearly show the implications of changing family structure over the 1990 to 2006 period. We distinguish between counties that are within Central Appalachia or Non-Central Appalachia, as well as counties that are nonmetropolitan or metropolitan. At a minimum, regardless of area, the observed poverty rate in 2006 was substantially larger than the counterfactual, where we assume family mean values at 1990 levels. For counties that were within Central Appalachia and were nonmetropolitan, the counterfactual rates (14.6 and 15.0 percent) were 11.5 and 12.8 percent lower than the observed rates, respectively. In metropolitan counties located within Central Appalachia, the counterfactual poverty rates (11.4 and 9.8 percent) were 13.6 and 10.1 percent lower than the observed rates. The effects were even more profound in Non-Central Appalachia. For nonmetropolitan counties in Non-Central Appalachia, the counterfactual family poverty rates (11.8 and 12.3 percent) were 13.9 and 15.2 percent lower than the observed poverty rates. In metropolitan counties located within Non-Central Appalachia, the counterfactual rates (10.7 and 9.4 percent) were 14.4 and 10.5 percent lower than the observed rates. To place this in better perspective, if we set the mean education at 1990 levels in nonmetropolitan counties located within Central Appalachia, the counterfactual poverty rates would be 17.2 and 18.2 percent, figures very similar to the observed rates. Family change trumps educational change in its impact on family poverty.

These results highlight the “poverty-increasing” effects of family change since 1990 on Appalachian poverty. Moreover, in some additional analysis (not shown), it was clear that much of this effect was driven by the rise in female-headed households with children (see Table A2). This can be shown by setting the female headship variable to its 1990 mean value, but allowing each of the means on the other variables (including the other family variables) to vary over time. The counterfactual poverty rates for Central Appalachia nonmetropolitan counties in this case were 15.7 and 16.5 percent in 2006. These poverty rates are 4.8 and 4.1 percent lower than the observed poverty rates, and represent figures that are only slightly lower than the rates (i.e., 11.5 and 12.8 percent) when all three family variables are set at the 1990 mean for Appalachian counties. These simulations have obvious heuristic value, but they also clearly raise new questions about the causes of Appalachian family change, including the rise in female-headed households with children.

Discussion and Conclusion

On April 24, 1964, President Lyndon Baines Johnson visited Inez, Kentucky and announced his “War on Poverty” from the front porch of Tommy Fletcher, a father of eight children who epitomized the squalid conditions that were characteristic of much of rural Appalachia. Appalachia has become a symbol of America’s struggle against poverty – especially chronic poverty in rural areas. Since that time, poverty rates in Appalachia have plummeted at a faster rate than the nation overall, leading to some convergence in the living conditions of Appalachian families with those outside the Region. Still, high rates of poverty persist in many parts of Appalachia, especially in its remote rural regions. Much of the emphasis on the Appalachian poor (and the nation as a whole) has focused on the impact of industrial

restructuring, especially on the shifts from extractive industries (especially mining, agriculture, and forestry) and manufacturing.

Our study has a singular goal, to balance the current preoccupation with employment and income growth by focusing instead on the poverty implications of changing family structure in the region. This topic is especially important today when marriage promotion has become an important part of the welfare dialogue about how best to improve the economic circumstances of low-income, welfare-dependent mothers and their children (Lichter et al. 2003). Rightly or not, marriage is increasingly viewed as a panacea.

In fact, our analyses clearly highlighted the poverty-increasing effects of changing family structure, especially the rise in female-headed families with children. Changes in family structure have slowed the pace of recent declines in family poverty, both nationally and in Appalachia. In this respect, our study of the region simply replicates conventional results of other demographic studies using either “shift-share” analysis (Cancian 2009) or place-based regressions (Lichter and McLaughlin 1995). The important points from our analyses are nevertheless two-fold. First, the implications of family change for family poverty appeared to be larger in Appalachia than in non-Appalachian areas, independent of regional differences in employment opportunities, industrial structure, demographic variables, and unobserved state and county variables. Second, family effects, notably those associated with changing female headship, were estimated to be larger than those for conventional economic and human capital variables. Our simulations in fact suggested that family poverty would have been roughly 10 to 15 percent lower than the observed poverty rate if Appalachian families had not changed since 1990.

Our results are preliminary and therefore interpretation requires some caveats. First, our analyses cannot support strong causal claims, although the inclusion of state and county fixed effects provides much stronger evidence about the links between family change and poverty than most previous analyses of this sort. Our analyses are nevertheless subject to simultaneity bias (i.e., poverty may be a cause of family change rather than effect). Second, changes in family structure also may mediate the effects of changing economic conditions on family poverty. Indeed, much of the effect of changing employment and economic conditions may be indirect. Family change may be a proximate “cause” of poverty, but employment and income may be a “first cause” or fundamental cause of changing poverty rates. Our statistical approach cannot adjudicate these competing claims about the mechanisms that ultimately serve to increase or reduce poverty. Lastly, our data for the most recent period precede the current economic recession, and therefore may misrepresent the significance of family change vis-à-vis economic change on family poverty. Data for all U.S. counties, including those located in Appalachia, will be released by the American Community Survey as 5-year estimates (2005-2009) in September, 2010. Our analyses clearly will benefit from the release next year of county estimates of family poverty which can capture the economic effects of the current recession.

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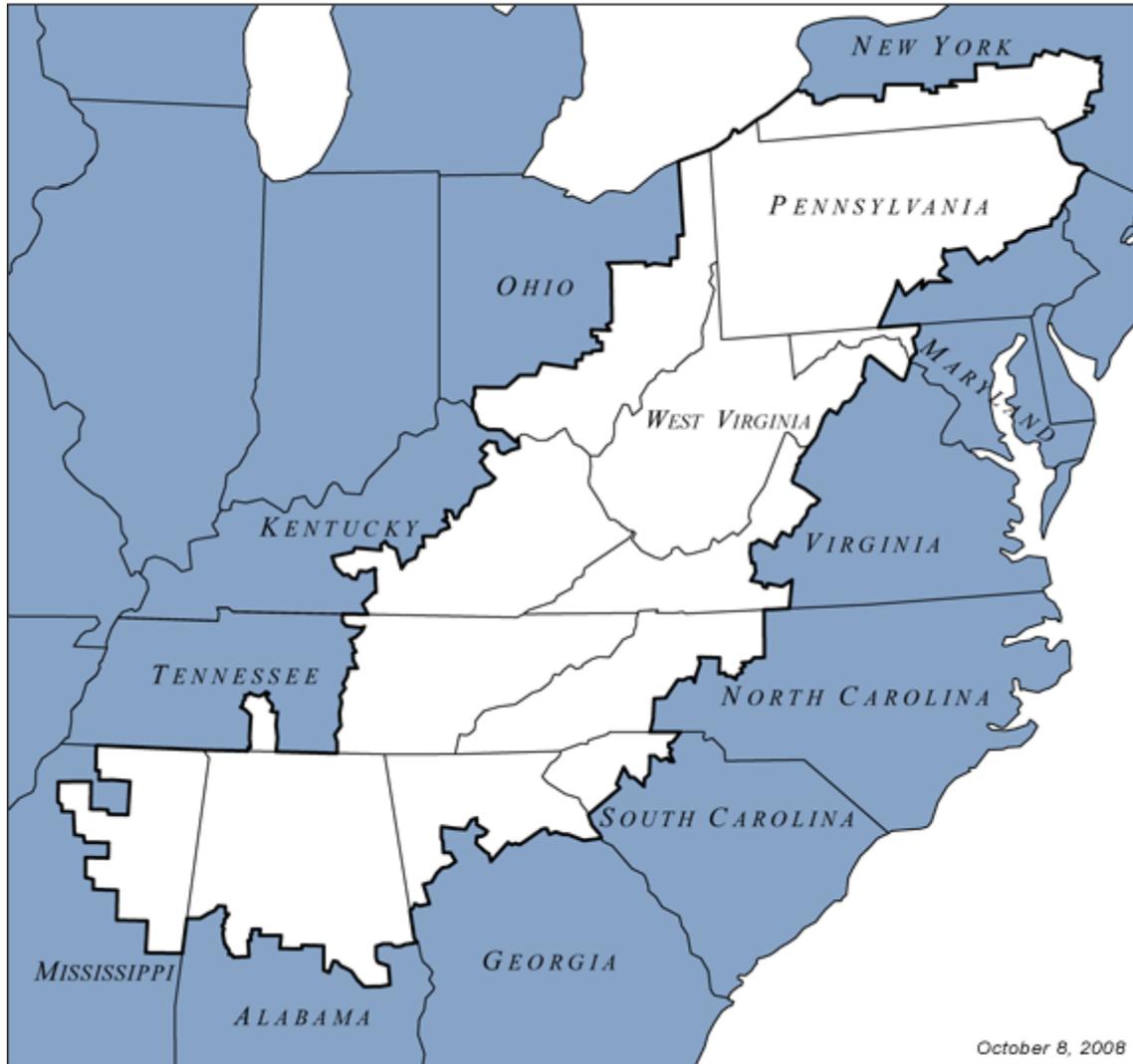
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Figure 1: Map of the Appalachian Region

The Appalachian Region



Source: Appalachian Regional Commission

Table 1: Definitions of Variables

Variable Name	Variable Definition
Appalachia ⁴	Counties located in Appalachia as of 2009
Central Appalachia ⁴	Counties located in Central Appalachia as of 2009
Nonmetro ³	Counties with a Rural-Urban Continuum Code of 4-9
Family ^{1,2}	A householder and one or more other persons living in the same household who are related to the householder by birth, marriage, or adoption
Percent Families in Poverty ^{1,2}	Percentage of families whose income is below poverty level
Percent Non-Hispanic Black ^{1,2}	Percentage of the population who are Non-Hispanic Black
Percent Hispanic ^{1,2}	Percentage of the population who are Hispanic
Percent Foreign Born ^{1,2}	Percentage of the population who are foreign born
Percent Aged Under 18 ^{1,2}	Percentage of the population younger than 18 years old
Percent Aged 65 and Over ^{1,2}	Percentage of the population 65 years old or older
Percent Bachelor's Degree ^{1,2}	Percentage of the population, 25 years old or older, with a bachelor's degree only
Percent Manufacturing ^{1,2}	Percentage of the civilian employed population, 16 years old or older, working in the manufacturing industry
Percent Extractive ^{1,2}	1990: Percentage of the civilian employed population, 16 years old or older, working in the agriculture, forestry, fishing, or mining industry 2000, 2006: Percentage of the civilian employed population, 16 years old or older, working in the agriculture, forestry, fishing, hunting, or mining industry
Percent Service ^{1,2}	1990: Percentage of the civilian employed population, 16 years old or older, working in business and repair services, personal services, entertainment and recreation services, or professional services industry 2000, 2006: Percentage of the civilian employed population, 16 years old or older, working in professional, scientific, management, administrative, or waste management services; education, health, or social services; arts, entertainment, recreation, accommodation, or food services; or other services industry
Percent Public Administration ^{1,2}	Percentage of the civilian employed population, 16 years old or older, working in the public administration industry
Percent Unemployed ^{1,2}	Percentage of the civilian labor force, 16 years old or older, who are unemployed
Percent Females Employed ^{1,2}	Percentage of females, 16 years old or older, who are employed in the civilian labor force
Percent Female-headed Households with Children ^{1,2}	Percentage of family households that are female-headed with children younger than 18 years old
Percent Never Married ^{1,2}	Percentage of the population, 15 years old or older, who never married
Percent Divorced or Separated ^{1,2}	Percentage of the population, 15 years old or older, who are divorced or separated

Sources: U.S. Census of Population¹ (1990, 2000); Social Explorer² (2006); U.S.D.A. Economic Research Service³ (1993, 2003); Appalachian Regional Commission⁴ (2009)

Table 2: Means and Standard Deviations of Family Variables, 1990-2006

1990	Appalachia	Non-Appalachian U.S.	U.S. Total
Percent Female-headed Households with Children	8.6 (2.6)	9.0 (4.2)	8.9 (4.0)
Percent Never Married	21.5 (5.1)	22.0 (5.7)	22.0 (5.6)
Percent Divorced or Separated	9.4 (1.3)	9.3 (2.4)	9.3 (2.3)
2000			
Percent Female-headed Households with Children	9.8 (2.9)	10.5 (4.6)	10.4 (4.4)
Percent Never Married	21.1 (5.1)	22.6 (5.6)	22.4 (5.6)
Percent Divorced or Separated	11.8 (1.6)	11.2 (2.4)	11.3 (2.3)
2006			
Percent Female-headed Households with Children	10.9 (3.3)	11.5 (4.9)	11.4 (4.7)
Percent Never Married	24.2 (5.5)	25.8 (6.3)	25.6 (6.2)
Percent Divorced or Separated	13.5 (2.4)	12.4 (2.7)	12.5 (2.7)
N	428	2681	3109

Sample includes all counties in the continental U.S., excludes Alaska and Hawaii

Standard deviation appears in parentheses

Sources: U.S. Census of Population (1990, 2000); Social Explorer (2006)

Table 3: Mean and Median Family Poverty Rates, 1990-2006

Year	Appalachia	Non-Appalachian U.S.	U.S. Total
1990	15.3 (13.1)	12.7 (11.3)	13.1 (11.5)
2000	12.6 (10.9)	10.4 (9.2)	10.7 (9.6)
2006	13.9 (12.9)	11.3 (10.3)	11.7 (10.7)
N	428	2681	3109

Sample includes all counties in the continental U.S., excludes Alaska and Hawaii

Median family poverty rate appears in parentheses

Sources: U.S. Census of Population (1990, 2000); Social Explorer (2006)

Table 4: Weighted Mean and Median Family Poverty Rates, 1990-2006

Year	Appalachia	Non-Appalachian U.S.	U.S. Total
1990	12.0 (10.5)	9.8 (8.9)	10.0 (9.2)
N	6,031,644	58,614,611	64,646,255
2000	10.2 (9.1)	9.1 (8.0)	9.2 (8.2)
N	6,482,928	65,336,229	71,819,157
2006	11.4 (10.6)	9.9 (9.2)	10.0 (9.3)
N	6,553,970	67,784,813	74,338,783

Sample includes all counties in the continental U.S., excludes Alaska and Hawaii

Family poverty rates are weighted by the number of families for whom poverty status is determined

Median family poverty rate appears in parentheses

Sources: U.S. Census of Population (1990, 2000); Social Explorer (2006)

**Table 5: 1990-2006 Model for Continental U.S.
Dependent Variable: Percent of Families in Poverty**

Variable Name	No Area Effects	State Effects	County Effects
Intercept	17.31***	8.91***	-2.56
Year 2000	-0.96***	-1.33***	-1.89***
Year 2006	-0.41***	-1.00***	-1.09***
Appalachia	0.99***	1.10***	10.10***
Nonmetro	1.18***	0.98***	0.62*
Appalachia * Nonmetro	0.92***	0.82***	-0.56
Percent Non-Hispanic Black	-0.01*	-0.01*	0.05**
Percent Hispanic	0.06***	0.06***	0.09***
Percent Foreign Born	-0.12***	-0.03**	0.05
Percent Aged Under 18	0.12***	0.18***	0.29***
Percent Aged 65 and Over	-0.10***	0.01	0.27***
Percent Bachelor's Degree	-0.05***	-0.08***	0.02
Percent Manufacturing	0.01	0.01	-0.01
Percent Extractive	0.18***	0.16***	0.07***
Percent Service	0.02	0.04***	0.02
Percent Public Administration	-0.04**	0.03**	-0.07**
Percent Unemployed	0.26***	0.31***	0.22***
Percent Females Employed	-0.34***	-0.30***	-0.15***
Percent Female-headed Households with Children	0.70***	0.57***	0.30***
Percent Never Married	0.03**	0.09***	-0.02
Percent Divorced or Separated	-0.09***	-0.03	0.03
N	9327	9327	9327
R Squared	0.79	0.83	0.94

*** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$

Estimates are unstandardized coefficients

Sample includes all counties in the continental U.S., excludes Alaska and Hawaii

State and county effects are jointly significant at the .0001 level

Time-invariant Appalachia indicator is nested in county effect

Sources: U.S. Census of Population (1990, 2000); Social Explorer (2006); U.S.D.A. Economic Research Service (1993, 2003); Appalachian Regional Commission (2009)

Table 6: 1990-2006 Model for Appalachia
Dependent Variable: Percent of Families in Poverty

Variable Name	No Area Effects	State Effects	County Effects
Intercept	23.84***	9.97***	-5.34
Year 2000	-2.06***	-1.50***	-2.99***
Year 2006	-1.07**	-0.62	-2.55***
Central Appalachia	1.06	-1.48**	5.02**
Nonmetro	0.88***	0.63**	0.31
Central Appalachia * Nonmetro	2.96***	2.86***	0.67
Percent Non-Hispanic Black	0.03*	-0.04**	0.01
Percent Hispanic	-0.07	-0.14	0.09
Percent Foreign Born	0.09	0.14	0.02
Percent Aged Under 18	0.10	0.37***	0.46***
Percent Aged 65 and Over	-0.29***	-0.01	0.25**
Percent Bachelor's Degree	-0.25***	-0.31***	-0.07
Percent Manufacturing	0.05**	0.02	-0.05
Percent Extractive	0.08**	0.09**	0.02
Percent Service	0.13***	0.11***	0.10**
Percent Public Administration	-0.05	0.09	0.04
Percent Unemployed	0.32***	0.28***	0.16***
Percent Females Employed	-0.38***	-0.32***	-0.07*
Percent Female-headed Households with Children	0.49***	0.50***	0.51***
Percent Never Married	-0.11***	0.06*	0.07
Percent Divorced or Separated	0.06	-0.06	-0.16**
N	1284	1284	1284
R Squared	0.80	0.84	0.95

*** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$

Estimates are unstandardized coefficients

Sample includes all 428 Appalachian counties

State and county effects are jointly significant at the .0001 level

Sources: U.S. Census of Population (1990, 2000); Social Explorer (2006); U.S.D.A. Economic Research Service (1993, 2003); Appalachian Regional Commission (2009)

**Table 7: 2006 Observed and Counterfactual Family Poverty for Appalachia
All Three Family Variables (No Area Effects Model)**

County Type and Year	Observed Family Poverty	Counterfactual Family Poverty	N
Central Appalachia Nonmetro, 2006	16.5%	14.6%	81
Non-Central Appalachia Nonmetro, 2006	13.7%	11.8%	203
Central Appalachia Metro, 2006	13.2%	11.4%	10
Non-Central Appalachia Metro, 2006	12.5%	10.7%	134

Sample includes all 428 Appalachian counties

Counterfactual family poverty is obtained by substituting the 1990 Appalachia sample mean into the 2006 Appalachia prediction equation

Sources: U.S. Census of Population (1990); Social Explorer (2006); U.S.D.A. Economic Research Service (2003); Appalachian Regional Commission (2009)

**Table 8: 2006 Observed and Counterfactual Family Poverty for Appalachia
All Three Family Variables (Metro and Nonmetro Models, No Area Effects)**

County Type and Year	Observed Family Poverty	Counterfactual Family Poverty	N
Central Appalachia Nonmetro, 2006	17.2%	15.0%	81
Non-Central Appalachia Nonmetro, 2006	14.5%	12.3%	203
Central Appalachia Metro, 2006	10.9%	9.8%	10
Non-Central Appalachia Metro, 2006	10.5%	9.4%	134

Sample includes all 428 Appalachian counties

Counterfactual family poverty is obtained by substituting the 1990 metro and nonmetro Appalachia sample mean into the 2006 metro and nonmetro Appalachia prediction equations

Sources: U.S. Census of Population (1990); Social Explorer (2006); U.S.D.A. Economic Research Service (2003); Appalachian Regional Commission (2009)

Table A1: Means and Standard Deviations of Variables for Continental U.S., 1990-2006

Variable Name	1990 Counties	2000 Counties	2006 Counties
Percent Families in Poverty	13.1 (7.0)	10.7 (5.8)	11.7 (5.7)
Percent Non-Hispanic Black	8.6 (14.3)	8.8 (14.5)	8.9 (14.5)
Percent Hispanic	4.5 (11.1)	6.2 (12.1)	7.4 (12.7)
Percent Foreign Born	2.2 (3.6)	3.4 (4.8)	4.2 (5.3)
Percent Aged Under 18	26.8 (3.5)	25.5 (3.2)	23.6 (3.2)
Percent Aged 65 and Over	15.0 (4.3)	14.8 (4.1)	15.2 (4.1)
Percent Bachelor's Degree	9.0 (4.2)	11.0 (4.9)	12.2 (5.3)
Percent Manufacturing	18.6 (10.6)	15.9 (9.1)	13.5 (7.9)
Percent Extractive	10.4 (9.6)	7.2 (7.6)	7.1 (7.6)
Percent Service	28.8 (5.8)	37.4 (6.4)	39.7 (6.3)
Percent Public Administration	4.8 (3.0)	5.4 (3.0)	5.3 (2.9)
Percent Unemployed	6.7 (3.1)	5.8 (2.7)	6.5 (2.9)
Percent Females Employed	48.5 (7.5)	51.6 (7.0)	52.0 (6.8)
Percent Female-headed Households with Children	8.9 (4.0)	10.4 (4.4)	11.4 (4.7)
Percent Never Married	22.0 (5.6)	22.4 (5.6)	25.6 (6.2)
Percent Divorced or Separated	9.3 (2.3)	11.3 (2.3)	12.5 (2.7)
N	3109	3109	3109

Sample includes all counties in the continental U.S., excludes Alaska and Hawaii

Standard deviation appears in parentheses

Sources: U.S. Census of Population (1990, 2000); Social Explorer (2006)

Table A2: Means and Standard Deviations of Variables for Appalachia, 1990-2006

Variable Name	1990 Counties	2000 Counties	2006 Counties
Percent Families in Poverty	15.3 (7.3)	12.6 (5.8)	13.9 (5.3)
Percent Non-Hispanic Black	5.9 (10.7)	6.1 (11.0)	6.3 (11.0)
Percent Hispanic	0.5 (0.4)	1.5 (2.0)	2.1 (2.7)
Percent Foreign Born	0.8 (0.9)	1.6 (1.9)	2.1 (2.7)
Percent Aged Under 18	25.2 (2.7)	23.7 (2.4)	22.4 (2.6)
Percent Aged 65 and Over	14.4 (2.7)	14.6 (2.8)	15.2 (2.9)
Percent Bachelor's Degree	6.6 (3.1)	8.1 (3.7)	9.2 (4.2)
Percent Manufacturing	26.5 (11.4)	21.9 (9.3)	17.7 (8.2)
Percent Extractive	6.5 (5.8)	4.0 (3.4)	4.1 (3.6)
Percent Service	26.9 (6.5)	36.0 (7.0)	39.5 (6.6)
Percent Public Administration	3.7 (1.5)	4.2 (1.5)	4.3 (1.6)
Percent Unemployed	8.0 (3.4)	6.4 (2.3)	7.5 (2.4)
Percent Females Employed	44.7 (8.1)	47.1 (6.4)	47.2 (6.1)
Percent Female-headed Households with Children	8.6 (2.6)	9.8 (2.9)	10.9 (3.3)
Percent Never Married	21.5 (5.1)	21.1 (5.1)	24.2 (5.5)
Percent Divorced or Separated	9.4 (1.3)	11.8 (1.6)	13.5 (2.4)
N	428	428	428

Sample includes all 428 Appalachian counties

Standard deviation appears in parentheses

Sources: U.S. Census of Population (1990, 2000); Social Explorer (2006)

Table A3: 1990-2006 Model for Continental U.S. (County Effects Model)
Dependent Variable: Percent of Population in Poverty

Variable Name	Children Under 18	Total Population
Intercept	0.11	-2.27
Year 2000	-2.28***	-1.84***
Year 2006	-0.35	-0.72***
Appalachia	17.57***	11.33***
Nonmetro	0.32	0.20
Percent Non-Hispanic Black	0.09*	0.07***
Percent Hispanic	0.12**	0.05*
Percent Foreign Born	0.06	0.09**
Percent Aged Under 18	0.38***	0.33***
Percent Aged 65 and Over	0.44***	0.34***
Percent Bachelor's Degree	-0.11**	0.01
Percent Manufacturing	-0.05*	0.02
Percent Extractive	0.07**	0.10***
Percent Service	0.01	0.04**
Percent Public Administration	-0.11*	-0.04
Percent Unemployed	0.30***	0.24***
Percent Females Employed	-0.22***	-0.18***
Percent Female-headed Households with Children	0.42***	0.18***
Percent Never Married	-0.04	0.01
Percent Divorced or Separated	0.21***	0.05*
N	9327	9327
R Squared	0.92	0.95

*** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$

Estimates are unstandardized coefficients

Sample includes all counties in the continental U.S., excludes Alaska and Hawaii

County effects are jointly significant at the .0001 level

Time-invariant Appalachia indicator is nested in county effect

Sources: U.S. Census of Population (1990, 2000); Social Explorer (2006); U.S.D.A. Economic Research Service (1993, 2003); Appalachian Regional Commission (2009)