

The Probability of Experiencing Poverty and its Duration in Adulthood
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Abstract:

Using information from four decades of the Panel Study of Income Dynamics, we calculate the probability that an adult will experience a first poverty spell and the proportion of time spent in poverty. To disentangle the heterogeneity that may exist in the probability of ever experiencing adult poverty, we use survival analysis and regression techniques to estimate the hazard of falling into poverty and the proportion of time spent in poverty as a function of economic and demographic characteristics at age 25. We find that there is substantial heterogeneity in the hazard of ever falling into poverty and the proportion of time spent in poverty. The higher one's income at age 25, the less likely one is to ever experience poverty during adulthood. There are similar large differences between the most-educated and least-educated, of whites and blacks and of men and women.

a. Description of Topic

Cross sectional studies on poverty provide important information on the probability a person will experience poverty at a specific moment in time. These studies, however, do not inform us about the incidence or concentration of poverty over a long horizon. We use data from the Panel Study of Income Dynamics (PSID) to extend our understanding of the dynamics of poverty over the full period of adulthood.¹ We estimate the probability that a person will fall into poverty as an adult and the proportion of years s/he will spend poor during adulthood. We also describe how the probability of initially falling into poverty and the proportion of years one is poor after initially falling into poverty vary by economic and demographic status at age 25, that is, by income, race, gender and educational attainment. Only a few studies have addressed these issues, in part because it is difficult to measure poverty over a long period (Duncan, 1984; Rank and Hirschl 1999; Rank and Hirschl 2001a; Rank and Hirschl 2001b).

Knowing that an adult has a 6 percent probability of being poor in any year tells us nothing about her/his probability of being poor at any time between the ages of 25 and 63. At one extreme, all individuals might face the same probability of being poor in any year. In this case, being poor in one year is independent of poverty experience in the prior year; the rich and the poor in one year are equally likely to be poor in the next year. Under this extreme case, falling into poverty at

¹ We define adults as persons between the ages of 25 and 63. Many younger adults have not yet completed their schooling and left their parental homes and many older adults have already retired. Our focus is thus on the years in which we expect most adults to be working.

some point during adulthood would be a very common experience. At the other extreme, the same 6 percent of adults are poor in every year. In this case, the non-poor never fall into poverty and only 6 percent of adults would ever be poor. However, those who are poor would spend all their adult years in poverty (Bane and Ellwood, 1986).

The extent to which poverty is a common or rare experience lies at the core of the ongoing policy debate about the extent of mobility into and out of poverty in recent decades. Some analysts suggest that poverty is not a serious problem because almost all of the poor will escape poverty; others suggest that there is a permanent underclass which is cut off from the economic mainstream. Our goal in this paper is to use appropriate methodological techniques to estimate the likelihood of ever experiencing poverty during adulthood and the intensity of that experience. First, we calculate the probability that an adult will experience a first poverty spell and the proportion of time s/he spends in poverty. Then, to disentangle the heterogeneity that may exist in the probability of ever experiencing adult poverty, we use survival analysis techniques to estimate the hazard of falling into poverty as a function of economic and demographic characteristics at age 25. Finally, we use regression analysis to estimate the proportion of time spent in poverty as a function of the same characteristics at age 25. Our contribution is to analyze longitudinal data from nearly four decades (spanning the entire adult lifespan of some respondents) taking appropriate account of the fact that the PSID does not have data on the complete life-histories of all respondents.

We find that there is substantial heterogeneity in the hazard of ever falling into poverty and the proportion of time spent in poverty. Focusing on the experience of the average respondent masks very different outcomes for different people. The higher one's income at age 25, the less likely one is to ever experience poverty during adulthood. A small percentage of those who are affluent at age 25, do fall into poverty at some point during adulthood, but they spend many fewer years in poverty than do those who are near poor. There are similar large differences between the poverty experiences of the most-educated and least-educated, of whites and blacks and of men and women. Since the distribution of outcomes is dispersed, looking only at the mean of the unconditional distributions can give a very misleading picture.

b. Theoretical Focus

Income mobility research examines how the economic status of a person (or family) changes over some specific time period. Results vary depending on the length of the time period and the income concept used (e.g. earnings, family income). Studies that measure mobility over longer periods do a better job of evaluating a person's "permanent" economic status, but this neglects transitory variations (Gottschalk and Danziger 1998). For example, Gottschalk (1997) finds that over 90 percent of earners in the lowest income quartile in 1974 remained in the bottom two quartiles the following year, with 68.7 percent remaining in the bottom quartile alone. Extending the analysis period to 17 years, the proportion of first-quartile earners in 1974 who remained in the first quartile in 1991 falls to 41.2 percent.

An alternative method for analyzing poverty mobility is to focus on the amount of time spent in poverty. Duncan (1984) was the first to use the PSID to show that while many people

experienced poverty at some time between 1968 and 1981, most experienced only brief spells. Recent studies have corroborated these findings over more recent years.²

The two broad conclusions from the literature – that mobility out of poverty is relatively low and that most poverty spells are short – might seem contradictory. However, Duncan (1984) and Huff-Stevens (1994) document that those who experience a first poverty spell are likely to experience a subsequent spell. Thus, a poor person may escape from poverty after a short initial spell, but experience poverty several times again in subsequent years. Even if each spell is short, this person may spend a substantial portion of her/his life in poverty. To deal with this issue we analyze both the risk of ever experiencing poverty during adulthood *and* the total amount of time spent in poverty.

The study most similar to ours is by Rank and Hirschl (2001a) who analyze the PSID data from 1968 to 1991 using a life-table approach. They find that 36 percent of respondents experience a poverty spell between the ages of 20 and 40. In related studies, Rank and Hirschl estimate the probability of experiencing a poverty spell over the entire adult lifespan from the same 25 years of data. They estimate that 51 percent of 20-year olds will experience a poverty spell by the time they reach age 65, and 66 percent by age 80 (Rank and Hirschl 1999). Rank and Hirschl (2001b) find that 43 percent of 25-year olds will experience poverty by age 65.

We note below some problems with using a life-table approach to study the likelihood of experiencing poverty as an adult. Our methodology avoids these problems and yields somewhat lower estimates of the probability that a person will be poor during adulthood. We also document that there is substantial heterogeneity across the population, so that poverty trajectories vary dramatically by economic status at the outset of adulthood. Finally, we estimate the proportion of adulthood that persons spend in poverty and how this differs by economic status at the onset of adulthood.

c. Data and Methods

We calculate Kaplan-Meier survival estimates and use Cox proportional hazard models to estimate the probability of experiencing a first poverty spell between the ages of 25 and 63. These standard hazard models allow us to estimate survivor functions with flexible duration dependence.

The primary difficulty of estimating the hazard of entering poverty between the ages of 25 and 63 is that few individuals are observed over their full adult lives. Some people leave the sample before reaching age 63, often because they have not yet reached this age in the most recent PSID

² Devine and Wright (1993) found that between 1968 and 1987 about 38 percent of the population experienced a poverty spell, but only 1 percent was poor during the entire 19-year study period. Blank (1997) found that about one-third of persons experienced a poverty spell during the 13-year period between 1979 and 1991, with most spells lasting fewer than three years; about a fourth of whites, but two-thirds of blacks experienced a poverty spell. Hertz (2006) focuses on short-term downward mobility (characterized by an income decline of \$20,000 or more in real terms) in the periods from 1997 to 1998 and 2003 to 2004.

survey wave. This type of right censoring is not a problem since age is exogenous (Cox 1972; Cox and Oakes 1984; Box-Steffensmeier and Jones 2004). Sample attrition due to non-response is a potentially more important but Fitzgerald, Gottschalk and Moffitt (1998) find that attrition is also largely exogenous.

More problematic is the left censoring of poverty experiences for persons who first enter the sample after age 25. While age is exogenous, we do not know whether these respondents had experienced a previous poverty spell.³ This left censoring problem can be avoided either by making strong identifying assumption or by restricting the sample to those who are observed at the beginning of adulthood. In the latter case we can distinguish between 40 year olds who first experience poverty at 40 and those who had earlier spells. If one includes persons with incomplete histories prior to the time they turn 40, one must make untestable identifying assumptions about the proportion that had experienced a prior unobserved poverty spell.⁴ We chose to include only persons who are observed at age 25 thus eliminating the problem of having to make untestable identifying assumptions about the unobserved histories of left censored cases. The cost of not including left censored spells is that this reduces sample size, which increases the standard error of our estimates. We believe that this loss in efficiency is a price worth paying in order to insure that our estimates are consistent.

In order to allow the hazard of first entry into poverty to vary across individuals, we allow the hazard to depend on economic and demographic characteristics measured at the beginning of adulthood (i.e., income, race, gender, education). As we document below, allowing for heterogeneity is important. The likelihood that an affluent 25-year-old experiences poverty later in life is much lower than that of a near-poor 25-year-old. This heterogeneity means that the unconditional hazard that averages across persons of all types masks these important differences.

We also calculate the proportion of time spent in poverty for those who fall into poverty and examine variations by attributes measured at age 25. We include the unemployment rate to control for macroeconomic conditions across the business cycle and a set of cohort dummies.

We use all 37 years of data currently available from the PSID, 1968 to 2005. For those who were 25 in 1968, we observe their full adult histories from 25 to 63. For those who turn 25 in a later year, we observe their early adulthood experiences, but their poverty histories are right censored before they reach 63. Respondents remain in sample until they experience their first poverty spell, attrite from the sample, or fail to respond to the income questions. Thus, individuals contribute information for as few as two years and as many as 38 years.

³ Left censoring is not a problem when one uses synthetic cohorts to estimate life tables for mortality, because mortality, unlike poverty, is a fully absorbing state.

⁴ Rank and Hirschl include left censored respondents and make adjustments for left censoring. If their adjustments are correct, in the sense that their adjustment captures the unobserved histories of the left censored spells, then they also obtain consistent estimates. Differences between our estimates and theirs provide an informal test of the implicit assumptions behind their correction for left-censoring. While Rank and Hirschl do not provide sufficient information to conduct a formal test one could, in principle, use a Hausman test to see whether their estimates were also consistent.

The Panel Study of Income Dynamics Data

We analyze data from the Panel Study of Income Dynamics (PSID), a nationally representative study that collects detailed information on economic and demographic characteristics of sample members and their families.⁵ The PSID consists of the self-weighting “Survey Research Center” (SRC) sample and the “Survey of Economic Opportunity” (SEO) over-sample of low-income and African American respondents, which together form the “core” sample that requires the use of sample weights. For this analysis, we use only the SRC sample.⁶

To measure poverty, we use the average weighted poverty thresholds of the U.S. Census Bureau for non-farm families that depend on the size of the family unit. An individual is considered to be poor if her/his family income from all cash income sources and from all household members is less than or equal to the household’s threshold. Poverty rates derived in this manner are slightly lower than published rates based on Current Population Survey data. However, the trend in poverty over the period from 1968 to 2005 is similar in the PSID and CPS.⁷ We also estimate models that measure poverty based on three-year moving averages of the ratio of income to needs, which lessens the effects transitory fluctuations in incomes and yields a lower poverty rate than the annual rate.⁸

d. Preliminary Findings

We begin by computing Kaplan-Meier survival functions for individuals classified into one of four mutually-exclusive economic categories at age 25: their family income is greater than 2.5 times their poverty line, between 1.5 and 2.5 times their poverty line, between 1.0 and 1.5 times their poverty line, and less than their poverty line. For those who are below the poverty line at age 25, the survival estimates represent the probability they will experience a subsequent poverty spell at age 26 or later. We perform this analysis for all respondents and for blacks and whites separately.

Figure 1 shows the cumulative probability of falling into poverty at each age after 25 for those meeting our sample-selection criteria. As expected, the probability of experiencing a poverty spell at any given age is higher when poverty is defined by annual income than by income averaged over three-years. Using three-year moving averages (dotted line), a random 25-year-old has a 6.4 percent probability of falling into poverty by age 30, a 12.8 percent probability by

⁵ Annual interviews were conducted from 1968 to 1998; biennial interviews, in 2000 and thereafter. Until the 1990s, when an immigrant sub-sample was added, the PSID was only representative of the non-immigrant population. We do not include sub-sample members for whom data are available for only a few years. PSID documentation is available at: <http://www.psidonline.psc.isr.umich.edu>.

⁶ The PSID stopped interviewing SEO sample members when it shifted to biennial interviews.

⁷ Grieger, Danziger, and Schoeni (2008) show that this method is preferred and caution against using the needs standard available in the PSID data file for each year since 1968.

⁸ Because the interviews changed from annual to biennial after 1997, we only use three-year averages through that year; thus, we focus primarily on the results using annual amounts.

age 40, a 16.9 percent probability by age 50 and a 24.6 percent probability by age 63. Using annual income, the random 25-year-old has a 34.1 percent probability by age 63. This is about 20 percent lower than the 42 percent reported by Rank and Hirschl (2001b). Their higher estimate primarily reflects the inclusion of left censored cases.

These estimates reflect the average experience across the population. However, there is considerable heterogeneity in adult poverty experiences. We, therefore, start by disaggregating by race and by economic status at age 25. Figure 2 shows the probabilities for whites for each of the four mutually-exclusive income-to-needs categories at age 25. The probability of experiencing a first poverty spell based on annual income varies dramatically⁹. Only about 1 in 5 of affluent whites (income-to-needs at age 25 of 2.5 or higher) experience a first poverty spell by age 63. Whites who were below the poverty line at age 25 are over three times as likely (69 percent) to experience a subsequent poverty spell by age 55.¹⁰

Figure 3 presents the corresponding four probabilities of ever experiencing a poverty spell for black respondents. Blacks who are affluent at age 25 are the least likely to fall into poverty.¹¹ However, the probabilities increase more quickly with age for black respondents than for whites, holding economic status constant, and reach much higher levels. For example, 86.3 percent who were poor at age 25 experienced a subsequent poverty spell by age 58, over 15 percentage points higher than for poor whites. Blacks with income-to-needs above 2.5 times poverty have a 41.2 percent probability of experiencing by age 58, 20 percentage points higher than for affluent whites. Over the life-course, the most affluent blacks at age 25 have a probability of falling into poverty that is similar to whites with incomes just above the poverty line.

Figures 2 and 3 account only for heterogeneity by race and economic status at age 25. Table 1 controls for additional covariates by presenting estimates from a Cox proportional hazard model of ever experiencing poverty. Covariates include race, gender, educational attainment at age 25, the unemployment rate in each year, and a set of cohort dummies and a third degree polynomial in income-to-needs at age 25. All variables are statistically significant at the .01 level and have the expected signs.¹² The results from the full model (column 5) show that controlling for other observed factors, blacks have a hazard rate 60.4 percent higher than whites (consistent with figures 2 and 3) and women have a 24.7 percent higher hazards than men. Education is negatively associated with the hazard of experiencing an adult poverty spell holding race, gender, income and other variables constant. Compared to college graduates, high school dropouts are about three times as likely to fall into poverty during adulthood. An increase of 1 percentage point in the national unemployment rate is associated with a 5.8 percent increase in the probability of falling into poverty as an adult.

⁹ For the remainder of the analyses, our estimates are based on annual income and needs.

¹⁰ The analysis for whites with income-to-needs below 1.0 at age 25 terminates at age 55 because of small sample size.

¹¹ The series terminates at ages 55-57 for black respondents because of small sample sizes.

¹² Pair-wise race and gender interactions of all covariates were tested, but were not significant and are not shown.

Figure 4 plots the change in the additive log-hazard and multiplicative hazard as a function of income-to-needs at age 25 holding other factors constant, centered at income-to-needs of 1.0. The hazard of experiencing a poverty spell decreases quite rapidly as income-to-needs at age 25 increases. For example, the hazard of experiencing a first poverty spell is reduced by over half (56 percent) for the average person whose income-to-needs at age 25 is 2.0. For the average person with income-to-needs of 2.5 at age 25, the hazard of experiencing a first poverty spell is a third of the hazard of someone with income-to-needs of 1.0 at age 25.

Figures 2 and 3 document that the probability of falling into poverty during adulthood increases more rapidly between ages 25 and 35 than at older ages. The hazard models and cumulative probabilities discussed to this point only provide information on individuals' *first* adult poverty experience. We now analyze the amount of time a person spends in poverty after this first experience.

Across all persons, the average proportion of time spent in poverty is 6.1 percent. However, there is substantial heterogeneity in the sample. Table 2 shows the average proportion of time spent in poverty from age 25 onward by race and socioeconomic status at age 25. White respondents, on average, spend about 4.6 percent of their adult lives in poverty; blacks, 20.2 percent. The proportion of time poor declines dramatically as economic status at age 25 increases for both white and black respondents. For example, whites who are poor at age 25 will spend 47 percent of adulthood in poverty; affluent whites, only 1.3 percent. For each socioeconomic category, black respondents spend about twice the amount of time poor as their white counterparts.

e. Next Steps

For the final analysis, we will analyze heterogeneity in the proportion of time poor. We will begin with a simple descriptive table which shows the proportion time poor for people classified by the age range over which we observe them. This depends on age at first entry and the number of years we follow the person. The rows would be the age at first entry, using 10-year age ranges (25-34, 35-44...) and the columns would in be the number of years over which the proportion of time poor is calculated. Each entry would show the mean proportion of time poor, the standard error of the mean and the number of observations used to calculate that mean. Next, we will document the heterogeneity around these means by providing kernel density estimates for some of the more interesting cells and estimate multivariate models to show how proportion of time poor varies with observed characteristics. These regressions would include a polynomial in age at first entry, observed duration after first entry, and an interaction of these two variables. We would then add covariates used in the hazard models to show the impact of observed covariates.

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Figure 1: Probability of Ever Experiencing a Poverty Spell by Age, Full Sample

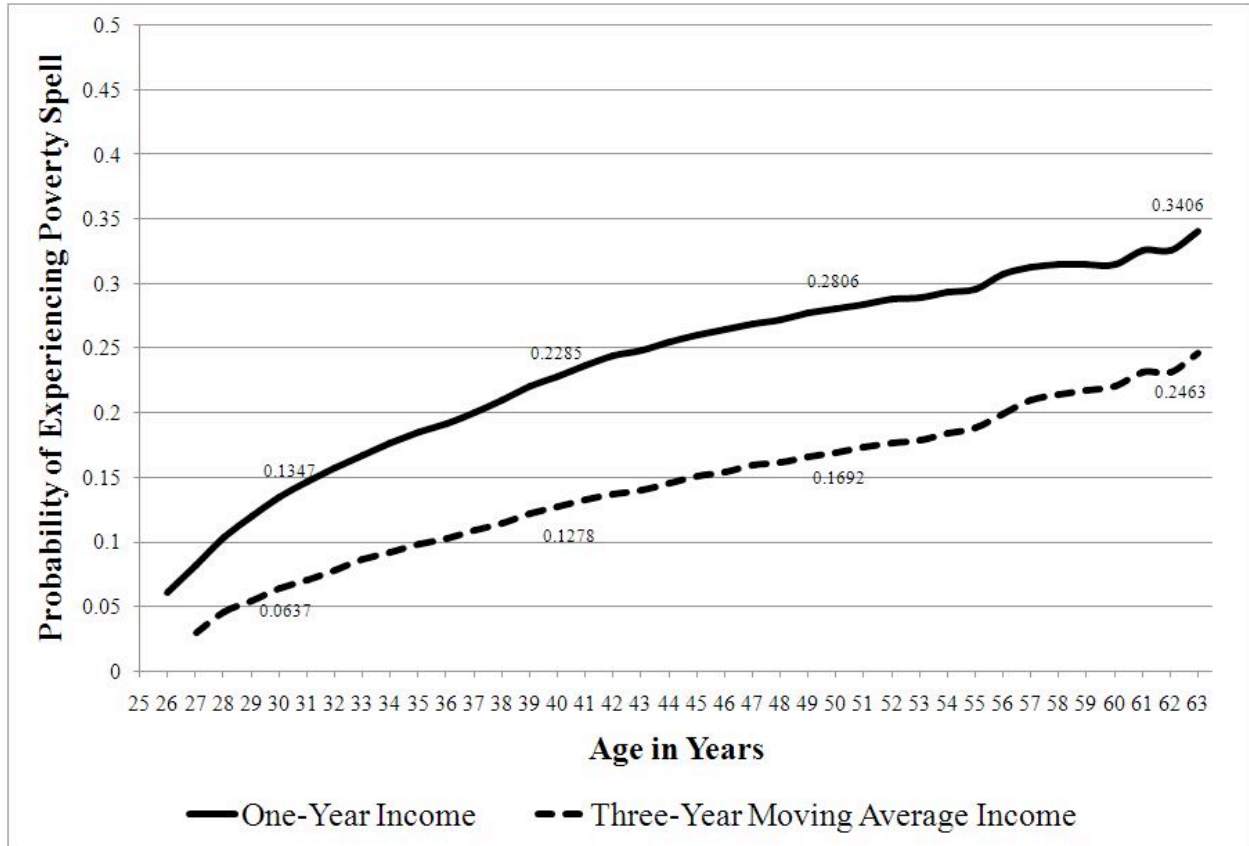


Figure 2: Probability of Ever Experiencing a Poverty Spell by Age and Economic Status at Age 25 – White Respondents Only

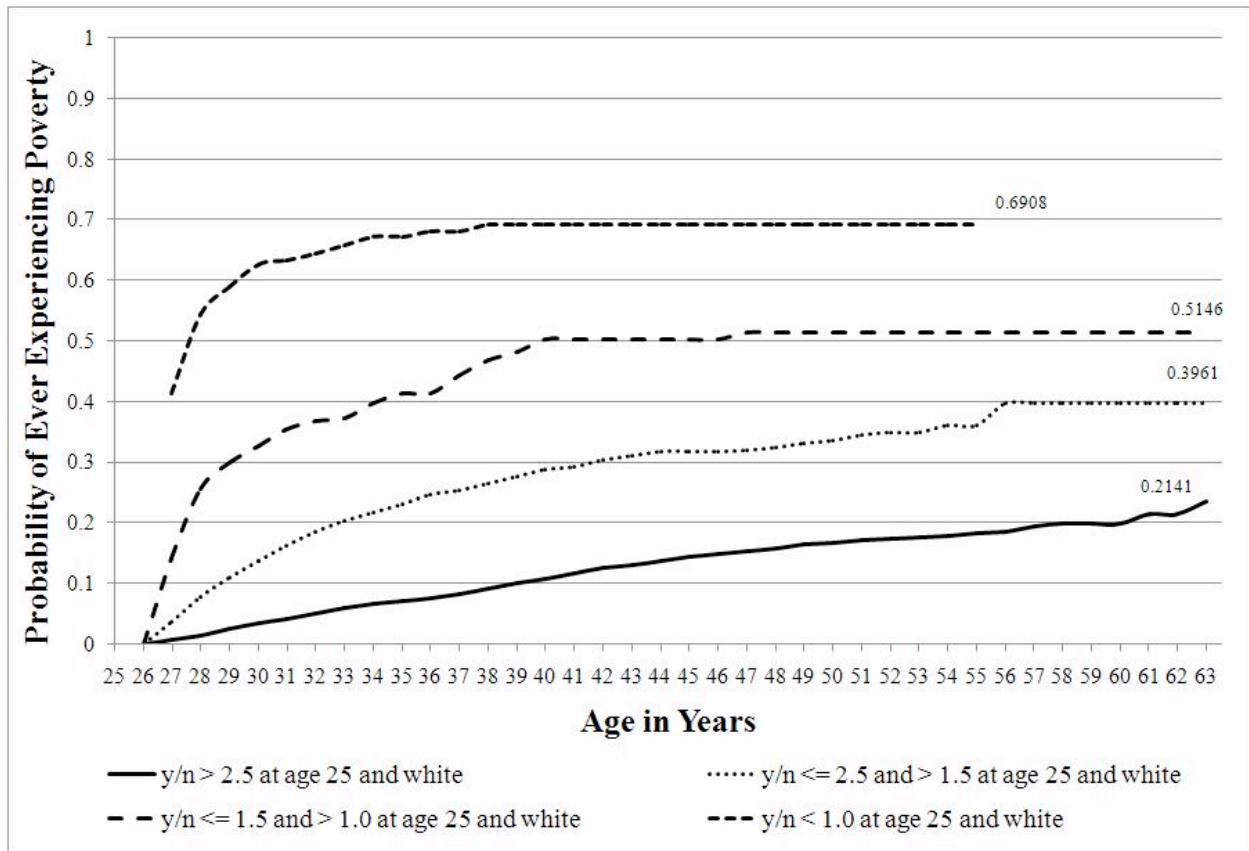


Figure 3: Probability of Ever Experiencing a Poverty Spell by Age and Economic Status at Age 25 – Black Respondents Only

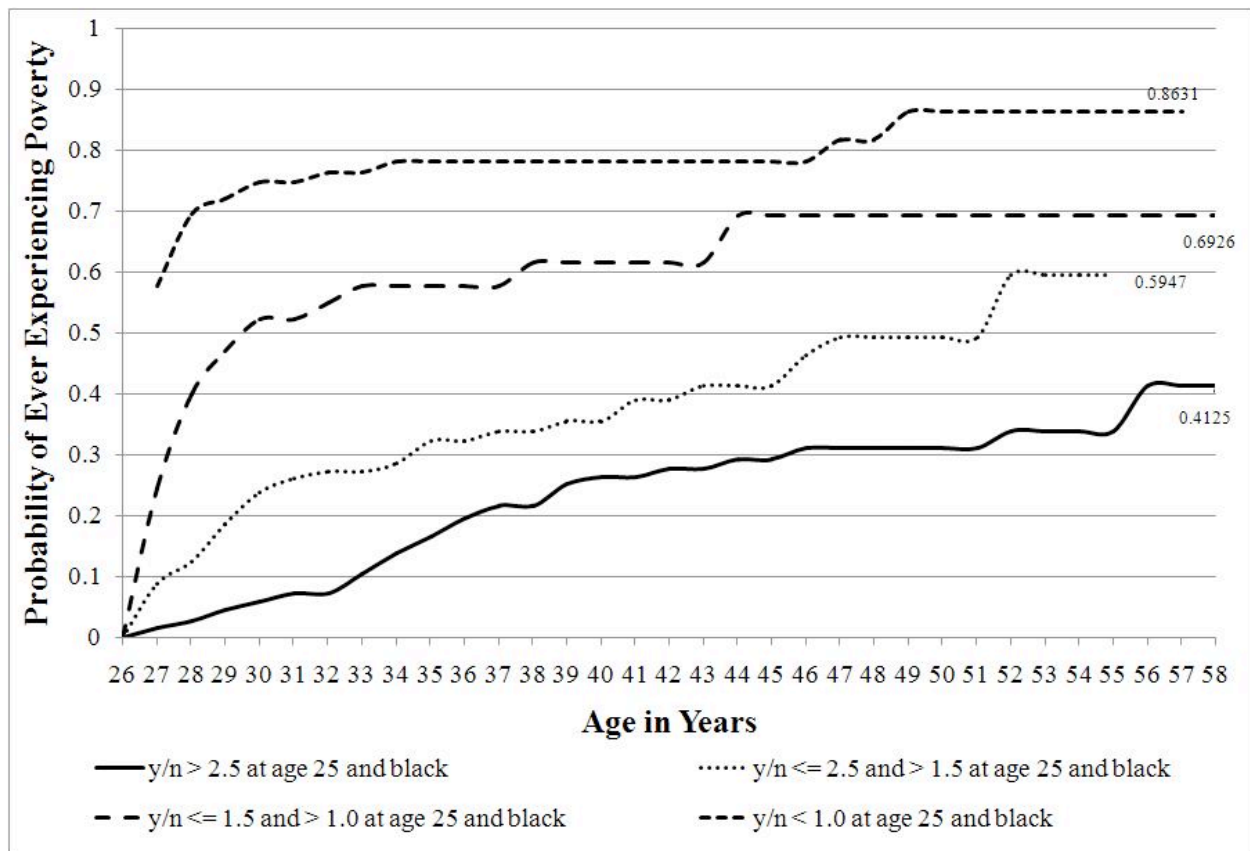


Table 1: Coefficients from Cox-Proportional Hazards Model on Experiencing a Poverty Spell

Coefficient	Model						
	1	2	3	4	5		
Black	2.93	**			1.60	**	
Female		1.32	**		1.25	**	
y/n at age 25 (>2.5 omitted)			0.27	**	0.29	**	
squared			1.16	**	1.16	**	
cubed			0.99	**	0.99	**	
Completed Education (16 years or more omitted)							
0-5 years				21.19	**	37.87	**
6-8 years				2.39	**	4.32	**
9-11 years				0.69	**	3.01	**
12 years				0.22	**	1.72	**
13-15 years				0.15	**	1.29	**
Unemployment rate						1.06	**
Year at age 25						Inc	
n=	5398	5398	5398	5398	5398	5398	

** = p<0.01; * = p<0.05

Figure 4: Additive Changes in Log-Hazard/Multiplicative Change in Hazard as a Function of Income-to-Needs at Age 25, Holding Other Factors Constant

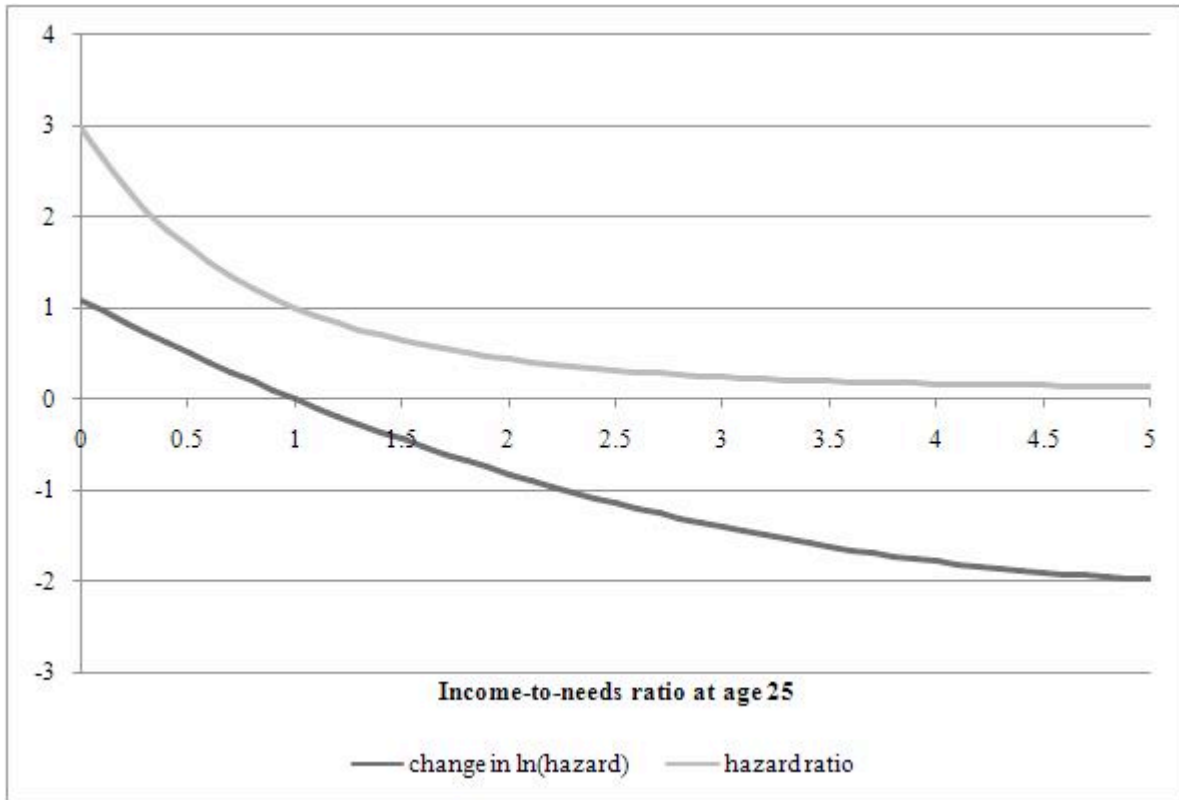


Table 2: Proportion of Time Poor by Race and Economic Status at Age 25

	Black	White
Overall	0.202	0.046
Y/N at age 25		
Less than 1.0	0.659	0.470
Between 1.0 and 1.5	0.161	0.092
Between 1.5 and 2.5	0.091	0.040
Greater than 2.5	0.028	0.013