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Skills and Proximate Poverty of Working-Age Americans

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Preface

Mitigating and reducing poverty and income inadequacy have been a major focus of federal government policy since the Great Depression. The Social Security Act of 1935 was enacted as an effort to at least reduce the "hazards and vicissitudes of life," by providing insurance against loss of income, initially for the elderly and later for insured workers, survivors, and persons with disability. Social Security became the backbone of what has now become a wide-ranging income and non-cash benefits transfer system in the United States, reducing poverty by directly supplementing the income of those at risk. Indeed, the old age insurance component of Social Security has been quite successful in reducing the incidence of poverty among the nation's elderly.

The 1960s saw a development of a second, and vastly different, set of policies to reduce poverty in the United States, policies based on the idea that bolstering the human capital (productive abilities) of individuals would lead to employment and earnings advantages in a competitive labor market. Human resource development policies that targeted the nonelderly working-age population were put in place to further develop this population's knowledge, skills, and abilities. Federal subsidies for higher education, training, and retraining programs for adults; vocational rehabilitation programs; welfare to work efforts; and many other education programs were enacted to support those with outdated or deficient human capital and left behind in a changing labor market. Powerful (and continuing) changes in the job content of the U.S. labor market placed education and training at the center of antipoverty efforts in the nation.

This new paper from the ETS Research Institute explores the role of literacy and numeracy skills as an essential part of human capital development including their relationships to the risks of poverty and income inadequacy in the United States. Between 2011 and 2018, The Program for the International Assessment of Adult Competencies (PIAAC) collected data in 39 countries on key cognitive skills including literacy and numeracy along with extensive background information. In 2017, this survey included a new question on household income, asking respondents to select from eleven income ranges to represent their total household income over the past year. This data, combined with information about household size, allowed the authors to create a poverty measure analogous to the official measure used by the U.S. Census Bureau, which considers annual income thresholds that vary by household size, age of householder, and number of children. Recognizing that the PIAAC data lack the granularity to match all poverty thresholds defined by the Census Bureau, the authors used weighted averages to approximate poverty status for households. This novel approach, while not a replacement for the official poverty measure, is offered to provide a comparable metric to explore the relationship between foundational skills and poverty in the United States using the PIAAC data.

The authors begin their paper with a rich discussion of proximate poverty among various subgroups of the working-age population in the United States, focusing on foundational skills and educational attainment. This discussion is followed by a more sophisticated slice of the data using logistic regression to explore the relationship between skills and proximate poverty. Their analyses suggest that while education plays an important role in reducing the risk of poverty, skills also play an independent and critical role. In fact, their findings suggest that a significant portion of the effect of education on reducing proximate poverty may be due to foundational skills, with the impact of education diminishing when skills are included as an independent variable.

As we continue to consider ways to alleviate poverty in the United States, the findings in this reportsuggest that learners at all stages and levels of education can be better equipped for the current labor market when their efforts are supported by strong foundational literacy and numeracy skills. Further, while there is no single solution to address poverty, this research suggests that programs aimed at improving human capital through degree attainment may be more successful if they also help learners acquire the necessary foundational skills that are often assumed to be associated with their level of education.

Poverty is a multifaceted and complex issue. By exploring the role human capital and skills play in poverty and by utilizing the novel poverty measure developed with PIAAC data, this report offers valuable insights for policymakers to help inform effective strategies for reducing poverty.

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Introduction

Since the declaration of the War on Poverty by President Johnson in 1964, research on the levels, trends, causes, consequences, and other dimensions of poverty as well as assessments of antipoverty policies has been voluminous. Haveman et al. provide an apt description of the size and scope of poverty research in the United States: "Thousands of gallons of ink have been devoted to describing the nature of the War on Poverty and analyzing the effects of the War and related legislation."[1] Yet, there is little consensus on the causes of poverty, at least among the nonelderly population.[2] More sophisticated data and methods for analyzing that data have revealed that poverty is a far more complex problem than the architects of the Great Society imagined 60 years ago. Indeed, at that time the basic measure of poverty was a blunt instrument still in its infancy.[3]

In their review of findings from research studies examining the dynamics of poverty (entry into and exit from poverty), Cellini, McKernan, and Ratcliffe write that it is not possible to have a single theory to explain why people are poor because several factors are likely to cause poverty, including but not limited to earnings, family composition, asset accumulation, transfer programs, and the economy, and they claim that many of these factors are likely to be interrelated.[4]

Antipoverty policies in the United States are designed to increase incomes of the poverty population through direct cash and in-kind transfer payments or by increasing the employment and earnings of the poverty population through labor market–related education and training programs. Antipoverty policies can therefore be broadly classified into two groups. One set of policies targets incomes by providing a safety net in the form of direct payments to raise household incomes at the lower end of the income distribution. Another set of polices targets the human capital of individuals. These policies focus on raising the human capital of people to lift them out of poverty by direct delivery of education and training programs designed to bolster the productive abilities of participants (to increase their employment and earnings) or by financing these programs. Antipoverty policies that target human capital accumulation typically focus on education including early childhood education, K through 12, and postsecondary education and on training through second chance programs such as adult basic education and workforce development programs.

Most research studies on the links between poverty/income inadequacy and human capital include educational attainment but not foundational (literacy and numeracy) skills as a measure of human capital. Exclusive focus on educational attainment as a measure of human capital in poverty research results in an overestimation of the strength of the connection between education and poverty.[5] While education and foundational skills are closely related, previous papers in this series have found large and significant effects of foundational skills on earnings and other labor market outcomes of working-age adults in the United States, even after regression controls for the other two important measures of human capital: educational

attainment and work experience.[6] Because foundational skills have a strong and independent effect on earnings and other labor market outcomes, we would expect foundational skills to have a similarly strong, but negative effect on the likelihood of poverty.

One of the reasons for the widespread use of educational attainment in poverty (and other) research is the easy availability of data on schooling levels from large nationally representative databases like the Current Population Survey (CPS) and the American Community Survey (ACS).[7] These surveys capture data on social, economic, housing, and transportation experiences of individuals and the households in which they reside. Unfortunately, these surveys do not provide data on foundational skills of respondents. Large nationally representative databases that provide data on a wide array of variables such as educational attainment, income, poverty, and other individual and household traits as well as foundational skills of respondents to the survey are hard to come by, limiting researchers to using educational attainment and perhaps work experience as the primary measures of human capital.

The Programme for the International Assessment of Adult Competencies (PIAAC) database is a rich source of nationally representative information on the foundational skills of adults along with other data such as basic demographic and socioeconomic traits, educational attainment, labor market outcomes, past work experience, work responsibilities, skills used at work and outside of work, literacy practices, civic engagement, and data on personal characteristics, health, and general background information of respondents.[8] However, until the third survey round conducted in 2017, the PIAAC survey did not gather the data on household income that is required to estimate poverty/income inadequacy status of respondents. A question on household income was added to the 2017 PIAAC survey that created a unique opportunity to study the link between foundational skills and poverty in the United States.

Although the 2017 PIAAC data file includes data on household incomes, it does not provide the data on the poverty status of respondents that are available in CPS and ACS public use micro data files. Therefore, we have developed a methodology to mimic the measurement of the US Census Bureau's official poverty measure (OPM) using 2017 PIAAC data on household income and household size to produce estimates of poverty. The methodology that we have developed is a modified version of the OPM approach and is able to accommodate restrictions in the way in which household income and household size data are reported in PIAAC data. The poverty measure that we have produced with 2017 PIAAC public use data does not perfectly match the OPM but serves as a close approximation of it: *a proximate poverty measure*. A summary description of the proximate poverty measure is provided in the Creating the Proximate Poverty Measure section below and a detailed description of our methodology is provided in Appendix B.

About the Data

Results reported in this paper are based on the 2017 PIAAC public use data file for the United States.[9] The 2017 PIAAC was the third round of PIAAC surveys following the first and second survey rounds completed in 2012 and 2014. The 2017 PIAAC survey was conducted between March 2017 and September 2017 with a nationally representative sample of 3,660 adults between the ages of 16 and 74.

The PIAAC survey instrument includes a background questionnaire as well as cognitive assessments of the literacy and numeracy proficiencies of respondents. Data collection was conducted by personal visit where a comprehensive background questionnaire was administered and followed by a direct assessment of literacy and numeracy collected on paper and by computer. In order to limit the time burden on respondents, the PIAAC skills assessment does not administer every skill proficiency question to respondents. The skills assessment employs an adaptive design that begins with a set of short, easy literacy and numeracy items.[10]

Because of the use of an adaptive questionnaire, PIAAC employs an item response theory scaling method that uses the regularities in response patterns to model the commonalities among items. PIAAC provides plausible values (PV) for literacy and numeracy test scores, which are multiple imputations, based on prior empirical evidence. PVs are a statistical means to replicate a probable score distribution that summarizes how well each respondent answered a small subset of the assessment items and how well other respondents from a similar background performed on the rest of the assessment item pool. These PVs are estimated using item response theory models. Ten PVs for literacy and numeracy test scores are provided in the PIAAC data file. Both the literacy and numeracy measures are produced on a scale of 0 to 500. PIAAC proficiency measures presented in this report, for the descriptive and regression-based analysis and associated measurement errors, are estimated using 10 PVs.[11]

Questions on the 2017 PIAAC background survey were mostly the same as the first round (2012) and the second round (2014) with a few exceptions. One of the new questions added to the 2017 PIAAC background questionnaire asked respondents to report the level of their household income. Of the 3,660 respondents to the 2017 US PIAAC survey, 3,140 respondents had provided a valid response to the question about household income. Because proximate poverty status of individuals cannot be ascertained without information on their household income, the 520 respondents without valid information on household income are excluded from the analysis in this paper. The descriptive analysis presented in this paper is based on 3,140 sample cases. In the regression analysis, we have excluded 21 additional respondents because of missing information on some of the independent variables included in these regressions. As a result, the regression analysis in this paper is based on 3,119 sample cases.

Creating the Proximate Poverty Measure

As noted above, the background questionnaire for the 2017 PIAAC survey included a new question on household income that was not included in the background questionnaire used in the 2012 and 2014 PIAAC surveys. Respondents to the 2017 PIAAC survey were asked to select one out of eleven household income ranges that best fit the approximate total income of all persons in their household over the preceding 12 months. Respondents were asked to include all income for people living in their household including income from jobs, investments, Social Security or retirement, and welfare. Data gathered from the household income question on the survey are provided with the following 11 household income categories in the PIAAC public use data file:[12]

1. Between $1 and $9,999
2. Between $10,000 and $19,999
3. Between $20,000 and $29,999
4. Between $30,000 and $39,999
5. Between $40,000 and $49,999
6. Between $50,000 and $59,999
7. Between $60,000 and $74,999
8. Between $75,000 and $99,999
9. Between $100,000 and $149,999
10. $150,000 or more
11. No household income

The PIAAC questionnaire also asked respondents to report the total number of persons living in their household (household size). The household size data in the 2017 PIAAC public use data file includes households with one person, two persons, three persons, four persons, five persons, six persons, and seven or more persons.

The official poverty threshold matrix as established by the Office of Management and Budget (OMB) is based on household cash income and household/family size. The inclusion of measures of household size and income on the 2017 PIAAC questionnaire created the opportunity to produce a measure of income inadequacy analogous to the official measure of poverty and connect these findings to measures of foundational skills.

To create a poverty measure with PIAAC household income information, we used the official poverty income threshold matrix produced by the US Census Bureau. The OPM in the United States was established by the OMB in 1969.[13] The OPM is based on annual dollar amounts of income thresholds that vary by household/family size, age of householder, and number of related children under age 18 that reside in the household. If the total annual cash income of

a household/family of a given size is below the income threshold for a family/household of that size, then all individuals living in that family/household are considered poor. Each year, the official poverty income thresholds are adjusted for inflation by the US Census Bureau.

The US Census Bureau defines poverty with 48 separate poverty income thresholds by household size (one to nine members), age of householder (under 65, and 65+) for single- and two-person households, and number of related children under 18 years old (no children to eight or more children). Unfortunately, these 48 poverty income thresholds cannot be used with PIAAC data that lack the granularity needed to identify the 48 household subgroups classified by household size, age of householder, and number of related children under 18.

However, the Census Bureau provides weighted averages of the poverty thresholds by household size from single-person households to households of 9 or more persons.[14] With a little modification, we use these weighted averages to determine the poverty status of households included within the PIAAC data. The first modification pertains to the household size. PIAAC data provide household size of one person to seven or more persons whereas the weighted average official poverty income thresholds are provided for household sizes ranging from one person to nine or more persons. Using the poverty thresholds for households with seven, eight, and nine or more persons, we have computed a weighted average poverty income threshold (weighted by number of households with seven, eight, and nine or more persons) for households with seven or more persons. And we have used the modified (for household sizes of one to seven or more persons) weighted average poverty income thresholds for 2016 and 2017 to define poverty status with 2017 PIAAC data.[15]

The second modification pertains to household income. PIAAC data lack granularity in the measurement of household income required to match the official poverty income thresholds. The 2017 PIAAC public use data file does not provide a continuous measure of household income. Rather, as noted above, the measure of the household income of individuals is provided in the form of 11 categories/ranges of household income. We have matched the 2016–2017 weighted average poverty income thresholds with the 11 household income categories and seven household sizes available in the 2017 PIAAC public use data file to identify household income categories for each of the seven household sizes that represent the poverty income threshold for households of that size (Table 1).

Individuals residing in a household of a given size are classified as being proximate poor if their household income category in the PIAAC data file was at or below the poverty threshold household income category for households of that size (Table 1). For example, individuals living in a three-person household are classified as proximate poor if their household income was zero (Category 11) or between $1 and $9,999 (Category 1) or between $10,000 and $19,999 (Category 2).

Table 1: PIAAC Household Income Categories That Are Matched with the Official Poverty Thresholds for Each of the Seven PIAAC Household Sizes, US, PIAAC 2017

PIAAC HOUSEHOLD SIZE	HOUSEHOLD INCOME CATEGORY NUMBER	2017 PIAAC HOUSEHOLD INCOME CATEGORY MATCHED TO OFFICIAL POVERTY INCOME THRESHOLDS
1-person household	1 & 11	No household income or $1 to $9,999
2 people	2	$10,000 to $19,999
3 people	2	$10,000 to $19,999
4 people	3	$20,000 to $29,999
5 people	3	$20,000 to $29,999
6 people	4	$30,000 to $39,999
7 or more people	4	$30,000 to $39,999

As noted previously, our estimates of proximate poverty are based on the official poverty income thresholds produced by the US Bureau of the Census. The OPM is based on the level of cash income needed to meet basic needs calculated as 3 times the cost of a minimum food diet in 1963 and is adjusted each year for inflation.[16] Over the years, the official poverty thresholds have remained unchanged despite changes in consumption patterns, taxes, and government benefits. This has led to an extensive body of literature about the shortcomings of the OPM that serves as a measure of wellbeing as well as for policy and resource allocation purposes in the United States.[17] Our measure of proximate poverty is not meant to serve as an alternative to the official measure of poverty or any alternatives to that measure such as the Census Bureau's Supplemental Poverty Measure. Rather, it is designed to create a measure of poverty from the 2017 PIAAC public use data that is conceptually comparable to the OPM and can be used to explore the connections between foundational skills and poverty/ income inadequacy in the United States.

Organization of this Paper

Poverty is a complex problem, and research studies have found a wide array of factors that influence the likelihood of poverty. In their review of findings from research studies that have used longitudinal data to examine the dynamics of poverty (entry into and exit from poverty), Cellini, McKernan, and Ratcliffe conclude that it is not possible to have a single theory to explain why people are poor because a number of factors are likely to cause poverty, including but not limited to earnings, family composition, asset accumulation, transfer programs, and the level and composition of aggregate economic activity. Adding to these various indicators, these authors convincingly argue that many of these factors are likely to be interrelated.[18] In this paper, we explore the complexities of poverty in the United States using the 2017 PIAAC household income data and the proximate poverty household income thresholds described above.

The paper is organized into three sections, with the first section providing a descriptive account of the prevalence of proximate poverty among different subgroups of the working-age population of the United States, particularly among subgroups with different levels of human capital, which we define as foundational skills (literacy and numeracy skills) and educational attainment. The second section presents findings from logistic regression models that are designed to measure the association between skills and the likelihood of proximate poverty among working-age individuals[19] with regression controls for educational attainment and health status of individuals, their employment status and history, household living arrangements, demographic characteristics, and the region in which they reside. The final section of this paper highlights the implications of the findings on antipoverty strategies in the United States. In this section, we recommend that in addition to income maintenance efforts to reduce poverty in the United States, we should focus on raising the productive abilities of adults. Human resource development strategies should avoid what sometimes appears as a singular focus on credential attainment and recommit to the development of the literacy and numeracy skills of American students.

Descriptive Analysis: The Proximate Poverty Rate of Working-Age Adults

The discussion that follows is organized along broad categories of factors that are closely connected with the risk of poverty and economic disadvantage, including human capital characteristics, labor market status, and household living arrangements.

Our analysis of the PIAAC data finds that the 2017 proximate poverty rate among the 16- to 74-year-old population was 14.6 percent (Table 2). About one in seven working-age Americans were living in proximate poor households, defined as households with incomes below the proximate poverty threshold for their household size. For comparison purposes, Table 2 also presents poverty estimates from two national public data sources: the ACS and the CPS. Estimates of the poverty rate or any measure from different databases are expected to be similar but not identical. Using the same estimation method and poverty income thresholds, the 2017 poverty rate estimated from the March CPS data (11.3 percent) was similar but not identical to the 2017 poverty rate estimated from ACS data (11.8 percent; Table 2). The proximate poverty rate derived from the PIAAC data is notably higher than the "official" poverty measures estimated from CPS data, as well as from the ACS findings for the nation.

Table 2: A Comparison of the Proximate Poverty Rate Estimated from the 2017 PIAAC Public Use Data File with the Official Poverty Rate Estimated from the 2017 March Current Population Survey and 2017 American Community Survey Public Use Data Files, US (Standard Errors in Parentheses)

DATA SOURCE	RATE ESTIMATED
PIAAC 2017 (proximate poverty)	14.6 (0.80)
March CPS 2017 (official poverty)	11.3 (0.13)
ACS 2017 (official poverty)	11.8 (0.04)
Difference between PIAAC and March CPS	3.3
Difference between PIAAC and ACS	2.8

Note: CPS = Current Populations Survey; ACS = American Community Survey.
Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017; US Census Bureau, American Community Survey, Public Use Microdata Sample (PUMS), 2017; US Census Bureau, Current Population Survey March Supplement, Public Use Micro Datafile, 2017. Tabulations by authors.

The proximate poverty rate estimated from PIAAC data is expected to be different from the CPS and ACS estimates, not just because it is a different database, but also because of the modifications in the methodology necessary due to data availability restrictions in the 2017 PIAAC public use data file—household income reported in ranges and not continuous amounts, and limited information on household composition and size. Because of the differences in the measures of household incomes and the use of poverty income thresholds that only approximate OMB poverty income thresholds, our measure of poverty approximates the official measure of the US poverty rate. The result is that our indicator of poverty/income inadequacy, the proximate poverty rate, is modestly higher than the official poverty rate.

Proximate Poverty and Human Capital

Much of the economics literature on poverty/ income inadequacy focuses on links between human capital and the likelihood of poverty. Economists define "human capital" as a measure of the productive potential of human resources in the production of goods and services. Human capital is the stock of knowledge, skills, abilities, behavioral characteristics, and other traits of individuals that contribute to this productive potential. Although it is typically measured by formal educational attainment, economists also use skills and work experience as expanded measures of human capital when these data are available. The development of human capital requires individuals to invest in themselves mostly through education, training, and work experience to develop the cognitive capacity that makes them more productive in the labor market.[20] Although the returns to human capital investments are most often measured in the labor market, they also can be found in other economic and social domains.[21]

As noted previously, the proximate poverty status of individuals is determined by comparing their household income to the proximate poverty income threshold for households of the same size. Income can be derived from market activities such as earnings from employment, self-employment income, investment income, and rental income or from government income support efforts including old age, survivors, and disability income (social security insurance programs); unemployment insurance compensation; cash public assistance such as Supplemental Security Income payments; and other federal, state and local cash income transfer programs. However, a large part of income for most working-age adults is derived from paid employment in the labor market. Therefore, employment status is expected to be an important influence on the probability of poverty for a working-age adult.

A large body of research has consistently demonstrated a very close relationship between the human capital traits of workers and their earnings.[22] As noted above, higher levels of human capital—education and skills—represent a higher productive capacity in the labor market. Individuals with higher levels of human capital are not only more likely to engage in the labor market, more likely to be employed, and less likely to be unemployed, but when they are employed, workers with higher levels of human capital are more likely to earn higher wages and are therefore less likely to be poor.

Previous papers in this series found that even after statistically controlling for the effects of other variables (including educational attainment) on earnings, workers with higher skills enjoy sizeable earnings premiums compared to their lower skilled counterparts, and similarly, workers reap large earnings premiums for higher levels of education after statistical controls for the effects of skills and other variables. Our research has also found that besides earnings, workers also enjoy other labor market benefits from higher levels of skills and educational attainment—higher rates labor force participation, employment, and full-time employment; higher rates of work experience and employer-provided training; lower rates of unemployment; and shorter durations of unemployment.[23]

Below, we examine the connections between proximate poverty and two measures of human capital: educational attainment and skills.

Proximate Poverty and Educational Attainment

Although there are multiple causes of poverty, the link between education and poverty has been an important focus of a large body of research.[24] Education and poverty are closely connected because of the very strong positive influence of education on earnings, which is the largest component of the household income of the working-age adult population.

Research by the Learning and Work Institute of the Joseph Rowntree Foundation in the United Kingdom has identified the following three avenues through which education can affect poverty (they use the term *skills* in the paper but they define skills loosely to include education, learning, training): (i) work and income: individuals with higher levels of education/

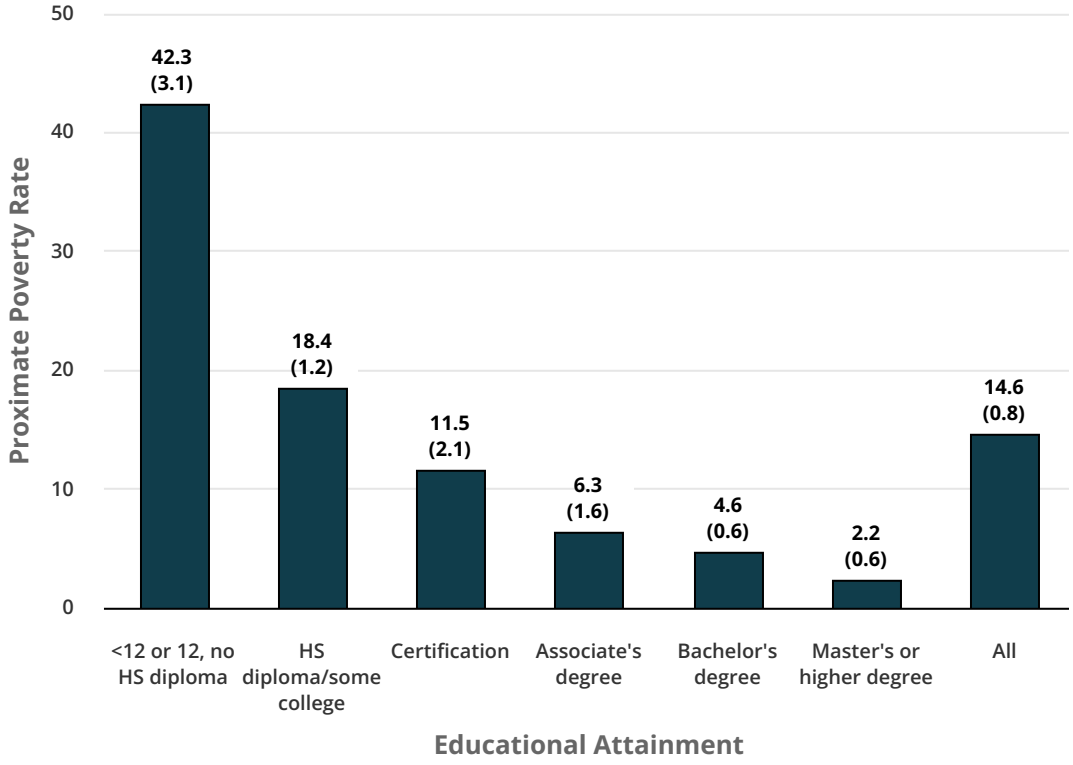
training are more likely to work, work full-time, and have higher earnings; (ii) social inclusion and active citizenship: individuals with higher levels of education/training are more likely to participate in learning, voting, and community engagement; have better health behaviors from better understanding of health information; and have better financial capability resulting in higher savings and assets; and (iii) intergenerational: parents with higher levels of education/training can help children attain better educational outcomes.[25]

Considerable research documents the negative effect of poverty on education, particularly the adverse impact of growing up in a poor household on the educational attainment of children.[26] Studies cite a number of factors such as a lack of resources and opportunities as well as poor health, nutrition, preschool education, and so on[27] that cause children raised in poor families to begin school with a sizeable deficit in school readiness that is exacerbated over time, resulting in poor school outcomes and low levels of attainment. Educational attainment, particularly at the postsecondary level, has increasingly become the fault line between a life of poverty and one of increased social and economic opportunities. Children raised in poverty have a lower chance of success in school and of completion of high levels of education, and their low levels of attainment in turn place them at a high risk of continued poverty into adulthood, resulting in the intergenerational transfer of poverty and lack of social and economic opportunities from their parents to them.

Our examination of 2017 PIAAC data yields an important, but unsurprising, finding of the close negative relationship between the proximate poverty rate and educational attainment. Findings presented in Figure 1 reveal sharp reductions in the proximate poverty rate, with higher levels of educational attainment among working-age adults. These findings reveal a very high proximate poverty rate of 42 percent among adults without a high school diploma. The proximate poverty rate of those with just a high school diploma along with those individuals who enrolled in college but never earned an award, was 18.4 percent; a rate that was less than half compared to that of high school dropouts. Among adults with higher levels of educational attainment, the proximate poverty rate fell sharply to 4.6 percent among those with a bachelor's degree and only 2.2 percent among those with a master's or higher degree.

Because of the sharply higher proximate poverty rates of working-age adults with lower levels of education compared to their counterparts with higher levels of education, we can expect wide differences in the educational human capital stock between proximate poor adults and their non-proximate poor counterparts. Indeed, a comparison of the educational attainment of working-age adults by their proximate poverty status reveals sharply lower educational human capital of proximate poor adults compared to their counterparts with incomes above the proximate poverty level (Figure 2). Almost one-third (32.1 percent) of proximate poor adults did not complete high school; more than 4 times the share (7.5 percent) among their non-proximate poor counterparts.

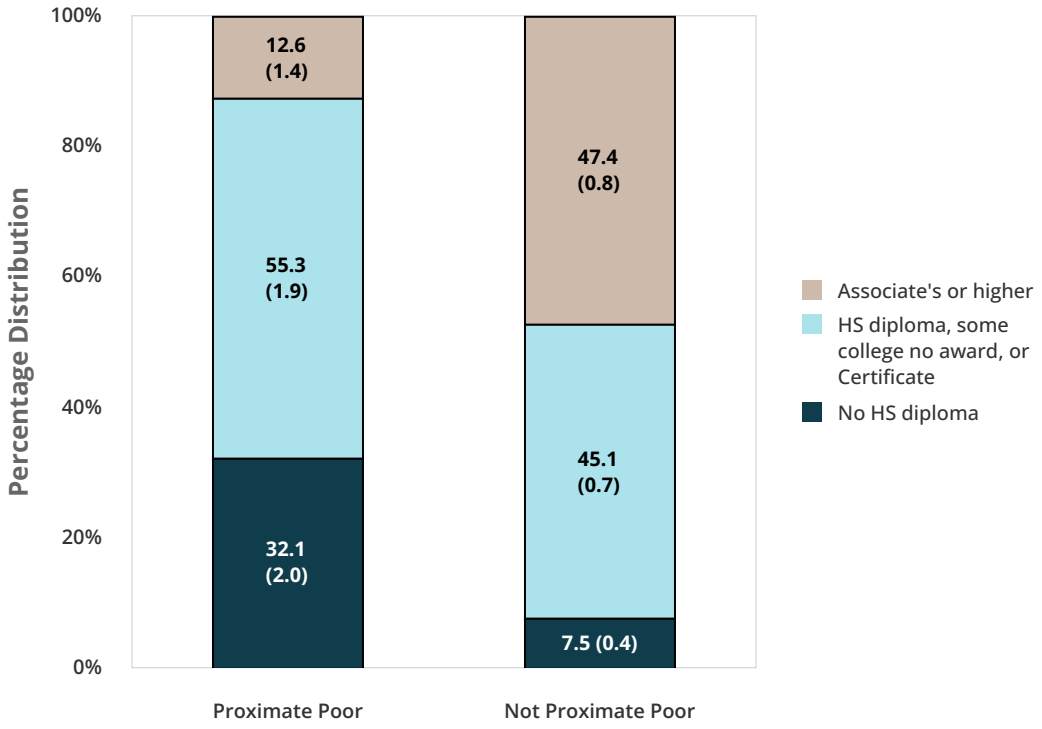
Figure 1: Proximate Poverty Rate of the 16- to 74-Year-Old Persons in the US, by Educational Attainment, PIAAC 2017 (Standard Errors in Parentheses)



Note: HS = high school.

Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

Figure 2: Percentage Distribution of 16- to 74-Year-Old Proximate Poor and Non-Proximate Poor Persons by Educational Attainment in the US, PIAAC 2017 (Standard Errors in Parentheses)



Note: HS = high school.

Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

At the upper end of the education spectrum, only 12.6 percent of proximate poor adults had earned a college degree (associate's or higher). In contrast, nearly 4 times as many non-proximate poor adults (47.4 percent) had earned an associate's or higher college degree (Figure 2).

Proximate Poverty and Foundational Skills

Studies of the link between foundational skills and poverty are very scarce, likely because of a dearth of large statistically reliable databases that contain measures of skills as well as poverty.[28] Indeed, it was not until 2017 that the PIAAC survey added a question on household income allowing us to compute an approximate measure of poverty and explore its association with skills.

The widespread availability of data on education and other important variables in large scale databases like the ACS and CPS results in frequent use of education as a proxy for skills. However, the use of education as a proxy for skills is not ideal and often results in incorrect

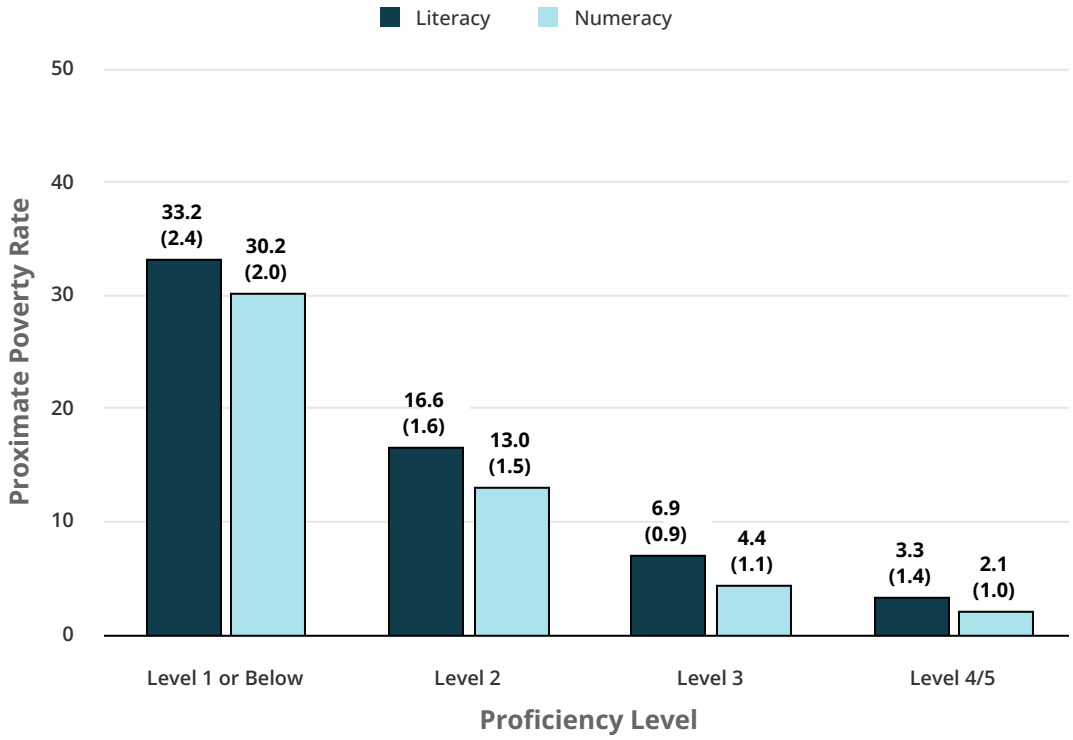
assumptions about the skills of individuals that can exaggerate the role of educational credentials in influencing life outcomes.[29] In a previous paper in this series, we found sharp differences in both literacy and numeracy proficiencies across working-age adults with the same level of education. In an earlier analysis of the PIAAC data we found that a surprising share of college graduates have low literacy and numeracy scores. Almost one-fifth (19 percent) of all employed college graduates (with a bachelor's degree or higher), over 21 percent of those with just a bachelor's degree, and nearly 15 percent of those with a master's or higher degree had literacy skills below Level 3.[30] Skill Level 3 is considered the fundamental standard for literacy and numeracy proficiencies associated with more positive economic, social, and educational outcomes.[31]

The addition of household income to the 2017 PIAAC background questionnaire offers a unique opportunity to directly examine the connection between skills and poverty instead of relying exclusively on educational credentials as a proxy for skills. Our examination of the relationship between skills and poverty reveals an extraordinarily strong negative link between the levels of literacy and numeracy proficiency and the proximate poverty rate.[32] The findings in Figure 3 reveal that higher levels of literacy and numeracy proficiencies are associated with sharply lower proximate poverty rates among working-age adults in the United States.

The proximate poverty rate of adults with the lowest level of literacy proficiency (Level 1 or lower) was 33 percent, twice as high as the proximate poverty rate of those with Level 2 literacy proficiency (16.6 percent). The likelihood of proximate poverty declines precipitously among adults with higher levels of literacy skills: 7 percent among those with Level 3 literacy skills, and only 3 percent among those with the highest level of literacy skills, Levels 4 or 5. A comparison of the proximate poverty rates of working-age adults by levels of their numeracy proficiency found similarly large gaps (Figure 3).

Higher rates of proximate poverty among adults with lower levels of literacy and numeracy proficiencies imply a much lower stock of foundational skills among proximate poor adults. Findings presented in Table 3 reveal substantial gaps by proximate poverty status in the mean skills scores of working-age adults. The mean literacy score of proximate poor adults was 42 points lower than their non-proximate poor counterparts (235 vs. 277). This is a difference of 0.84 of 1 standard deviation of the 2017 PIAAC literacy proficiency score for US adults. On the numeracy scale, the gap between the mean scores was even larger: a mean score of 209 for proximate poor adults versus 263 for non-proximate poor adults, representing a difference of 54 points or 0.90 of 1 standard deviation of the 2017 PIAAC numeracy proficiency score for US adults.

Figure 3: Proximate Poverty Rate of the 16- to 74-Year-Old Population in the US, by Literacy and Numeracy Proficiency Levels, PIAAC 2017 (Standard Errors in Parentheses)



Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

Table 3: Mean Literacy and Numeracy Scores of 16- to 74-Year-Old Persons in the US,by Their Proximate Poverty Status, PIAAC 2017

DOMAIN	PROXIMATE POOR	NON-PROXIMATE POOR	DIFFERENCE
Mean Literacy Score	235 (2.4)	277 (1.4)	-42 (2.7)***
Mean Numeracy Score	209 (2.4)	263 (1.5)	-54 (2.8)***

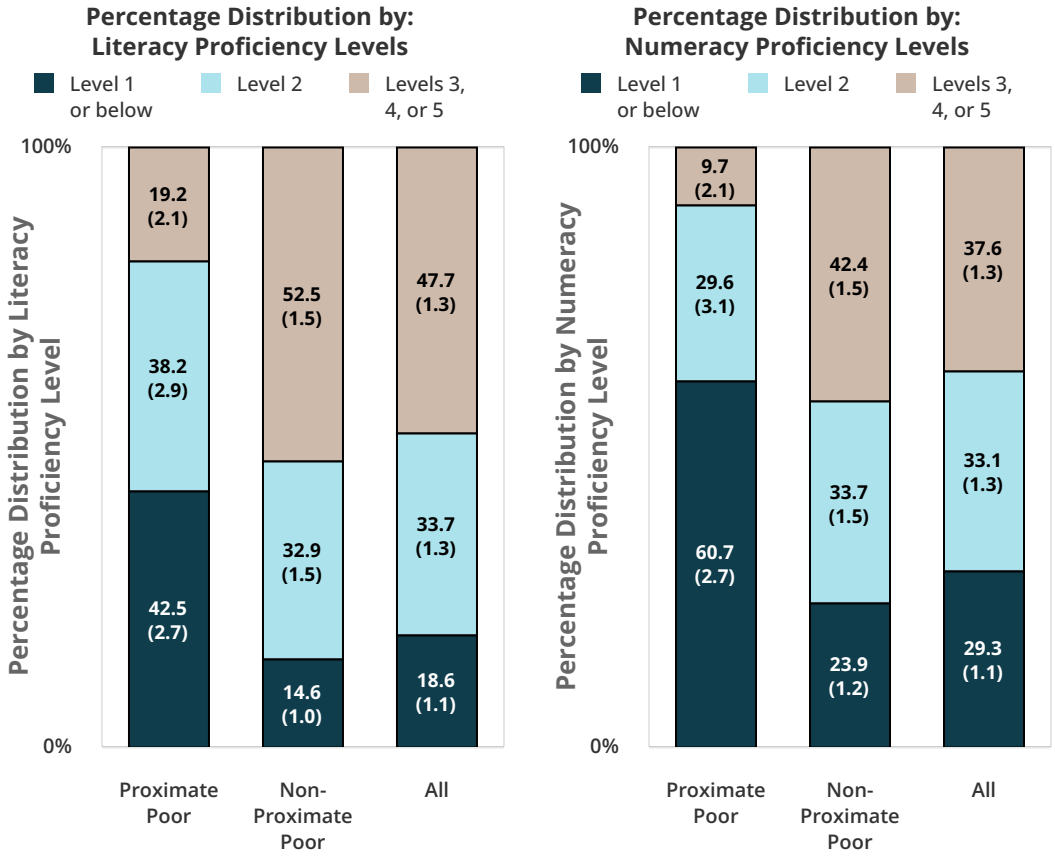
Statistical significance: *** sig. at .01 level, ** sig at .05 level.
Source: Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

Although the mean skill scores highlight the difference in the average skills between proximate poor and non-proximate poor adults, a comparison of the distribution of proximate poor and non-proximate poor adults by the level of their literacy and numeracy proficiencies provides insights into the skill distribution of the two groups. Findings presented in Figure 4 reveal sizeable concentrations at the lower end of the skill distribution among proximate poor working-age adults compared to their non-proximate poor counterparts. Nearly 43 percent of

adults classified as proximate poor scored at or below Level 1 of the PIAAC literacy scale; nearly 3 times the 15 percent share of non-proximate poor adults who scored at or below literacy Level 1. At the upper end of the skill distribution only one in five proximate poor adults achieved a literacy proficiency score at Level 3 or higher compared to over half of their non-proximate poor counterparts.

Skill distribution gaps between proximate poor and non-proximate poor adults are even greater on the numeracy proficiency measure. Six out of ten proximate poor adults scored at or below Level 1 on the numeracy test compared to one in four of their non-proximate poor counterparts. And at the upper end of the numeracy proficiency distribution, fewer than 10 percent of the proximate poor scored at or above Level 3 compared to 42 percent of non-proximate poor adults.

Figure 4: Percentage Distribution of 16- to 74-Year-Old Proximate Poor and Non-Proximate Poor Persons in the US, by Literary and Numeracy Proficiency Levels, PIAAC 2017 (Standard Errors in Parentheses)



Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

These findings on the connections between proximate poverty and the two measures of human capital used in this paper (education and foundational skills) reveal an extraordinarily strong negative relationship between the level of human capital and the risks of living in a poor household among the working-age population in the United States. The risk of proximate poverty is considerably higher among working-age adults with lower levels of educational attainment and foundational skills than their counterparts with higher levels of education and skills. Comparisons of the human capital characteristics of the proximate poor and non-proximate poor populations reveal sizeable human capital gaps between the two groups and a severe human capital deficiency among proximate poor working-age adults in the United States.

Proximate Poverty and Employment

Engagement and success in the labor market is closely related to the likelihood of poverty. Most families and households report that a large part of their income is derived from earnings in the labor market. Therefore, engagement and success in the labor market are expected to be closely related to the likelihood of proximate poverty. The risk of proximate poverty is expected to be lower among working-age individuals who are employed than those who are not employed. And among those who are employed, individuals who work more intensively (a greater number of hours of work) are less likely to experience proximate poverty.

One of the questions on the PIAAC background survey asks respondents about their employment status at the time of the PIAAC survey and in the past. Respondents were asked to report whether they were employed currently (at the time of the 2017 PIAAC survey). Respondents who reported that they were currently jobless were asked to select one of the following three options about the timing of their most recent employment experience:

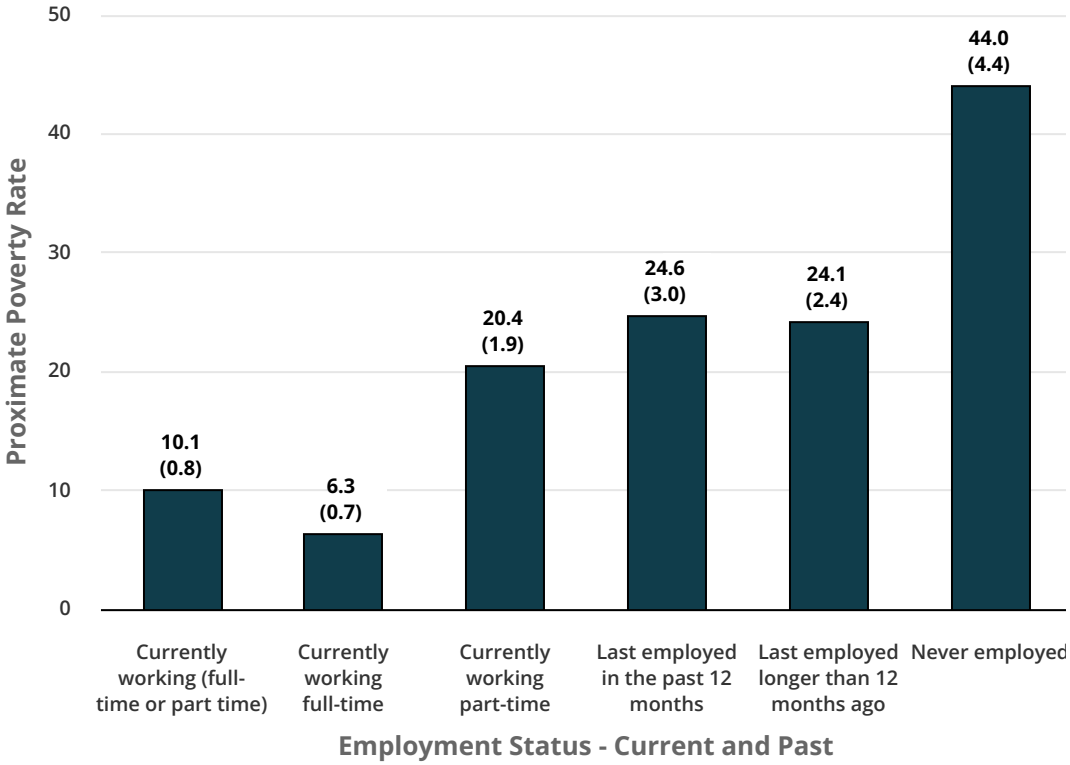
- Jobless now, but employed sometime during the previous 12 months,
- Jobless now but employed sometime prior to the last 12 months, or
- Jobless now and never worked in the past.

Respondents currently employed (at the time of the PIAAC survey) were asked to report their weekly hours of employment. We use the weekly hours of employment to classify workers into full-time (35-plus weekly hours) and part-time (less than 35 weekly hours) workers, a usual standard to distinguish between full-time and part-time employment.[33]

Findings from our examination of the proximate poverty rates of working-age adults by their current (at the time of the 2017 PIAAC survey) employment status and past employment experience are presented in Figure 5. The proximate poverty rate among working-age adults who were employed at the time of the PIAAC survey was a surprisingly high 10 percent.[34] However, we found considerable difference in the proximate poverty rate by weekly hours of work. Workers supplying more hours of labor per week were much less likely to have

household incomes below the proximate poverty thresholds. The proximate poverty rate was 6.3 percent among full-time workers, more than a third lower than the proximate poverty rate of 20.4 percent among part-time workers. Among those who were not employed at the time of the PIAAC survey but had worked at some point in the past 12 months or at some point prior to the past 12 months, the proximate poverty rate was about 25 percent.

Figure 5: Proximate Poverty Rate of the 16- to 74-Year-Old Population in the US, by Recent and Past Employment Status, PIAAC 2017 (Standard Errors in Parentheses)



Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

The group with the highest risk of proximate poverty consisted of those with no previous employment experience. This group of individuals who were not employed at the time of the 2017 PIAAC survey and had no prior employment experience includes young people, some of whom may not have had the opportunity for prior employment experience because of their young age and primary focus on education, people with health and disability limitations that restrict their ability to work in the labor market, as well as people who have been disconnected from the labor market for a variety of reasons including low levels of human capital (foundational skills and education) and/or other barriers to employment. Among this group of adults (who had never worked in the past and were not employed at the time of the 2017 PIAAC survey), the proximate poverty rate was 44 percent. More than four out of ten adults who were never employed were proximate poor (Figure 5).

A comparison of the current and past employment status of proximate poor individuals with that of their non-proximate poor counterparts presented in Table 4 reveals that a surprisingly large share of adults classified as proximate poor had a job. One half of the population of proximate poor adults were employed at the time of the 2017 PIAAC survey. Moreover, half of the working proximate poor reported that they worked 35 or more hours (full-time). More than one-quarter of the proximate poor population reported that although they were jobless at the time of the 2017 PIAAC survey, they had worked within the prior year. Only 10 percent of the proximate poor population indicated that they had never held a job.

The non-proximate poor population is much more likely to be employed and work full-time than the proximate poor, and they are less likely to have never worked. For most households, earnings from work are sufficient to avoid the very bottom of the household income distribution. Yet we find that for half of the proximate poor population, employment fails to increase income sufficiently to avoid proximate poverty. Intermittent employment consisting of some full-time work weeks over the year, reduced hours of work during the entire year, as well as intermittent employment in part-time jobs and low wages contribute to reduced earnings that result in proximate poverty despite being employed. These problems of work in jobs with intermittent employment and low wages are also connected to lower levels of human capital of workers.[35]

Table 4: Percentage Distribution of Proximate Poor and Non-Proximate Poor 16-to 74-Year-Old Population in the US, by Recent and Past Employment Status, PIAAC 2017 (Standard Errors in Parentheses)

	PERCENTAGE DISTRIBUTION (PERCENT OF TOTAL)		
EMPLOYMENT STATUS/EXPERIENCE	PROXIMATE POOR	NON-PROXIMATE POOR	TOTAL
Currently working (full-time or part-time)	50.3 (2.3)	76.5 (0.9)	72.7 (0.8)
Currently working full-time	23.0 (2.4)	58.3 (1.2)	53.1 (1.1)
Currently working part-time	27.3 (2.0)	18.2 (0.9)	19.5 (0.1)
Last employed in the past 12 months	11.2 (1.3)	5.8 (0.5)	6.6 (0.5)
Last employed longer than 12 months ago	29.0 (2.5)	15.6 (0.7)	17.5 (0.6)
Never employed	9.6 (1.5)	2.1 (0.4)	3.2 (0.4)
Total	100.0	100.0	100.0

Source: Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

Despite the high share of employed persons among the proximate poverty population, attachment to work is key to avoiding poverty. Individuals who are employed are less likely to be poor than those who are not employed. However, the intensity and continuity of the attachment to work are also vital to the connection between work and the risk of poverty.

Individuals with steady work over the year and those employed in jobs with a full-time work week have a much lower risk of poverty than those with intermittent attachment to work and just a few hours of work per week. Findings in Figure 5 clearly show that although the proximate poverty rate among those who were employed at the time of the 2017 PIAAC survey was much lower than those who were not employed, workers who were employed in full-time jobs were considerably less likely to be poor than part-time employed peers.

Data on employment intensity in the PIAAC data file is only available for weekly hours of work on jobs held by respondents at the time of the PIAAC survey and not for the number of weeks of employment during the entire year. Therefore, the continuity of employment during the year cannot be computed from the 2017 PIAAC data. However, the official poverty statistics from the US Census Bureau's March CPS do provide this information. Based on March CPS data, the poverty rate of adults varied from just 2.2 percent among those who were employed year-round (50 weeks or more) in 2017 and 13.4 percent among persons with less than full-time and year-round employment in 2017 to nearly 31 percent among persons with no employment during the entire year in 2017.[36] The risk of poverty is highest among persons with no labor market experience followed by those with no current employment but some employment experience in the past. As expected, among those who are employed at a given point in time (currently), the risk of poverty is sharply lower among workers with full-time employment during the entire year than those with intermittent employment during the year and/or those with less than full-time employment during each week.

The issue of the working poor often comes up in discussions of the links between work and poverty. Individuals in poverty who have just a marginal attachment to the workforce in the form of intermittent bouts of employment cannot be considered working poor. In fact, the official definition of "working poverty" is not poverty among those who had any work. Rather, the US Bureau of Labor Statistics defines "working poverty" as poverty among those who are engaged in the labor market (either employed or actively looking for work) for at least 27 weeks during the year.[37] Based on this definition, individuals are classified as "working poor" if they were employed or actively seeking employment in the labor market for at least 27 weeks during the year and had an annual income below the official poverty line.

In 2019 (the most recent prepandemic year), the working poverty rate among 16 and older persons in the United States was 4.0 percent; that means 4.0 percent of individuals who participated (employed or looking for employment) in the labor market for at least 27 weeks during 2019 had incomes below the official poverty line. The incidence of working poverty varied widely among individuals by their weekly hours of employment during the year. The poverty rate of workers who were usually employed in full-time jobs during 2019 was only 2.7 percent compared to 9.8 percent among those who were usually employed in part-time positions during the year.[38] And, among part-time workers, the poverty rate was much higher among those who were working in part-time jobs involuntarily (those who wanted to work in full-time jobs but were forced to work in part-time jobs because a full-time position was not

available) than those who voluntarily chose to work in part-time jobs (16.8 percent among involuntary part-time workers versus 8.1 percent among voluntary part-time workers).[39] Involuntary part-time employment reflects weakness in the labor market and typically rises in times of labor market downturns. Workers with lower levels of human capital (skills and educational attainment) are also at a higher risk of involuntary part-time employment because of their position at the bottom of the labor queue where the workers' choice regarding the type of work and hours of work is typically limited. Voluntary part-time workers choose to work fewer hours likely because they are engaged in other activities (school or family responsibilities), and they are less likely to be the primary breadwinner of their household. Another situation that results in voluntary part-time work occurs when workers reach benefits cliffs; that is, when workers restrict hours of employment to prevent their earnings and incomes from exceeding the income eligibility threshold for public assistance programs.[40]

The ability (and willingness) of individuals to participate in the labor market and secure employment, especially full-time employment, are vital labor market determinants of the level of poverty/income inadequacy. Besides their human capital traits, the ability of individuals to find employment is also influenced by the strength of the labor market and the availability of jobs, particularly full-time jobs.

Proximate Poverty and Household Living Arrangements

Researchers have found a strong link between household living arrangements and the likelihood of poverty. According to the most recent data for the United States, the poverty rate of persons in 2021 ranged from just 5.2 percent among persons living in married couple families to more than twice as high (12.7 percent) among single-male householder (no spouse present) families to nearly 5 times as high (25.3 percent) among persons living in single-female householder (no spouse present) families. Poverty rates of persons residing in single-female-headed households are considerably higher than any other household type. The poverty rate was also higher among persons who lived in families with children: 6.7 percent among persons living in married couple families with children, 37.2 percent in single-female-headed families with children (single-mother families), and 18.2 percent in single-father families (families of custodial fathers).[41]

Comparisons of poverty rates across different types of families consistently find that families with children that are headed by a single mother are at the highest risk of poverty. The formation of a single-mother family by childbirth among single women or by the dissolution of marriage of couples with children has a high likelihood of pushing these families into poverty.

Studies of the dynamic of poverty identify events that are associated with transitions in and out of poverty over time. These studies use longitudinal data and track events that precede transitions into and out of poverty. In addition to events such as loss of employment or change in health or disability status, these studies also find that changes in household

composition including birth of a child (which requires more resources and may reduce income from redirecting some hours of labor market work to childrearing) and the change from a married couple family to single household family, particularly single-mother family, are associated with a transition into poverty.[42] Cellini, McKernan, and Ratcliffe find a consistent pattern across the multiple studies of a considerably greater likelihood of entry into poverty among female-headed families with children.[43]

According to Haskins and Sawhill,[44] three life events are closely connected to poverty—education, work, and family composition. They contend that young people who follow these life events in a certain sequence—the success sequence—can greatly reduce their risk of poverty. They define the success sequence as the occurrence of key life events in the following sequence: first, engage in educational activities and complete education (earning at least a high school diploma); second, secure full-time employment; and the final steps in this sequence are marriage followed by children. While admitting that there will always be people who are not able to follow the success sequence, they claim that those who can and do follow the success sequence can greatly reduce their risk of poverty.

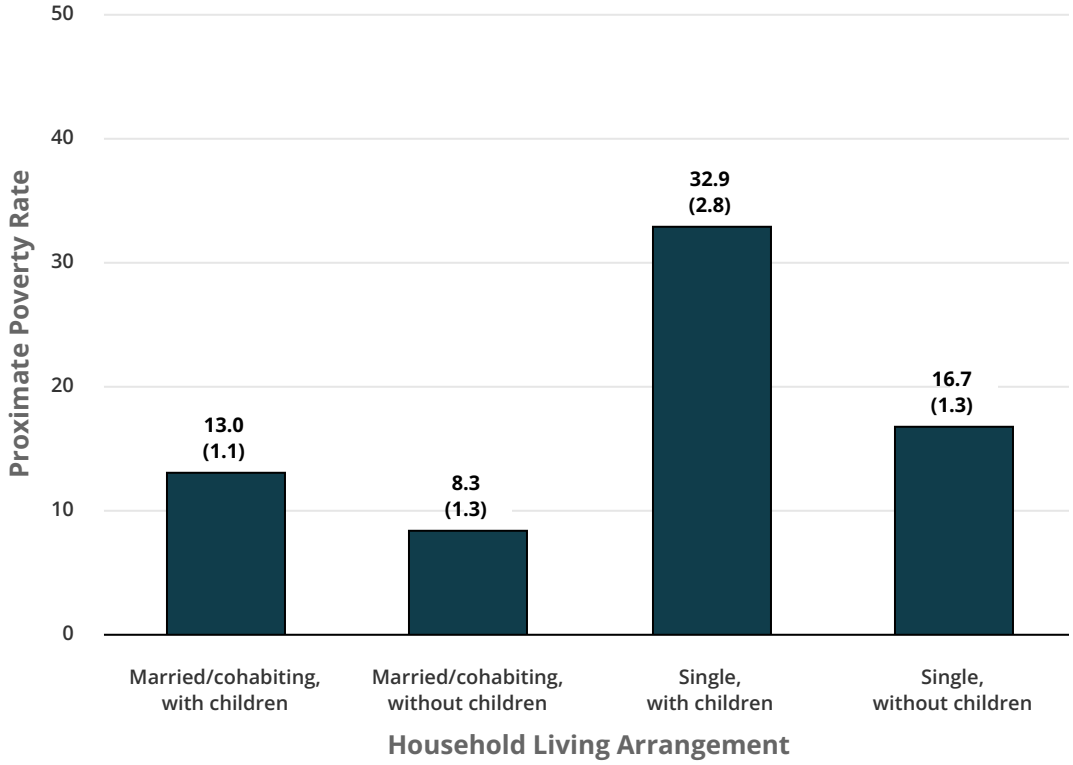
A synthesis of literature on research of the success sequence by Goesling, Inanc, and Rachidi found that although research on the link between the success sequence and poverty has been mostly based on descriptive methods applied to cross sectional data, the findings do provide correlational evidence that families who meet the definition of following the success sequence, based on their educational level, employment status, and marital status, have lower poverty rates than families that do not meet the definition.[45] A recent longitudinal study found that among adults aged 32 to 38 years, the poverty rate of those who missed all three steps of the success sequence was 52 percent, and among those who completed some but not all three steps of the success sequence, the poverty rate ranged from 27 percent among those who completed just the first step (graduated from high school) and 10 percent among those who completed the first and second steps in order (graduated from high school and had a full-time job). In sharp contrast, only 3 percent of those who completed all three steps of the success sequence—graduated from high school, then had a full-time job, and got married before having children[46] —had family incomes below the poverty threshold.

The 2017 PIAAC data are cross sectional and therefore not amenable to measuring the sequence of the life events of respondents. However, the PIAAC background questionnaire does ask respondents a question about their household living arrangement: whether they were living with their spouse or partner in the household at the time of the PIAAC survey; it also asks two questions regarding children: whether they have any children and the age of their children.[47] Using data from these questions, we classified respondents into the following four groups by the type of their household living arrangement with their spouse or partner (marital/cohabitation status) and whether they had children under 18 years old: (i) married/cohabiting with children, (ii) married/cohabiting without children, (iii) single with children, and (iv) single without children.

Findings from our examination of the proximate poverty rates for working-age adults in each of the four household living arrangements are presented in Figure 6. These findings reveal that one out of three single parent households had income below the proximate poverty threshold. The likelihood of proximate poverty among persons who were married/cohabiting and had children under 18 (married/cohabiting parents) was dramatically lower, 13 percent. And only 8 percent of individuals who were married/cohabiting and did not have any children were classified as proximate poor. Among single individuals without children, the proximate poverty rate was 16.7 percent (Figure 6).[48]

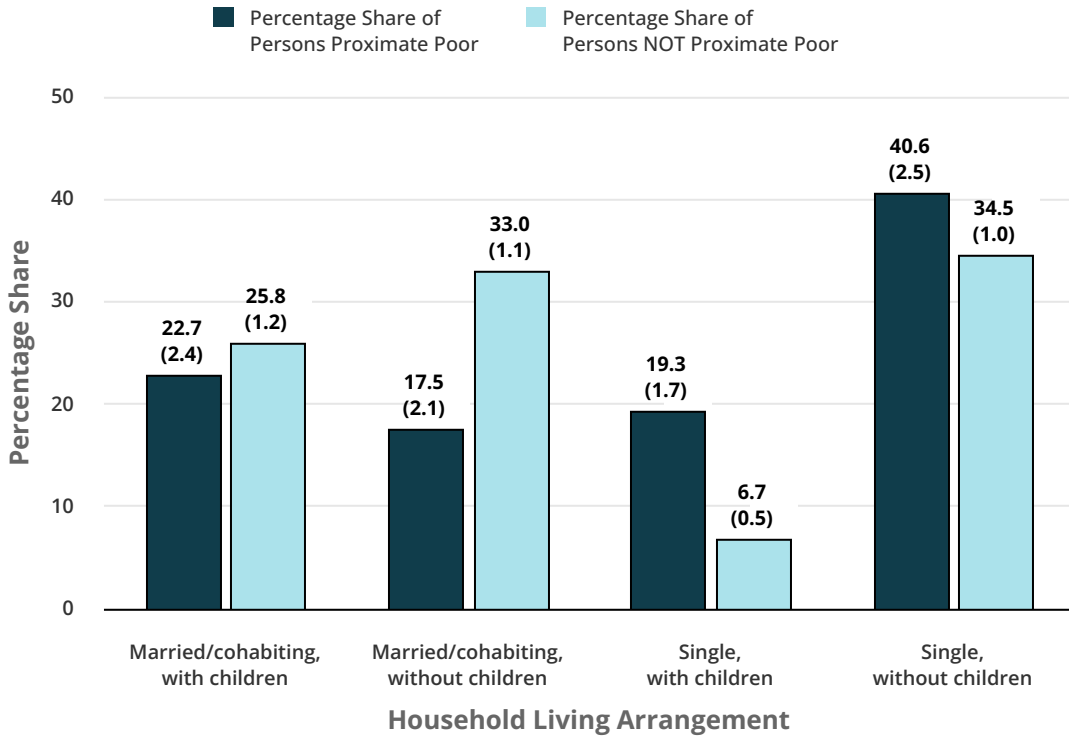
Figure 7 presents a comparison of the percentage distribution of proximate poor persons and their counterparts who were not proximate poor by their household living arrangements at the time of the 2017 PIAAC survey. The percentage of working-age adults who were married/cohabiting with children was about the same among proximate poor versus non-proximate poor persons (23 percent vs. 26 percent). Proximate poor individuals, however, were only half as likely as their non-proximate poor counterparts to be married/cohabiting without children (17.5 percent vs. 33 percent). The percentage of proximate poor individuals who lived in a household as a single parent was 3 times higher than their non-proximate poor counterparts (19 percent vs. 6.7 percent). Four in ten (40.6 percent) proximate poor persons were single and without children compared to 35 percent of non-proximate poor individuals (Figure 7).

Figure 6: Proximate Poverty Rate of the 16- to 74-Year-Old Population in the US, by Household Living Arrangement, PIAAC 2017 (Standard Errors in Parentheses)



Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

Figure 7: Percentage Distribution of Proximate Poor and Non-Proximate Poor 16- to 74-Year-Old Population in the US, by Household Living Arrangement, PIAAC 2017(Standard Errors in Parentheses)



Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

The analysis above reveals a close connection between the household living arrangements of individuals and their likelihood of proximate poverty. Our finding (from the 2017 PIAAC data) that single parents have the highest rate of proximate poverty, mirrors findings from other data and studies. The household living arrangements of proximate poor persons are very different from that of their non-proximate poor counterparts. Marriage/cohabitation (with or without children) was much less likely among proximate poor individuals than among individuals with household incomes above the proximate poverty level.

Regression Analysis: The Likelihood of Proximate Poverty Among Working-Age Adults

In this section of the paper, we present findings from regression analysis of the likelihood of proximate poverty among working-age adults in the United States. Regression models in this section are designed to estimate independent associations between the likelihood of proximate poverty among 16- to 74-year-old adults and their human capital characteristics, current and past employment status, household living arrangements (marital/cohabitation/parental status), and other demographic characteristics. We used logistic regression analysis

for this study because the dependent variable in the regression is a discrete variable (and not a continuous variable).[49] In this analysis, the dependent variable is the proximate poverty status of working-age adults, which is a dichotomous variable taking on the value 1 if the individual was proximate poor or 0 if the individual was not proximate poor.

The independent (or explanatory) variables in these regressions consist of variables that are known to be associated with proximate poverty and include the following: two measures of human capital—skills and educational attainment, current (at the time of the 2017 PIAAC survey) and past employment status, household living arrangement (marital/cohabitation status and parental status), health status, gender, age, race/ethnicity, nativity status, school enrollment status, and region of residence in the United States. Definitions and specifications of all variables included in these regressions are presented in Appendix F.

We have estimated a total of three logistic regressions. The dependent variable in all three regressions is the proximate poverty status of working-age adults (16 to 74 years) in the United States. The independent variables in all three regressions are the same except for the measure of skills. The first regression (model 1) excludes any measure of skills among the independent variables;[50] the second regression (model 2) includes all independent variables in the first regression (model 1) and adds the PIAAC literacy skills score to the independent variables; and the third regression (model 3) is the same as the second regression (model 2), except it excludes the PIAAC literacy skills score from the independent variables and replaces it with the PIAAC numeracy skills score.

Regression model 1 represents the more typical analysis of poverty that is undertaken in the absence of rigorous measures of foundational skills that are not included in most household surveys. This limitation forces the researcher to rely on the educational attainment variable as the only measure of human capital. Using the 2017 PIAAC data containing information on educational attainment as well as skills, we have estimated two additional regressions (models 2 and 3), each including one of the two measures of foundational skills as an independent variable: regression model 2 contains the literacy skill as an independent variable, and regression model 3 contains the numeracy skill score as an independent variable.

The coefficients[51] of each independent variable in the three regression models are presented side-by-side (in Table 5) to highlight differences in the estimated coefficients of independent variables between models 1, 2, and 3. In particular, the comparison shows changes in the coefficients of education variables before and after including skills among the independent variables (model 1 compared to models 2 and 3). Estimated regression coefficients and standard errors for all variables in each of the three regression models are presented in Appendix F.

Human Capital and the Likelihood of Proximate Poverty

Descriptive analysis in the previous section found strong links between foundational skills and the proximate poverty rate of working-age adults in the United States. Compared to the mean skill scores of non-proximate poor individuals, the mean literacy score of proximate poor individuals was 42 points lower (0.84 of 1 standard deviation), and the mean numeracy score was 54 points lower (0.9 of 1 standard deviation). The proximate poverty rates of working-age adults varied widely by the level of their literacy and numeracy proficiencies. Among adults who scored at or below Level 1 on the PIAAC literacy test, one-third were proximate poor compared to just 3 percent of those who scored in Levels 4 or 5. A comparison of the proximate poverty rate by numeracy proficiency levels also found similarly large gaps.

As noted above, regression model 1 did not include any measure of foundational skills among the independent variables. Therefore, our analysis of the regression-based links between skills and proximate poverty is based on regression models 2 and 3. Findings from these two regressions reveal a strong link between skills and proximate poverty (Table 5). Even after statistically controlling for educational attainment, employment status, household living arrangements, health status, and demographic characteristics of age, gender, race/ethnicity, nativity status, and region of residence, these regressions find a strong negative association between skills and the likelihood of proximate poverty. Findings in Table 5 reveal that the likelihood of proximate poverty is expected to decline by 4.5 percentage points with an increase in the PIAAC literacy skill score of 1 standard deviation (Table 5, model 2), and by 5.7 percentage points with an increase in the PIAAC numeracy skill score of 1 standard deviation (Table 5, model 3). According to regression models 2 and 3, higher foundational skills are expected to reduce the likelihood of proximate poverty of working-age adults, independent of the effects of other variables included in these regressions.

Educational attainment is the second measure of human capital included in these regressions. Unlike foundational skills that were only included in regression models 2 and 3, educational attainment is included among the independent variables in all three regressions (models 1, 2, and 3). Findings presented in Table 5 show that each of the three regressions estimate sizeable independent associations between educational attainment and proximate poverty. However, estimates of the association between education and proximate poverty are much stronger in regression model 1 (that does not include skills among the independent variables) than in regression models 2 and 3 (each of which includes one measure of skills among the independent variables: regression model 2 includes literacy skill score as an independent variable and regression model 3 includes numeracy skill as an independent variable).

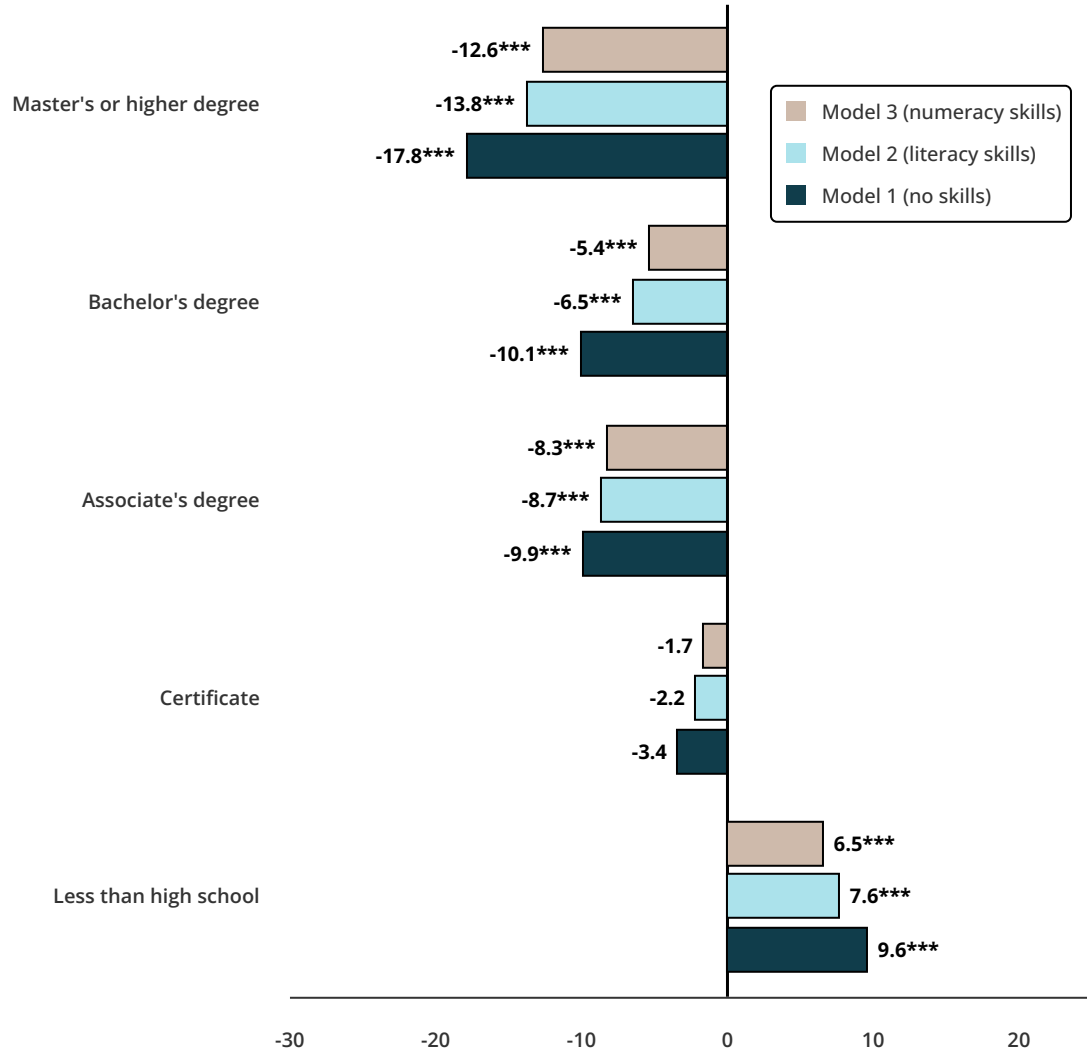
Compared to the base group (individuals with just a high school education or with some college and no award), the likelihood of proximate poverty is expected to be 9.6 percentage points higher among those without a high school degree or credential (after regression controls for all independent variables included in regression model 1). With the addition of

skills as an independent variable, the likelihood of proximate poverty for this group is expected to be 7.6 percentage points higher than the base group in regression model 2 (that includes literacy skills among the independent variables), and 6.5 percentage points higher than the base group in regression model 3 (that includes numeracy skills among the independent variables). Regression-based estimates of the effect of a failure to complete high school and the likelihood of proximate poverty is smaller after statistically controlling for the effect of skills on proximate poverty (Figure 8).

Regression findings from models 1, 2, and 3 show no statistical difference in the likelihood of proximate poverty among working-age adults with a postsecondary certificate compared to their counterparts in the base group (those with just a high school education or with some college and no award). Among individuals with an associate's, bachelor's, or master's or higher degree, the likelihood of proximate poverty is expected to be considerably lower compared to the base group.

Findings in Figure 8 reveal that estimates of the likelihood of proximate poverty among adults with an associate's degree compared to the base group (those with just a high school education or with some college and no award) ranged from -9.9 percentage points in model 1 (without regression control for skills), -8.7 percentage points in model 2 (with regression control for literacy skills), and -8.3 percentage points in model 3 (with regression control for numeracy skills).

Figure 8: Regression-Based Estimates of Expected Percentage Point Change in the Likelihood of Proximate Poverty of 16- to 74-Year-Old Adults, by Educational Attainment in the US, PIAAC 2017 (Findings for Educational Attainment Covariates from Regression Models 1, 2, and 3)



*** sig. at .01 level; ** sig. at .05 level.

Note: Explanatory variables in regression models. Model 1: educational attainment, employment status, household living arrangement, sex, age, race/ethnicity, nativity status, health status, school enrollment status, region of residence. Model 2: model 1 plus standardized literacy score. Model 3: model 1 plus standardized numeracy score.

Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

Estimates of the likelihood of proximate poverty are even lower among adults with a bachelor's or a graduate degree. According to regression model 1, adults with a bachelor's degree are expected to have a 10.1 percentage point lower likelihood of proximate poverty compared to the base group (those with just a high school education or with some college and

no award). However, the addition of skills as an independent variable in regression models 2 and 3 results in sizeable declines in the coefficients of bachelor's degree and a master's or higher degree award. After regression controls for skills, a bachelor's degree is associated with a 6.5 percentage points lower likelihood of proximate poverty (than the base group) in regression model 2 (with regression controls for literacy skills) and a 5.4 percentage point lower likelihood of proximate poverty in regression model 3 (with regression controls for numeracy skills). The regression-based likelihood of proximate poverty among those with a master's degree or higher is estimated to be lower than the base group (those with just a high school education or with some college and no award) by 17.8 percentage points in regression model 1, 13.8 percentage points in regression model 2 (with regression controls for literacy skills), and 12.6 percentage points in regression model 3 (with regression controls for numeracy skills; Figure 8).

These findings indicate a very strong connection between education and proximate poverty. Even after statistically controlling for all the covariates included in the regressions, the results reveal that the likelihood of proximate poverty declines sharply as the level of educational attainment increases. However, a comparison of the findings from regression model 1 with the findings from regression models 2 and 3 reveals that a sizeable portion of the effect of education on the likelihood of proximate poverty, particularly at the bachelor's and higher levels of education, is attributable to foundational skills. Adding skills as an independent variable in regression models 2 and 3 resulted in a decline in the size of the estimated coefficients of the education variables in these models (2 and 3) compared to the education coefficients estimated in regression model 1. Declines in the size of the coefficients of education variables were particularly large for the coefficient for bachelor's degree and master's or higher degree.

These findings highlight the importance of education as well as skills in lowering the risk of poverty. A comparison of the education coefficients estimated from regression model 1 with those that were estimated with regression models 2 and 3 reveal the extent to which the exclusion of skills and the use of education as a proxy for skills results in an overestimation of the effect of education on poverty. Regression model 1 was primarily estimated to illustrate how the widespread use of education as a proxy for skills in studies examining the link between human capital and poverty runs the risk of overestimating the effect of education on poverty. The availability of data in the skills as well as household incomes in the 2017 PIAAC data allowed us to examine the independent effect of skills and educational attainment on the likelihood of proximate poverty among working-age adults in the United States.

Table 5: Regression-Based Estimates of Expected Percentage Point Change in the Likelihood of Proximate Poverty of 16- to 74-Year-Old Adults in the US, PIAAC 2017

VARIABLE	EXPECTED PERCENTAGE POINT CHANGE NO SKILLS (MODEL 1)	LITERACY SKILLS (MODEL 2)	NUMERACY SKILLS (MODEL 3)
One standard deviation[a] change in literacy score (Model 2)	—	4.5***	—
One standard deviation[b] change in numeracy score (Model 3)	—	—	5.7***
Educational attainment level (base group is high school graduates or GED or some college, no award)			
Less than high school	9.6***	7.6***	6.5***
Certificate below the Associate Degree	-3.4	-2.2	-1.7
Associate's degree	-9.9***	-8.7***	-8.3***
Bachelor's degree	-10.1***	-6.5***	-5.4***
Master's or higher degree	-17.8***	-13.8***	-12.6***
Employment Status (base group is employed full-time)			
Currently employed part-time	13.6***	13.1***	13.5***
Last worked in the past 12 months	13.9***	14.2***	14.3***
Last worked more than 12 months ago	17.6***	16.6***	16.9***
Never employed	16.6***	15.2***	14.2***
Household Living Arrangement (base group is married/cohabiting, no children)			
Married/cohabiting with children under 18	4.6**	4.8**	4.7**
Single with children under 18	13.5***	13.0***	12.7***
Single with no children under 18	3.2	3.6**	3.3
Health Status (base group is poor health-fair or poor)			
Good health (excellent, very well, or well)	-5.6***	-4.7***	-4.7***
Gender (base group is male)			
Female	1.1	1.6	0.9
Age (base group is 55- to 74-year-olds)			
16-24	4.3**	6.5***	7.3***
25-34	9.5***	10.9***	11.0***
35-54	5.9***	6.5***	6.7***
Race/ethnicity (base group is White)[1]			
Black	9.2***	6.2***	4.9**
Hispanic	11.2***	9.4***	8.3***
All Other Races	—	—	—
Nativity status (base group is native-born)			
Foreign-born	3.3	1.4	1.7
School enrollment status (base group is not enrolled in school)			
Enrolled	-4.5***	-3.0	-2.8
Region of residence (base group is South region)			
Northeast	-2.2	-1.4	-0.9
Midwest	-1.9	-1.6	-1.4
West	-1.7	-1.0	-0.6
N = 3,119			

— Not applicable.
*** sig. at .01 level, ** sig at .05 level.
[a] One standard deviation of the literacy score of all 16- to 74-year-old persons = 50.81
[b] One standard deviation of the numeracy score of all 16- to 74-year-old persons = 55.98
[1] The PIAAC data file provides a five-category derived race variable. Individuals who answered yes to the Hispanic or Latino origin question were classified as Hispanic. The remaining respondents who said they were not Hispanic or Latino (non-Hispanics) were classified into four race groups: White, Black, Asian/Pacific Islander, and a residual race category of "all other races," that includes Asian, American Indian, Alaska Native, Native Hawaiian, and Other Pacific Islanders race groups. Races in this last category, "all other races," could not be reported individually because the sample sizes were not large enough to meet the OECD recommendations to have a sample size of 62 cases per analytic group or subgroup to report and publish findings. (See: AIR PIAAC Team. (n.d.). *What you need to consider before working with PIAAC data.* Retrieved from https://static1.squarespace.com/static/51bb74b8e4b0139570ddf020/t/57ebf7cd9f74562532dd2df3/1475082297812/WorkingWithPIAACData_updated+092816.pdf. Since this residual category is conceptually meaningless, findings for this group are not included in discussions in this paper.
Source: Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

The discussion of the findings for the remaining independent variables primarily focuses on regression models 2 and 3 that include a measure of skills (literacy skills or numeracy skills) among the independent variables. As noted above, the estimation of regression model 1 is primarily designed to serve as a baseline to illustrate the overestimation of the effect of education on poverty when skills are excluded from the regression analysis. The inclusion of skills in regression models 2 and 3 changes the size of the coefficients of other independent variables as well, but most of these changes are small, except for the variables representing the race/ethnicity of individuals. Results for the remaining independent variables are discussed below.

Employment Status and the Likelihood of Proximate Poverty

The descriptive section of this paper found a negative link between the employment status of working-age adults and their proximate poverty rate. Individuals who had a full-time job at the time of the 2017 PIAAC survey had the lowest proximate poverty rate compared to their counterparts who were employed in part-time positions, not employed in 2017 but were employed in the past, or not employed in 2017 with no prior employment. The latter group (not employed at the time of the 2017 PIAAC survey and without any prior employment experience) includes young people, some of whom may not have had the opportunity for prior employment experience because of their young age and primary focus on education, people with health and disability limitations that restrict their ability to work in the labor market, as well as people who have been disconnected from the labor market for a variety of reasons including low levels of human capital (foundational skills and education) and/or other barriers to employment. Descriptive analysis presented in the previous section found a very high proximate poverty rate (44 percent) among adults who were never employed.

Regression analysis confirms a strong connection between full-time employment and the likelihood of proximate poverty among working-age adults in the United States. Findings from regression model 2 show that compared to the base group (individuals who were currently—at the time of the 2017 PIAAC survey—employed in a full-time job), the likelihood of proximate poverty is expected to be higher by:

- +13 percentage points among those who were currently employed in part-time jobs,
- +14 percentage points among those who were not currently employed but were employed at some time during the prior 12 months,
- +17 percentage points among those who were not currently employed but were employed at some time before the prior 12 months, and
- +15 percentage points higher among those who were never employed (Table 5, model 2). Findings in regression model 3, (with standardized numeracy skill score as an independent variable) are similar to the findings from regression model 2 (Table 5, model 3).

Full-time employment at a given point in time is associated with a considerably lower risk of proximate poverty compared to part-time employment or intermittent past employment or no employment in the past. Even after statistically controlling for the effects of skills, educational attainment, household living arrangements, health status, and other background demographic traits on the likelihood of proximate poverty, full-time employment is expected to have a very strong effect of lowering the likelihood of proximate poverty among working-age adults. Regression analysis in models 2 and 3 (with skills) found a 14 to 17 percentage point lower risk of proximate poverty among adults with full-time employment at the time of the 2017 PIAAC survey compared to their counterparts with part-time employment, some employment in the past, or no employment in the past.

Proximate Poverty and Other Factors

In this section, we discuss the likelihood of proximate poverty among 16- to 74-year-old adults in the context of household living arrangements (marital/cohabitation/parental status), race/ethnicity, and health status.

Household Living Arrangements

As noted in the descriptive section, out of the four alternative living arrangement categories (married/cohabiting without children, married/cohabiting with children, single without children, and single with children—single parent), the proximate poverty rate was the highest (32.9 percent) among single parents. In comparison, the rate of proximate poverty was considerably lower, roughly half, among single individuals without children (16.7 percent). Married/cohabiting individuals had the lowest rates of proximate poverty: 13 percent among married/cohabiting individuals with children and 8 percent among married/cohabiting individuals without children.

Regression analysis of proximate poverty also found a much higher likelihood of proximate poverty among single parents. Even after regression controls for literacy skills, educational attainment, employment status, health status, and other background demographic variables in regression model 2, the likelihood of proximate poverty relative to the base group (married/cohabiting individuals without children) is expected to be 13 percentage points higher among single parents, nearly 5 percentage points higher among married/cohabiting parents, and 3.6 percentage points higher among single individuals without children (the latter two coefficients were statistically significant at .05 level; Table 5, model 2). Findings from regression model 3 were similar except for single individuals without children among whom regression model 3 found no statistical difference in the likelihood of proximate poverty compared to the base group (married/cohabiting individuals without children; Table 5, model 3).

Health Status

One question on the 2017 PIAAC survey asks respondents about their health status. The question is worded as follows: "In general, would you say your health is excellent, very good, good, fair, or poor?" Respondents were asked to select one of the five options (excellent, very good, good, fair, or poor) that best matched their general health condition including physical and mental health.[52] We have combined respondents into two groups based on their self-reported health status: (i) those who reported their health as excellent, very good, or good and (ii) those who reported their health as fair or poor. The proximate poverty rate of adults with health status in the fair/poor category was 2.3 times higher than those who reported their health as excellent/very good/good (27.3 percent vs. 11.8 percent; Appendix D, Table D.1). One out of three adults in proximate poverty reported being in fair/poor health compared to just 15 percent of their non-proximate poor counterparts (Appendix D, Table D.1).

Poverty and poor health are intricately linked. The risk of poverty is high among individuals in poor health and conversely, the risk of poor health is much greater among individuals with poverty/income inadequacy problems. Research on the connection between poverty/income inadequacy and health has shown that income affects health through several avenues including but not limited to barriers to healthcare access (less likely to have jobs with health insurance benefits, less likely to have access to medical facilities, primary care, and specialty care, etc.); higher likelihood of engaging in risky behaviors like smoking and alcohol use, substance use, sedentary lifestyle; greater exposure to environmental risks from living and working in unfavorable conditions including air pollution from living near highways and crowded urban areas, exposure to high levels of crime, as well as limited access to nutritious foods (food deserts/food swamps).[53] And the adverse health outcomes of individuals in turn negatively affect the development of their human capital and reduce their attachment to the labor market resulting in lower incomes and poverty—a negative feedback loop that Khullar and Chokshi refer to as the health-poverty trap.[54]

Findings from our regression analysis reveal that even after regression controls, there is a strong negative link between health and the likelihood of proximate poverty. With statistical controls for human capital (skills and educational attainment), employment status, household living arrangements, and all other variables included in regression models 2 and 3, these regressions found that the likelihood of proximate poverty is expected to be 4.7 percentage points higher among adults who rated their health as fair or poor compared to those who reported their health as excellent, very good, or good (Table 5, models 2 and 3).

Race/Ethnicity

Discussions on poverty frequently focus on the differences by race/ethnicity. Our analysis of the 2017 PIAAC data show wide differences in the proximate poverty rate of working-age adults by race/ethnicity.[55] Compared to the 9 percent proximate poverty rate of White individuals, the proximate poverty was more than 3 times higher among Black and Hispanic individuals (27.3 percent and 30 percent, respectively; Appendix D, Table D.1).

Findings from the regression analysis presented in Table 5 show that even after controlling for the variables included in each of the three regression models, the likelihood of proximate poverty among Black and Hispanic working-age adults is expected to be higher than their White counterparts (the base group). However, the coefficients of the race variables varied across the three regression models. Regression coefficients from models 2 and 3 (that have statistical controls for skills) are markedly smaller than coefficients from model 1 (that does not have statistical control for skills). The likelihood of proximate poverty among Black individuals relative to the base group (White individuals) is estimated to be 9.2 percentage points higher in regression model 1, 6.5 percentage points higher in regression model 2, and 4.9 percentage points higher in regression model 3, representing a reduction of one half in the Black-White poverty gap (from 9.2 to 4.9 percentage points) after accounting for numeracy skills.

Estimates of the likelihood of proximate poverty among Hispanic individuals compared to the base group (White individuals) declined from +11.2 percentage points in regression model 1 to +9.4 and +8.3 percentage points in regression models 2 and 3, respectively, representing a decline of 25 percent in the Hispanic–White gap (from 11.2 to 8.3 percentage points) when numeracy skills are included in the model (Table 5).

These findings suggest that skills underlie sizeable portions of the proximate poverty of Black and Hispanic individuals. Regression models that included statistical controls for skills resulted in a reduction in the proximate poverty gap between these White individuals and their Black and Hispanic counterparts. However, even after regression controls for skills, regressions models 2 and 3 still estimate a higher likelihood of proximate poverty among Black and Hispanic individuals compared to their White counterparts (Table 5, models 2 and 3).

It must be noted that the acquisition of human capital—skills and education —is itself related to a host of factors including a lack of opportunity due to poverty/income inadequacy. Growing up in a poor household has an adverse impact on the educational attainment of children. A number of factors such as a lack of resources and opportunities, poor health, nutrition, pre-school education, and so on cause children raised in poor families to begin school with a sizeable deficit in school readiness that is exacerbated over time resulting in poor school outcomes and low levels of attainment. Educational attainment, particularly at the postsecondary level, has increasingly become the fault line between a life of poverty and

one of economic success. Children raised in poverty have a lower chance of success in school and completing high levels of education, and their low levels of attainment in turn place them at a high risk of continued poverty into adulthood resulting in the intergenerational transfer of poverty from their parents to them.

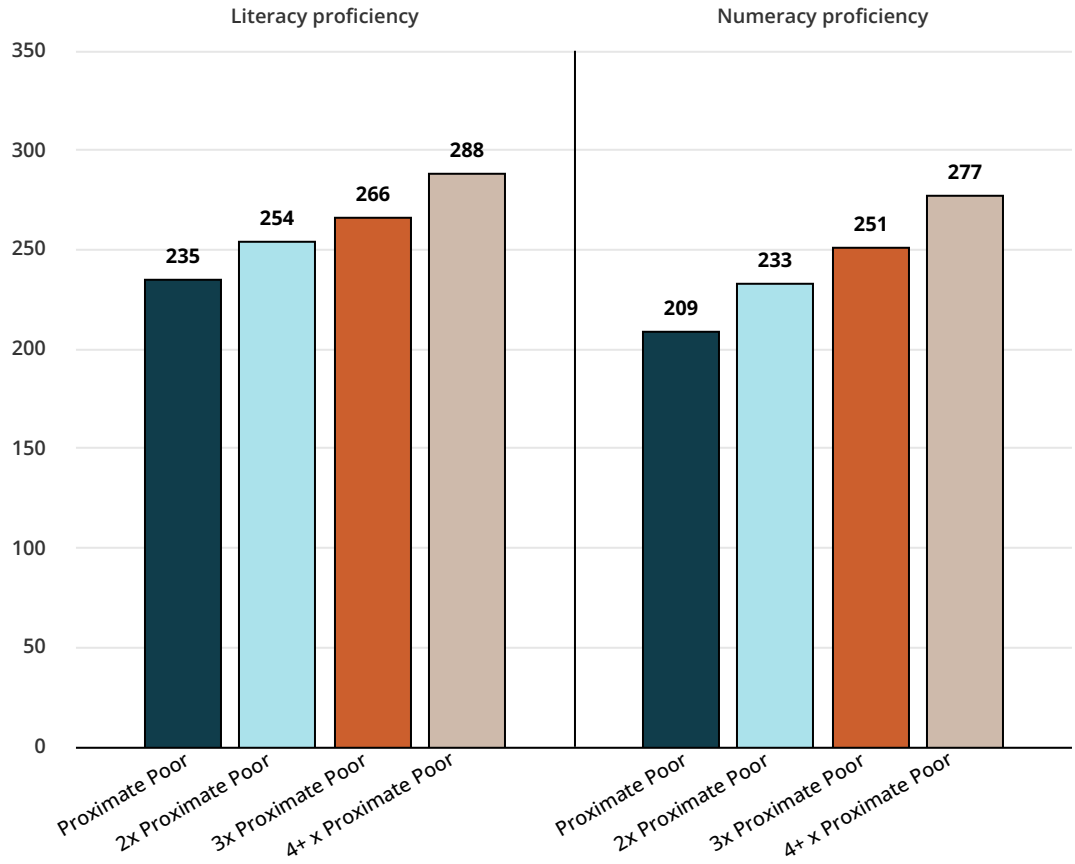
Implications of the Findings

This paper emphasizes the relationship between foundational skills and the seemingly intractable problem of poverty in the United States. Part of our motivation for this study is the dearth of research in the United States about skills and poverty. We don't think that this is the product of an unwillingness to undertake studies of skills and poverty. Rather, it is simply the result of an absence of reliable systematic nationally representative data that capture the two measures—household income and foundational skills—required to undertake this sort of analysis. The first two rounds of the PIAAC study completed during 2012 and 2014 did not include measures of household income or household size necessary to produce a measure of poverty/income inadequacy.

Most studies of poverty employ educational attainment as the primary measure of human capital ability based on the assumption that knowledge, skills, and ability increase with educational attainment. Yet, the relationship between educational attainment and skills is far from perfect. Indeed, analysis of PIAAC data reveals surprisingly high shares of college graduates with literacy and especially numeracy skill deficiencies.[56] Literacy and numeracy skills both exert large positive effects on the employment, earnings, and most other labor market outcomes of adults that are independent of the highest level of educational attained.[57] Ignoring skills development in the drive for postsecondary credentials ultimately undermines the promise of education.

This study finds a clear relationship between poverty and skills. Indeed, PIAAC data also reveal a close relationship between skills and household income. Findings in Figure 9 show considerable gaps in both literacy and numeracy skills across household income levels represented as proximate poverty multiples (the ratio of household income to the proximate poverty threshold). These findings indicate a wide variation in skills by the level of household income even among those with household incomes above the proximate poverty threshold.

Figure 9: Mean Literacy and Numeracy Skill Scores of 16- to 74-Old Persons by the Ratio of their Household Income Relative to the Proximate Poverty Threshold, US, PIAAC 2017



Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

The proximate poverty multiples presented in Figure 9 are not simply artifacts for use in our analysis. Rather, multiples of poverty thresholds are used in the allocation of federal funds across states and localities and as income eligibility standards for participation in a variety of federal–state benefits transfer programs. Eligibility for most federal benefit transfer programs ends when household income exceeds 4 times the poverty threshold level. The findings in Figure 9 reveal that the mean literacy and numeracy scores of households that are not income eligible for participation in nearly all benefit transfer programs (household incomes that are 4+ times higher than the proximate poverty threshold) are dramatically higher than those of the proximate poor. The *mean literacy and numeracy scores of those with incomes that are 4 or more times the proximate poverty threshold are at least 1 standard deviation higher than those of their proximate poor counterparts*. In the case of numeracy proficiencies, the mean score of the proximate poor population is at proficiency level 1, while the mean score for those with household incomes that are at least 4 times those of the proximate poverty thresholds are at

proficiency level 3. These findings suggest that foundational skills are not just closely connected with the problems of poverty but also with dependence on benefit transfer programs.

The results of our regression analysis confirm that attainment of educational credentials is closely related to the likelihood of poverty. Our baseline model (model 1) finds that earning an educational credential generally is associated with a substantially lower risk of poverty. Working-age adults at the bottom of the educational hierarchy (those who have not completed high school) have a 9.6 percentage point higher likelihood of being proximate poor compared to high school graduates. Reductions in the risks of poverty are especially strong for those who earn postsecondary degree awards. At the undergraduate level, an associate's degree award reduces the risk of poverty by 9.9 percentage points, and at the bachelor's degree level the probability of poverty is reduced by 10.1 percentage points. The reductions in the risk of poverty are quite large among those who earned a graduate degree, reducing the risk by 17.8 percentage points.

The postsecondary education system in the United States has increasingly become the centerpiece of workforce development strategies in most states, with increasing federal and state resources flowing to support for college education via many initiatives including Pell grant financial aid and state and local "College Promise" free college tuition programs that often provide last dollar financial aid for a community college degree or certificate matriculant.[58] Most states have created ambitious goals to expand the share of their working-age populations with a postsecondary award. These goals have focused state educational priorities on high school graduation and college credentials and have become a mainstay of workforce development efforts and a primary mechanism to develop human capital to reduce the incidence of poverty and income inequality.[59] Yet credentials must be credible signals of foundational skills as well as occupational proficiencies that should characterize the quality of an academic award. Our earlier research on the relationship between foundational skills and credentials found that surprisingly large shares of adults with college degrees had very low literacy and numeracy skills.[60]

Regression model 1 provides clear evidence of strong positive influence of college credentials in reducing the risk of poverty. Yet, models 2 and 3 suggest that while postsecondary schooling is an important tool in the antipoverty toolkit, the effectiveness of a college education in reducing the risk of poverty is less than the consensus from research that does not control for the effect of skills. Inclusion of literacy skills in regression model 2, results in a sharp decline in the estimate of the effect of attaining a college degree on the likelihood of proximate poverty compared to this estimate from the baseline regression model 1. The effect of earning a bachelor's degree on the likelihood of proximate poverty falls from 10.1 percentage points in regression model 1 to 6.5 percentage points in regression model 2 representing a one-third reduction. The reduction on the estimated effect is even greater in regression model 3 with controls for numeracy skills. According to regression model 3, earning

a bachelor's credential is expected to reduce the likelihood of poverty by 5.4 percentage points; down from 10.1 percentage points in regression model 1, representing a relative decline of 46 percent. Similarly large reductions are found in estimates of the impact of graduate and professional credentials on reducing the risk of poverty, when literacy and numeracy skills are included in regression models 2 and 3.

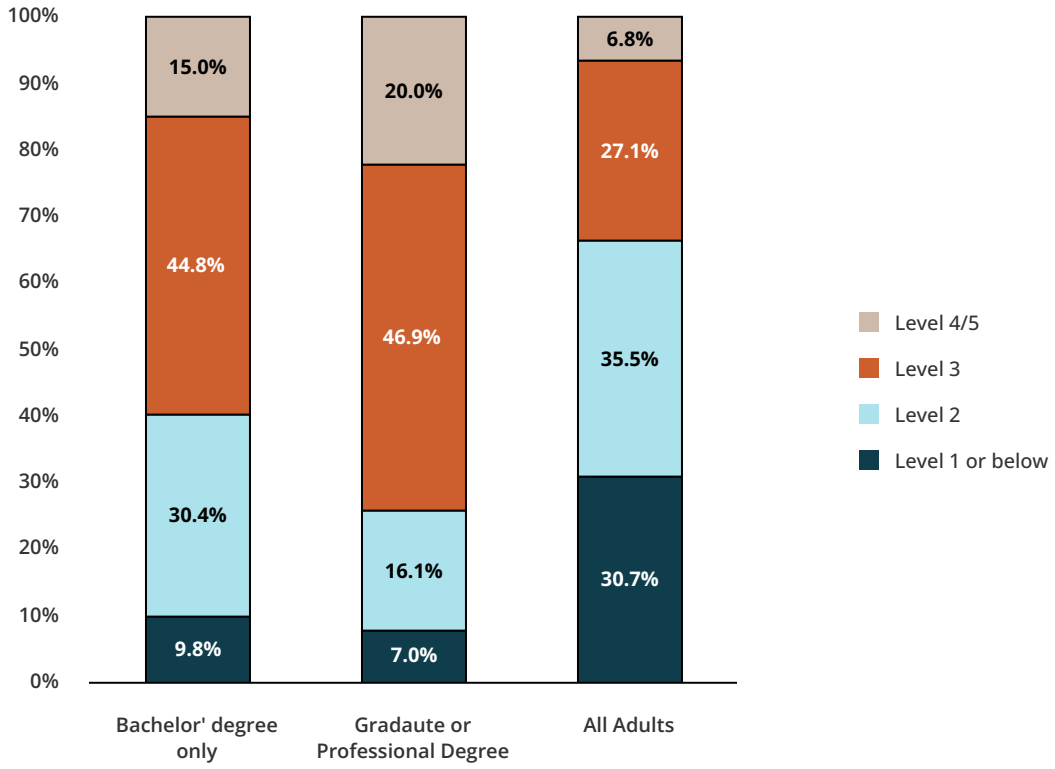
College degrees are often thought to serve as a signal that an individual has attained a level of ability substantially greater than those without a credential and the greater abilities of college graduates are commensurately valued in the labor market.[61] However, after regression models account for differences in literacy and numeracy skills, the size of the coefficients for education decline significantly.[62] Our findings suggest that this results from the variability in literacy and numeracy skills among college graduates reporting the same levels of educational attainment.

The findings in Figure 10 reveal that a surprisingly large number of college graduates have literacy or numeracy skills scores at level 1. Level 1 scores suggest a minimal level of skills. Examples of tasks at literacy level 1 and numeracy level 1 are presented below:

- Literacy skills at level 1: A score at this level indicates a person is unlikely to find the name of a particular congressperson in a summary information sheet that lists the congressional district, the name of the district's representative and the representative's date and place of birth.[63]
- Numeracy skills at level 1: A person with numeracy skills at this level would struggle to find how many gallons of gas were available in a gas tank if the tank's capacity was 48 gallons and the gas gauge was halfway between the middle tick and the full tick.[64]

One in ten adults with a bachelor' s degree earned a score at or below level 1 on either or both PIAAC proficiency tests—literacy and numeracy. This means that more than 3.7 million college graduates with a bachelor's degree had large deficiencies in their foundational skills at the time of the 2017 PIAAC survey. Perhaps even more surprising is the share of persons who earned graduate and professional degrees beyond the bachelor's with very low literacy and numeracy skills. About 1.7 million or 7 percent of all advanced degree recipients in the United States scored at or below level one on at least one of the two PIAAC foundational skills measures.

Figure 10: The Share of 16- to 74-Year-Old College Graduates with Either Literacy or Numeracy Score at Different Proficiency Levels, US, PIAAC 2017



Source: Organisation for Economic Co-operation and Development (OECD), Programme for the International Assessment of Adult Competencies (PIAAC), 2017. Tabulations by authors.

A variety of experts have suggested that level 3 literacy and numeracy proficiencies are essential to full participation in the economic, social, and civic life of the nation. Yet, substantial proportions of college graduates achieve a score at level 2 on one or both foundational proficiency tests (literacy and numeracy) test. Just over 30 percent of adults with a bachelor's degree as their highest level of attainment have literacy and/or numeracy skills at level 2. This means that an additional 11.6 million bachelor's degree recipients have a foundational skill deficit that is likely to limit their success in important life outcomes. At the graduate and professional level, 26 percent scored at level 2 on the literacy and/or numeracy test, representing an additional 6.3 million adults with a foundational skill deficit.

Taken together, these findings reveal that 40 percent of all working-age adults with a bachelor's degree (15.4 million out of 38.2 million) and 33 percent of their counterparts with a master's or higher degree (8 million out of 24.3 million) have literacy and/or numeracy skills below level 3. At the top of the foundational skills distribution, about 15 percent of all college graduates with a bachelor's degree and 20 percent of those with a graduate or professional degree have exceptional foundational skills, achieving a level 4 or 5 score on the literacy and/or numeracy tests.

The findings in Figure 10 illustrate that college degrees are imperfect indicators of foundational skills. Indeed, a surprisingly large share of those with bachelor's and graduate degrees have extremely low literacy and/or numeracy skills. When we account for skill gaps at each level of educational attainment in our models, we find that those with stronger skills are less likely to experience poverty. We focus on college degrees in this discussion because it is often presumed that those with a bachelor's or higher degree have attained a high level of foundational skills. But the PIAAC data in the United States belie this assumption. The consequences of exiting college with a degree award but with lower level skills are diminished success in the job market and an elevated risk of poverty/income inadequacy.

Our regression results for those with attainment levels below the bachelor's degree are similar to those of college graduates. For both high school diplomas and postsecondary awards below the bachelors, the independent effects of the credential on reducing the risks of poverty decline sharply when foundational skills measures are added into the model.

These findings suggest that an educational system that can develop and *certify* a level of foundational skills (literacy and numeracy) at PIAAC level 3 may be a critical antipoverty effort. Today, two thirds of working age Americans have enrolled in a postsecondary educational program and half have earned an award of some type. Most states have developed goals that between 60 and 70 percent of their 25- to 64-year-old population earn a postsecondary credential by 2025.[65]

These trends show that higher education has taken center stage in American human resource development. It is therefore essential that the nation's postsecondary system make certain that its graduates possess the foundational skills that exert a strong influence on a whole host of life outcomes, including the risk of poverty. To this end, many institutions of higher learning do engage in many different, often locally developed, testing activities to determine the English language and math skills of new students and often provide remedial education for those judged to have a deficiency.[66] However, the impact of participation in college remedial programs seems mixed.[67] While most remedial programs are designed to bolster foundational skills of students, studies that examine the impact of college remediation focus on the effects of remedial course taking on various retention and credential completion outcomes but not on foundational skill gains. Thus, participation and completion of a college remedial course or courses may not be closely connected to achieving a desired level of literacy and numeracy proficiency.

One alternative might be for educational institutions to offer a warranty of foundational skills for their graduates. In the early stages of the education reform movement, high stakes testing of foundational skills was important in many states. Even today, while many states have abandoned testing, the Commonwealth of Massachusetts stands out as it has continued what is essentially a rigorous foundational skills testing program that serves as a warranty of literacy and numeracy skills for high school graduates.[68]

A long-term objective for the nation should be that every high school diploma award means that the new graduate must have levels of literacy and numeracy skills that provide them the opportunity to fully participate in the economic, civic, and social life of the nation. Yet, such an objective seems very remote. When one in ten adults who earned a bachelor's degree diploma have literacy or numeracy skills at level 1 or below, it is difficult to see how high school can be held to a higher level of academic achievement than institutions of higher learning.[69] One possible proposal, but in some important ways still an ambitious proposal; a college diploma warranty.

A college diploma warranty would be based on a test of the foundational skills of students with a test like the PIAAC to determine that the credential recipient possessed Level 3 foundational skills expected of a college graduate. In essence, a college credential warranty of this type would be backed by measures of foundational skills certifying that the literacy and numeracy proficiencies of college degree recipients are at or above the level that is generally associated with success in the labor market and more broadly in life outcomes including a sharply reduced risk of poverty/income inadequacy.

An important finding from our analysis is the strong link between full-time employment and a lower likelihood of proximate poverty. Full-time employment is a clear pathway to reducing the risks of proximate poverty. Adults employed in part-time jobs or who report a sporadic employment history are much more likely to experience poverty/income inadequacy. Further compounding the poverty problem associated with part-time employment is that large shares of part-time workers are concentrated in occupations characterized by low wages, low skills requirements, and a high turnover.[70] The combination of reduced annual hours of work and lower wages among part-time workers means the risk of poverty/income inadequacy is considerably elevated for part-timers.

The wage gap between full-time and part-time workers is largely a product of a concentration of employment among high-skilled workers in high-wage (and more likely full-time) occupations and among lower skill workers in lower paying (and more likely part-time) occupations. Thus, as the skills of workers sort them across occupations, these same skills also influence the likelihood of part-time employment among workers. To illustrate, about 45 percent of workers in low-skill/low-wage/high-turnover food and personal service occupations are part-time workers (often mixing work and schooling), while in most high-skill/high-wage/ lower turnover professional occupations, fewer than one in ten incumbents work in part-time positions. These findings suggest that the path to full-time employment is tied to the human capital traits of individuals that influence their access to employment in most professional and managerial fields. Achieving higher levels of foundational skills and accumulating educational credentials are both critical checkpoints on the path to full-time employment and a reduction of the risk of poverty.

Our analysis also found that intermittent or long-term joblessness substantially increases the risk of proximate poverty. One of our earlier studies based on the of PIAAC data in the United States found that employment is closely (and positively) related with both literacy and numeracy skills and disconnection from work is characterized by significantly lower literacy and numeracy skills. Moreover, the duration of disconnection is also related to foundational skills; individuals with longer durations of disconnection from work have lower literacy and numeracy skills than those with shorter disconnection spells.[71] There are certainly many barriers to employment for the jobless, but foundational skills deficiency is a very important barrier. Efforts to bolster these proficiencies can serve as part of a broader strategy to re-engage those who have found themselves disconnected from the world of work for an extended time.

Beginning in the 1960s, antipoverty programs that were designed to bolster the employability of low-income adults were established under the Great Society Program.[72] These early ventures into a national human resource development policy have evolved from a second chance system for those left behind in a changing economy to one where massive investments in education in pre-K, elementary, secondary, and especially postsecondary level are now predominant. The federally funded Pell Grant program, a means-tested college financial aid program, was funded at $27.4 billion during academic year 2022–23.[73] This amount dwarfs the $870 million funding during program year 2022 for adult employment and training services under the Workforce Innovation Opportunity Act, the current successor of the 1960s "manpower development" programs.[74]

Human capital oriented antipoverty programs must do as they advertise; increase human capital of individuals through education and training to increase the likelihood of labor market success and reduce the risk of poverty. Increasing educational attainment without bolstering the knowledge, skills, and abilities of students is mere credentialism that assigns a status without evidence of merit and leads to the paradox of a society characterized by ever rising levels of educational attainment without a commensurate rise in skills, leading to an immutable problem of poverty.

Appendix A: The 2017 PIAAC Background Questionnaire

The PIAAC Background Questionnaire

Please see the following URL for the 2017 PIAAC background questionnaire:

https://nces.ed.gov/surveys/piaac/2017-en-household-bq.htm.

The structure of the PIAAC Background Questionnaire

(Source: National Center for Education Statistics, "What PIAAC Measures," https://nces.ed.gov/surveys/piaac/measure.asp.)

The structure of the PIAAC background questionnaire, presented below, provides a list of subjects covered in the 2017 PIAAC background questionnaire and a guide to navigate the survey.

The interviewer's questions begin with question **A_Q01a**. Each question begins with a letter representing the section to which it belongs. The questionnaire is broken into the following areas of interest:

- Section A: Basic Demographics
- Section B: Past and Present Education
- Section C: Work History
- Section D: Present Work Experience
- Section E: Past Work Experience
- Section F: Work Responsibilities
- Section G: Skills Used at Work
- Section H: Skills Used Outside of Work
- Section I: Personal Characteristics and Health
- Section J: General Background Information

Researchers should note that each question is named with a letter representing the section to which it belongs, a number indicating its position in the section's sequence of questions, and sometimes an additional marker. For example, the interviewer's first question is **A_Q01a**. Questions in the US household background questionnaire that were adapted from the international version of the PIAAC questionnaire have "US" at the end of the variable name (e.g., B_Q01aUS) and questions that were country-specific and only administered in the United States have "USX" at the end of the variable name (e.g., B_Q01bUSX).

ZZ Section: The final section of the questionnaire (ZZ) contains general questions for the interviewer to answer regarding the interview process itself. This includes assigning a disposition code, which would indicate whether the respondent completed the interview, had a language problem, or had a learning/mental disability, as well as other variables, such as whether the respondent was interrupted by some other task or needed assistance during the interview.

Appendix B: Methodology to Create the Proximate Poverty Measure from the 2017 PIAAC Public Use Data for the United States

The third round of PIAAC surveys in the United States was conducted between March 2017 and September 2017 with a nationally representative sample of 3,660 adults between the ages of 16 and 74.[75] The background questions in the US PIAAC survey of 2017 were about the same as those in the 2012 and the 2014 PIAAC surveys with just a few exceptions. One of those exceptions was the addition of a question on household income. In 2017, the following household income question was added to the PIAAC background questionnaire:

Which category best fits the approximate total income of all persons in your household over the past 12 months? Please include all income for people living in your household, including income from jobs, investments, Social Security or retirement, and welfare. (If undergraduate college student living away from family home, please provide household income for your permanent residence.)

Respondents were provided a choice of one of the following 11 categories of household income:

01 Between $1 and $9,999
02 Between $10,000 and $19,999
03 Between $20,000 and $29,999
04 Between $30,000 and $39,999
05 Between $40,000 and $49,999
06 Between $50,000 and $59,999
07 Between $60,000 and $74,999
08 Between $75,000 and $99,999
09 Between $100,000 and $149,999
10 $150,000 or more
11 NO HOUSEHOLD INCOME

Out of the total of 3,660 respondents to the 2017 US PIAAC survey, 3,140 respondents had provided a valid response to household income question (Table B.1). The remaining 520 did not provide a valid response and either refused to answer the question or did not know their household income. Because of the lack of information on household income, we could not determine the proximate poverty status of these individuals. Therefore, these 520 individuals were excluded from all analysis in this paper.

Table B.1: The Distribution of 16- to 74-Year-Old Persons in the US, by the Level of Their Household Income, US, PIAAC 2017

HOUSEHOLD INCOME	NUMBER (WEIGHTED ESTIMATES)	PERCENT OF TOTAL	PERCENT OF VALID TOTAL	PIAAC 2017 SAMPLE SIZE
Between $1 and $9,999	10,366,555	4.4	5.2	202
Between $10,000 and $19,999	15,425,873	6.6	7.7	301
Between $20,000 and $29,999	17,894,829	7.6	9.0	296
Between $30,000 and $39,999	16,203,077	6.9	8.1	282
Between $40,000 and $49,999	16,811,898	7.2	8.4	258
Between $50,000 and $59,999	19,014,182	8.1	9.6	301
Between $60,000 and $74,999	23,947,828	10.2	12.0	364
Between $75,000 and $99,999	22,587,064	9.6	11.3	337
Between $100,000 and $149,999	30,568,037	13.0	15.4	438
$150,000 or more	25,704,141	11.0	12.9	353
No household income	529,413	0.2	0.3	8
Valid Total (valid responses)	199,052,897	85.0	100.0	3,140
Don't know	10,417,103	4.4	—	141
Refused	11,668,238	5.0	—	198
Not stated or inferred	13,178,181	5.6	—	181
Total (valid + not valid responses)	234,316,418	100.0	—	3,660

— Not applicable.
Source: 2017 PIAAC public use data file, National Center for Education Statistics. Tabulations by authors.

The PIAAC questionnaire also asked respondents about the numbers of persons living in the household in which they resided. The information gathered from this question was provided in the PIAAC public use data file in the form of seven household sizes (Table B.2) ranging from single person households to households with 7 or more persons.

Table B.2: The Distribution of 16- to 74-Year-Old Persons, by Household Size, US, PIAAC 2017

NUMBER LIVING IN HOUSEHOLD	NUMBER (WEIGHTED ESTIMATES)	PERCENT OF TOTAL	PIAAC SAMPLE
One	30,957,283	13.2	770
Two	64,011,145	27.3	1,051
Three	42,789,749	18.3	570
Four	43,344,774	18.5	571
Five	22,306,763	9.5	290
Six	9,150,152	3.9	128
Seven or more	8,474,266	3.6	97
Don't know/refused	104,105	0.0	2
Not stated or inferred	13,178,181	5.6	181
Total	234,316,418	100.0	3,660

To create the proximate poverty measure using household income information from the 2017 PIAAC public use data, we have used the official poverty income thresholds of US Census Bureau. These poverty income thresholds underlie the official poverty measure (OPM) of the United States established by the OMB.[76] The US Census Bureau definition of poverty is based on a set of poverty income thresholds for 48 groups of households classified by householder age, household size, and number of related children under 18 who reside in the household (Table B.3). Based on the householder age, household size, and the presence and number of related children under 18 living in the household, the income of each household is compared with one of the 48 poverty income thresholds that is relevant to that household. If the household income is lower than the poverty income threshold, the household and all individuals residing in that household are classified as poor.

Each year, the US Census Bureau publishes these poverty income thresholds that are updated for inflation. Table B.3 contains the 2016 poverty income thresholds published by the US Census Bureau. The 2016 poverty income thresholds are used to determine the poverty status using 2017 PIAAC data because respondents were asked to report their household income during the 12 months preceding the survey, which took place between March and September of 2017.

Table B.3 reveals that the 2016 official poverty income thresholds are quite granular. There are 48 separate poverty income thresholds for 48 groups of individuals classified by household size (one to nine members), age of householder (under 65, and 65+) for single and two-person households, and number of related children under 18 years old (no children to eight or more children). Unfortunately, these 48 poverty income thresholds cannot be used with PIAAC data that lack the granularity needed to identify the 48 subgroups of households by household size, age of householder, and the number of related children under 18 in order

to compare the income of each household against the poverty income threshold for one of the 48 subgroups that matches their own traits for householder age, size, and number of related children.

Table B.3: Poverty Income Thresholds for 2016 and 2017, by Size of Family and Number of Related Children Under 18 Years

SIZE OF FAMILY UNIT	WEIGHTED AVERAGE POVERTY THRESHOLDS	RELATED CHILDREN UNDER 18 YEARS								
		NONE	ONE	TWO	THREE	FOUR	FIVE	SIX	SEVEN	EIGHT OR MORE
2016 Poverty Income Thresholds										
One person:	12,228	—	—	—	—	—	—	—	—	—
Under age 65	12,486	12,486	—	—	—	—	—	—	—	—
Aged 65 and older	11,511	11,511	—	—	—	—	—	—	—	—
Two people:	15,569	—	—	—	—	—	—	—	—	—
Householder under age 65	16,151	16,072	16,543	—	—	—	—	—	—	—
Householder aged 65 and older	14,522	14,507	16,480	—	—	—	—	—	—	—
Three people	19,105	18,774	19,318	19,337	—	—	—	—	—	—
Four people	24,563	24,755	25,160	24,339	24,424	—	—	—	—	—
Five people	29,111	29,854	30,288	29,360	28,643	28,205	—	—	—	—
Six people	32,928	34,337	34,473	33,763	33,082	32,070	31,470	—	—	—
Seven people	37,458	39,509	39,756	38,905	38,313	37,208	35,920	34,507	—	—
Eight people	41,781	44,188	44,578	43,776	43,072	42,075	40,809	39,491	39,156	—
Nine people or more	49,721	53,155	53,413	52,702	52,106	51,127	49,779	48,561	48,259	46,400
2017 Poverty Income Thresholds										
One person:	12,488	—	—	—	—	—	—	—	—	—
Under age 65	12,752	12,752	—	—	—	—	—	—	—	—
Aged 65 and older	11,756	11,756	—	—	—	—	—	—	—	—
Two people:	15,877	—	—	—	—	—	—	—	—	—
Householder under age 65	16,493	16,414	16,895	—	—	—	—	—	—	—
Householder aged 65 and older	14,828	14,816	16,831	—	—	—	—	—	—	—
Three people	19,515	19,173	19,730	19,749	—	—	—	—	—	—
Four people	25,094	25,283	25,696	24,858	24,944	—	—	—	—	—
Five people	29,714	30,490	30,933	29,986	29,253	28,805	—	—	—	—
Six people	33,618	35,069	35,208	34,482	33,787	32,753	32,140	—	—	—
Seven people	38,173	40,351	40,603	39,734	39,129	38,001	36,685	35,242	—	—
Eight people	42,684	45,129	45,528	44,708	43,990	42,971	41,678	40,332	39,990	—
Nine people or more	50,681	54,287	54,550	53,825	53,216	52,216	50,840	49,595	49,287	47,389

— Not applicable.
Source: "Poverty Thresholds," US Census Bureau, last revised January 23, 2024, https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html

Specifically, PIAAC data lack granularity in the measurement of three variables: household income, household size, and age of children. First, the 2017 PIAAC public use data file does not provide a continuous measure of household income. Rather, as noted above, household income in the 2017 PIAAC public use data file is provided with 11 categories/ranges of household income. Second, household size in the PIAAC public use data file is measured on a range of 1 to 7 or more persons versus 1 to 9 or more persons needed to match the official poverty income thresholds presented in Table B.3. And third, instead of single counts of the number of related children under 18 ranging from none to 9 or more children, the PIAAC public use data file provides number of children in five age categories (0-2, 3-5, 6-12, 13-17, and 18+ years old).

Due to data availability restrictions on the 2017 PIAAC public use data file for the United States, we cannot produce a measure of poverty from these data that would be a perfect match with the OPM of the United States. Therefore, we have created a measure of poverty that is a close approximation of the OPM of the United States; a measure that we have labeled "proximate poverty." We have used household income categories and household size information available in the 2017 US PIAAC public use data file along with the "weighted average" poverty income thresholds by household size in Table B.3, to produce measures of proximate poverty from the 2017 US PIAAC public use data.[77] Table B.4 below displays the household income category that is the closest match with the proximate poverty thresholds for each of the seven household sizes available in the 2017 US PIAAC public use data file.

Table B.4: PIAAC Household Income Category Matched to Each of the Census Bureau's Average of 2016 and 2017 Weighted Poverty Thresholds for Each of the Seven PIAAC Household Sizes, US, PIAAC 2017

PIAAC HOUSEHOLD SIZE	CENSUS BUREAU WEIGHTED AVERAGE POVERTY INCOME THRESHOLD (AVERAGE OF 2016 & 2017)	PIAAC HOUSEHOLD INCOME CATEGORY MATCHED TO POVERTY INCOME THRESHOLD
One-person household	12,358	$1 to $9,999
Two people	15,723	$10,000 to $19,999
Three people	19,310	$10,000 to $19,999
Four people	24,829	$20,000 to $29,999
Five people	29,413	$20,000 to $29,999
Six people	33,273	$30,000 to $39,999
Seven or more people (weighted average)	40,706	$30,000 to $39,999

Table B.5 displays a comparison of PIAAC proximate poverty rate estimates generated using methodology described above with those estimated for persons between the ages of 16 and 74 years from 2017 March Current Population Survey (CPS) and the 2017 American Community Survey (ACS).

The proximate poverty rate estimated with 2017 US PIAAC survey data for persons aged 16 to 74 was 14.6 percent, which was 3.2 percentage points higher than that of the March 2017 CPS poverty rate estimate and 2.8 percentage points higher than that of the 2017 ACS poverty rate estimate.

Table B.5: A Comparison of the Poverty Rate Estimates for Persons Aged 16-to-74 from the March Supplement of the Current Population Survey (CPS), the American Community Survey (ACS), and Proximate Poverty Estimates from PIAAC 2017

ESTIMATES	PIAAC 2017 (PROXIMATE POVERTY)	MARCH CPS 2017	ACS 2017	DIFFERENCE (PIAAC-MARCH CPS)	DIFFERENCE (PIAAC-ACS)
Poverty/Proximate Poverty Rate	14.6	11.3	11.8	+3.2	+2.8

We also estimated proximate poverty rates of persons aged 16-to-74 in 2017 by their literacy and numeracy proficiency levels. (Table B.6). As expected, poverty rates varied widely by levels of literacy and numeracy proficiency with exceptionally higher poverty rates among those in lower levels of literacy/numeracy skills and extremely lower poverty rates among those with higher levels of skills. For example, one third of adults in literacy proficiency level 1 or below were proximate poor while only 3.4 percent of adults in literacy proficiency level 4/5 combined were proximate poor (Table B.6). Variation in the proximate poverty rate by proficiency levels was similar across numeracy proficiency levels (Table B.6).

Table B.6: Proximate Poverty Rate of Persons Aged 16 to 74, by Literacy and Numeracy Proficiency Levels, US, PIAAC 2017

PROFICIENCY LEVEL	PROXIMATE POVERTY RATE	STANDARD ERROR
Literacy Proficiency Level		
Level 1 or Below	33.2	2.4
Level 2	16.6	1.6
Level 3	6.9	0.9
Level 4/5	3.3	1.4
Total	14.6	0.8
Numeracy Proficiency Level		
Level 1 or Below	30.2	2.0
Level 2	13.0	1.5
Level 3	4.4	1.1
Level 4/5	2.1	1.0
Total	14.6	0.8

Based on proximate poverty income thresholds, we have created the following four ranges of the ratio of household income to the proximate poverty threshold:

1. Household income less than proximate poverty threshold (household income below the poverty income threshold),
2. Household income 1 to <2*proximate poverty threshold (household income above the proximate poverty threshold but below 200 percent of the proximate poverty threshold),
3. Household income 2 to <3*proximate poverty threshold (household income above 200 percent of the proximate poverty threshold but below 300 percent of the proximate poverty threshold), and
4. Household income 3+*proximate poverty threshold (household income above 300 percent of the proximate poverty threshold).

A percentage distribution of 16- to 74-year-old adults across the four ranges of the ratio of their household income to the proximate poverty threshold are presented in Figure B.1. Findings show that the share of working-age adults with household incomes below the proximate poverty income threshold was 14.6 percent. About 17 percent of adults had household incomes above the proximate poverty threshold and below 200 percent of the proximate poverty threshold. Nearly 18 percent of adults had household incomes between 200 percent and 300 percent of the proximate poverty threshold, and the remaining half had household incomes above 300 percent of the proximate poverty threshold (Figure B.1).

Figure B.1: Percentage Distribution of 16- to 74-Year-Old Persons by the Ratio of Their Household Income to the Proximate Poverty Income Threshold, US, PIAAC 2017

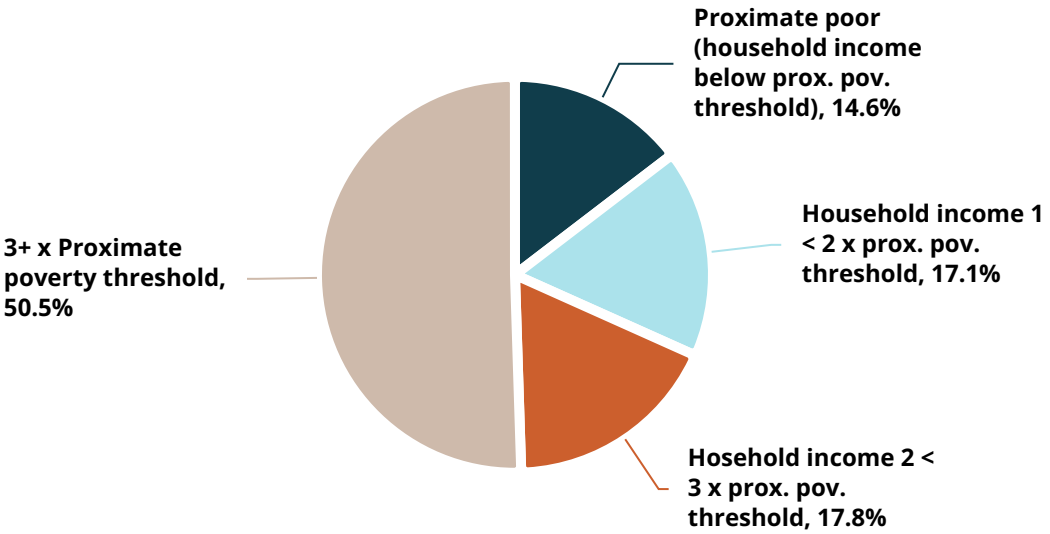


Table B.7 displays the distribution of working-age adults with different levels of literacy and numeracy proficiency across the four ranges of the ratio of their household income to the proximate poverty threshold. There is a strong link between skills proficiency levels and household income. One in three adults aged 16 to 74 whose literacy proficiency score was at or below the cut score defining level 1 were proximate poor and fewer than one-quarter had household incomes higher than 3 times the proximate poverty threshold. In sharp contrast, only 3.4 percent of those with the highest level of literacy proficiency, levels 4 or 5, were proximate poor and nearly three-quarters of these highly skilled working-age adults had household incomes above 3 times the proximate poverty threshold. Findings by numeracy proficiency levels show similar patterns (Table B.7).

Table B.7: Percentage Distribution of 16- to 74-Year-Old Persons in Each Literacy and Numeracy Proficiency Level, by the Ratio of Their Household Income to the Proximate Poverty Income Threshold, US, PIAAC 2017 (Standard Errors in Parentheses)

	HOUSEHOLD INCOME			
PROFICIENCY LEVEL	BELOW THE PROXIMATE POVERTY THRESHOLD	1 TO <2* THE PROXIMATE POVERTY THRESHOLD	2 TO <3* THE PROXIMATE POVERTY THRESHOLD	3*+ THE PROXIMATE POVERTY THRESHOLD
Literacy Proficiency Level				
Level 1 or below	33.2 (2.4)	23.6 (2.9)	19.1 (2.1)	24.1 (2.7)
Level 2	16.6 (1.6)	21.9 (2.0)	19.7 (1.8)	41.8 (2.2)
Level 3	6.9 (0.9)	12.7 (1.5)	16.3 (1.7)	64.1 (2.1)
Level 4/5	3.4 (1.4)	7.7 (1.9)	15.0 (2.4)	73.9 (3.2)
Total	14.6 (0.8)	17.1 (1.1)	17.8 (0.8)	50.5 (1.3)
Numeracy Proficiency Level				
Below Level 1	30.2 (2.0)	24.7 (2.1)	19.4 (1.5)	25.7 (2.2)
Level 1	13.0 (1.5)	19.2 (1.9)	18.6 (1.5)	49.2 (2.5)
Level 2	4.4 (1.1)	10.8 (1.8)	16.7 (1.9)	68.1 (2.7)
Level 3	2.1 (1.0)	6.0 (2.0)	13.5 (2.6)	78.5 (3.5)
Total	14.6 (0.8)	17.1 (1.1)	17.8 (0.8)	50.5 (1.3)

Appendix C: Details on PIAAC Proficiency Levels for Literacy and Numeracy Scales

Table C.1: Score Boundaries and Task Descriptions for PIAAC Proficiency Levels on the Literacy Scale

LITERACY PROFICIENCY LEVELS AND SCORE BOUNDARIES	LITERACY TASK DESCRIPTIONS
Below Level 1 (0 to 175)	The tasks at this level require the respondent to read brief texts on familiar topics to locate a single piece of specific information. Only basic vocabulary knowledge is required and the reader is not required to understand the structure of sentences or paragraphs or make use of other text features. There is seldom any competing information in the text and the requested information is identical in form to information in the question or directive. While the texts can be continuous the information can be located as if the text were noncontinuous. Tasks below Level 1 do not make use of any features specific to digital texts.
Level 1 (176 to 225)	Most of the tasks at this level require the respondent to read relatively short digital or print continuous noncontinuous or mixed texts to locate a single piece of information which is identical to or synonymous with the information given in the question or directive. Some tasks may require the respondent to enter personal information into a document in the case of some noncontinuous texts. Little if any competing information is present. Some tasks may require simple cycling through more than one piece of information. Knowledge and skill in recognizing basic vocabulary evaluating the meaning of sentences and reading of paragraph text is expected.
Level 2 (226 to 275)	At this level the complexity of text increases. The medium of texts may be digital or printed and texts may comprise continuous noncontinuous or mixed types. Tasks in this level require respondents to make matches between the text and information and may require paraphrase or low-level inferences. Some competing pieces of information may be present. Some tasks require the respondent to • cycle through or integrate two or more pieces of information based on criteria • compare and contrast or reason about information requested in the question or • navigate within digital texts to access and identify information from various parts of a document.
Level 3 (276 to 325)	Texts at this level are often dense or lengthy including continuous noncontinuous mixed or multiple pages. Understanding text and rhetorical structures become more central to successfully completing tasks especially in navigation of complex digital texts. Tasks require the respondent to identify interpret or evaluate one or more pieces of information and often require varying levels of inferencing. Many tasks require the respondent construct meaning across larger chunks of text or perform multistep operations in order to identify and formulate responses. Often tasks also demand that the respondent disregard irrelevant or inappropriate text content to answer accurately. Competing information is often present but it is not more prominent than the correct information.
Level 4 (326 to 375)	Tasks at this level often require respondents to perform multiple-step operations to integrate interpret or synthesize information from complex or lengthy continuous noncontinuous mixed or multiple type texts. Complex inferences and application of background knowledge may be needed to perform successfully. Many tasks require identifying and understanding one or more specific noncentral ideas in the text in order to interpret or evaluate subtle evidence claim or persuasive discourse relationships. Conditional information is frequently present in tasks at this level and must be taken into consideration by the respondent. Competing information is present and sometimes seemingly as prominent as correct information.
Level 5 (376 to 500)	At this level tasks may require the respondent to search for and integrate information across multiple dense texts; construct syntheses of similar and contrasting ideas or points of view; or evaluate evidence-based arguments. Application and evaluation of logical and conceptual models of ideas may be required to accomplish tasks. Evaluating reliability of evidentiary sources and selecting key information is frequently a key requirement. Tasks often require respondents to be aware of subtle rhetorical cues and to make high-level inferences or use specialized background knowledge.

Source: Tamassia, Claudia Tamassia and Mary Louise Lennon, "PIAAC Proficiency Scales," *Technical Report of the Survey of Adult Skills (PIAAC),* Organisation for Economic Co-operation and Development, 2013, Chapter 21 (http://www.oecd.org/skills/piaac/_technical%20report_17oct13.pdf).

Table C.2: Score Boundaries and Task Descriptions for PIAAC Proficiency Levels on the Numeracy Scale

NUMERACY PROFICIENCY LEVELS AND SCORE BOUNDARIES	NUMERACY TASK DESCRIPTIONS
Below Level 1 (0 to 175)	Tasks at this level are set in concrete familiar contexts where the mathematical content is explicit with little or no text or distractors and that require only simple processes such as counting sorting performing basic arithmetic operations with whole numbers or money or recognizing common spatial representations.
Level 1 (176 to 225)	Tasks in this level require the respondent to carry out basic mathematical processes in common concrete contexts where the mathematical content is explicit with little text and minimal distractors. Tasks usually require simple one-step or two-step processes involving for example performing basic arithmetic operations; understanding simple percents such as 0.5; or locating identifying and using elements of simple or common graphical or spatial representations.
Level 2 (226 to 275)	Tasks in this level require the respondent to identify and act upon mathematical information and ideas embedded in a range of common contexts where the mathematical content is fairly explicit or visual with relatively few distractors. Tasks tend to require the application of two or more steps or processes involving for example calculation with whole numbers and common decimals percents and fractions; simple measurement and spatial representation; estimation; and interpretation of relatively simple data and statistics in texts tables and graphs.
Level 3 (276 to 325)	Tasks in this level require the respondent to understand mathematical information which may be less explicit embedded in contexts that are not always familiar and represented in more complex ways. Tasks require several steps and may involve the choice of problem-solving strategies and relevant processes. Tasks tend to require the application of for example number sense and spatial sense; recognizing and working with mathematical relationships patterns and proportions expressed in verbal or numerical form; and interpretation and basic analysis of data and statistics in texts tables and graphs.
Level 4 (326 to 375)	Tasks in this level require the respondent to understand a broad range of mathematical information that may be complex abstract or embedded in unfamiliar contexts. These tasks involve undertaking multiple steps and choosing relevant problem-solving strategies and processes. Tasks tend to require analysis and more complex reasoning about for example quantities and data; statistics and chance; spatial relationships; change; proportions; and formulas. Tasks in this level may also require comprehending arguments or communicating well-reasoned explanations for answers or choices.
Level 5 (376 to 500)	Tasks in this level require the respondent to understand complex representations and abstract and formal mathematical and statistical ideas possibly embedded in complex texts. Respondents may have to integrate multiple types of mathematical information where considerable translation or interpretation is required; draw inferences; develop or work with mathematical arguments or models; and justify evaluate and critically reflect upon solutions or choices.

Source: Tamassia, Claudia Tamassia and Mary Louise Lennon, "PIAAC Proficiency Scales," *Technical Report of the Survey of Adult Skills (PIAAC),* Organisation for Economic Co-operation and Development, 2013, Chapter 21 (http://www.oecd.org/skills/piaac/_technical%20report_17oct13.pdf).

Appendix D: Proximate Poverty Rates

Table D.1: Proximate Poverty Rates of 16- to-74-Year-Old Persons in the US, PIAAC 2017

VARIABLE	PROXIMATE POVERTY RATE	STANDARD ERROR	TOTAL
Total	14.6	0.8	3,140
Gender			
Male	12.8	1.2	1,459
Female	16.2	0.8	1,681
Race/Ethnicity[1]			
White	9.0	0.6	2,074
Black	27.3	3.3	434
Hispanic	30.0	2.6	381
All Other Races	—	—	—
Age			
16-24	19.3	2.2	397
25-34	18.1	1.7	592
35-54	14.0	1.0	1,144
55-74	10.6	1.1	1,007
Educational Attainment			
No HS diploma	42.3	3.1	335
HS diploma or some college, no credential	18.4	1.2	1,160
Certification	11.5	2.1	246
Associate's degree	6.3	1.6	328
Bachelor's degree	4.6	0.6	655
Master's or higher degree	2.2	0.6	414
School Enrollment Status			
Enrolled	14.5	1.9	407
Not Enrolled	14.6	0.8	2,733
Nativity Status			
Native-Born	13.6	0.8	2,784
Foreign-Born	21.1	2.3	352
Self-Reported Health Status			
Good Health (excellent, very good, or good)	11.8	0.9	2,565
Poor Health (fair or poor)	27.3	1.6	573
Disability Status			
Without disabilities	12.4	0.9	2,290
With disabilities	20.6	1.4	844

— Not applicable.

[1] The PIAAC data file provides a five-category derived race variable. Individuals who answered yes to the Hispanic or Latino origin question were classified as Hispanic. The remaining respondents who said they were not Hispanic or Latino (non-Hispanics) were classified into four race groups: White, Black, Asian/Pacific Islander, and a residual race category of "all other races," that includes Asian, American Indian, Alaska Native, Native Hawaiian, and Other Pacific Islanders race groups. Races in this last category, "all other races," could not be reported individually because the sample sizes were not large enough to meet the OECD recommendations to have a sample size of 62 cases per analytic group or subgroup to report and publish findings. (See: AIR PIAAC Team. (n.d.). *What you need to consider before working with PIAAC data.* Retrieved from https://static1.squarespace.com/static/51bb74b8e4b0139570ddf020/t/57ebf7cd9f74562532dd2df3/1475082297812/WorkingWithPIAACData_updated+092816.pdf. Since this residual category is conceptually meaningless, findings for this group are not included in discussions in this paper.

Table D.1: Proximate Poverty Rates of 16- to-74-Year-Old Persons in the US, PIAAC 2017 (Continued)

VARIABLE	PROXIMATE POVERTY RATE	STANDARD ERROR	TOTAL
Current and Past Employment Status			
Currently working (full-time or part-time)	10.1	0.8	2,288
Currently working full-time	6.3	0.7	1,702
Currently working part-time	20.4	1.9	586
Recent work experience in last 12 month	24.6	3.0	210
Last paid work longer than 12 months ago	24.1	2.4	550
No work experience	44.0	4.4	92
Regions of Residence			
Northeast	11.3	1.6	331
Midwest	11.3	1.4	967
South	17.9	1.6	1,295
West	14.7	1.5	547
Household Living Arrangement			
Living with spouse with kids	13.0	1.3	705
Living with spouse, no kids	8.3	1.1	862
No spouse, living with kids	32.9	2.8	362
No spouse living alone/living with others	16.7	1.3	1,211
Literacy Proficiency Level			
Level 1 or Below	33.2	2.4	590
Level 2	16.6	1.6	1,050
Level 3	6.9	0.9	1,085
Levels 4 or 5	3.3	1.4	415
Numeracy Proficiency Level			
Level 1 or Below	30.2	2.0	929
Level 2	13.0	1.5	1,043
Level 3	4.4	1.1	866
Levels 4 or 5	2.1	1.0	301

— Not applicable.

[1] The PIAAC data file provides a five-category derived race variable. Individuals who answered yes to the Hispanic or Latino origin question were classified as Hispanic. The remaining respondents who said they were not Hispanic or Latino (non-Hispanics) were classified into four race groups: White, Black, Asian/Pacific Islander, and a residual race category of "all other races," that includes Asian, American Indian, Alaska Native, Native Hawaiian, and Other Pacific Islanders race groups. Races in this last category, "all other races," could not be reported individually because the sample sizes were not large enough to meet the OECD recommendations to have a sample size of 62 cases per analytic group or subgroup to report and publish findings. (See: AIR PIAAC Team. (n.d.). *What you need to consider before working with PIAAC data.* Retrieved from https://static1.squarespace.com/static/51bb74b8e4b0139570ddf020/t/57ebf7cd9f74562532dd2df3/1475082297812/WorkingWithPIAACData_updated+092816.pdf. Since this residual category is conceptually meaningless, findings for this group are not included in discussions in this paper.

Appendix E: Race/Ethnicity

Race/ethnicity categories used in this paper are based on respondents' answers to two questions regarding their race and Hispanic origin. The first question asks respondents if they were Hispanic or Latino with the option to answer yes or no. The second (separate) question asked respondents to select a race group out of the following five that best describes them: i) White, ii) Black or African American, iii) Asian, iv) American Indian or Alaska Native, and v) Native Hawaiian or Other Pacific Islander.

Using these two questions, the PIAAC data file provides a five-category derived race variable. Individuals who answered yes to the Hispanic or Latino origin question were classified as Hispanic. The remaining respondents who said they were not Hispanic or Latino (non-Hispanics) were classified into four race groups: White, Black, Asian/Pacific Islander, and a residual race category of "other race," that includes Asian, American Indian, Alaska Native, Native Hawaiian, and Other Pacific Islanders race groups. These race groups could not be reported individually because the sample sizes were not large enough to meet the OECD recommendations to have a sample size of 62 cases per analytic group or subgroup to report and publish findings. Since this residual category is conceptually meaningless, findings for this group are not included in discussions in the paper.

Appendix F: Definitions of Variables in Proximate Poverty Regressions

Dependent Variable

prox_pov = a dichotomous proximate poverty status variable
= 1, if proximate poor
= 0, if else

Independent Variables

Standardized Literacy and Numeracy Test Score

pvlitz = Standardized literacy proficiency score

pvnumz = Standardized numeracy proficiency score

Gender
Base group is male.

female = a dichotomous gender variable
= 1, if female
= 0, if male

Race/Ethnicity Variables
Base group is non-Hispanic White.

black = a dichotomous race variable
= 1, if non-Hispanic Black
= 0, if else

hispanic = a dichotomous race variable
= 1, if Hispanic
= 0, if else

Other_race = a dichotomous residual race variable
= 1, if All Other Races (NOT White, Black, or Hispanic)
= 0, if else

Nativity Status
Base group is native-born.

foreign_born = a dichotomous nativity status variable
= 1, if born outside the United States
= 0, if else

Age

Base group is 55 to 74 years old.

age_16_24 = a dichotomous age category variable
= 1, if 16 to 24 years old
= 0, if else

age_25_34 = a dichotomous age category variable
= 1, if 25 to 34 years old
= 0, if else

age_35_54 = a dichotomous age category variable
= 1, if 35 to 54 years old
= 0, if else

School Enrollment Status

Base group is not enrolled in school.

enrolled = a dichotomous enrollment status variable
= 1, if enrolled in educational institutions
= 0, if else

Health Status

Base group is fair or poor self-reported health.

health_excellent_verygood_good = a dichotomous self-reported health status variable
= 1, if self-reported health is excellent, very good, or good
= 0, if else

Educational Attainment

Base group is persons with high school diploma or some college, no degree.

educat_lt_hs = a dichotomous educational attainment variable
= 1, if less than high school diploma
= 0, if else

educat_certification = a dichotomous educational attainment variable
= 1, if some type of college of trade school certification
= 0, if else

educat_associates = a dichotomous educational attainment variable
= 1, if Associate's degree
= 0, if else

educat_bachelors = a dichotomous educational attainment variable
= 1, if Bachelor's degree
= 0, if else

educat_masters_plus = a dichotomous educational attainment variable
= 1, if Master's or higher degree
= 0, if else

Current and Past Employment Status

Base group is currently (at the time of the 2017 PIAAC survey) working full-time (35 or more hours per week).

curr_emp_pt = a dichotomous current employment status variable
= 1, if currently working part-time (less than 35 hours per week)
= 0, if else

work_last_12m = a dichotomous past employment status variable
= 1, if last worked in the 12 months preceding the 2017 PIAAC survey
= 0, if else

work_last_12mago = a dichotomous past employment status variable
= 1, if last worked longer than 12 months ago
= 0, if else

never_worked = a dichotomous past employment status variable
= 1, if never worked
= 0, if else

Region of Residence of Worker

Base group is resident of the South region.

northeast = a dichotomous region of residence variable
= 1, if Northeast region resident
= 0, if else

midwest = a dichotomous region of residence variable
= 1, if Midwest region resident
= 0, if else

west = a dichotomous region of residence variable
= 1, if West region resident
= 0, if else

Household Living Arrangements - Marital/Cohabitation Status and Children Under 18

Base group is married/cohabiting without children under age 18.

marr_cohab_withkids = a dichotomous household living arrangements variable
= 1, if married/cohabiting with children under age 18
= 0, if else

single_withkids = a dichotomous household living arrangements variable
= 1, if single (not married/cohabiting) with children under age 18
= 0, if else

single_nokids = a dichotomous household living arrangements variable
= 1, if single (not married/cohabiting) without children under age 18
= 0, if else

Appendix G: Estimated Coefficients, Standard Errors, and Percentage Point Effects of Each Proximate Poverty Logistic Regression Model

Table G.1: Estimated Logistic Regression Coefficients, Standard Errors, and Percentage Point Effects for Regression Model 1 (Excluding Standardized Literacy or Numeracy Proficiency Score among Independent Variables), 16- to 74-Year-Old Individuals, US, PIAAC 2017

VARIABLE	COEFFICIENT	STANDARD ERROR	Z	P>Z	ESTIMATED PERCENTAGE POINT EFFECT
female	0.116	0.141	0.8	0.412	1.1%
hispanic	1.223	0.186	6.6	0.000	11.2%
black	1.003	0.212	4.7	0.000	9.2%
all_other_races	—	—	—	—	—
foreign_born	0.364	0.203	1.8	0.073	3.3%
age_16_24	0.466	0.231	2.0	0.044	4.3%
age_25_34	1.039	0.215	4.8	0.000	9.5%
age_35_54	0.645	0.207	3.1	0.002	5.9%
educat_lt_hs	1.055	0.164	6.4	0.000	9.6%
educat_certification	-0.370	0.239	-1.6	0.122	-3.4%
educat_associates	-1.089	0.263	-4.1	0.000	-9.9%
educat_bachelors	-1.102	0.190	-5.8	0.000	-10.1%
educat_masters_plus	-1.949	0.368	-5.3	0.000	-17.8%
enrolled	-0.491	0.176	-2.8	0.005	-4.5%
health_excellent_verygood_good	-0.619	0.157	-3.9	0.000	-5.6%
curr_emp_pt	1.485	0.182	8.2	0.000	13.6%
worked_last_12m	1.525	0.195	7.8	0.000	13.9%
worked_last_12mago	1.923	0.255	7.6	0.000	17.6%
never_worked	1.819	0.231	7.9	0.000	16.6%
marr_cohab_withkids	0.500	0.218	2.3	0.021	4.6%
single_withkids	1.476	0.214	6.9	0.000	13.5%
single_nokids	0.349	0.203	1.7	0.086	3.2%
northeast	-0.239	0.271	-0.9	0.378	-2.2%
midwest	-0.212	0.158	-1.3	0.179	-1.9%
west	-0.182	0.178	-1.0	0.306	-1.7%
constant	-3.444	0.222	-15.5	0.000	—
N = 3,119					

— Not applicable.

Table G.2: Estimated Logistic Regression Coefficients, Standard Errors, and Percentage Point Effects for Regression Model 2 (Including Standardized Literacy Proficiency Score among Independent Variables), 16- to 74-Year-Old Individuals, US, PIAAC 2017

VARIABLE	COEFFICIENT	STANDARD ERROR	Z	P>Z	ESTIMATED PERCENTAGE POINT EFFECT
pvlitz	-0.503	0.115	-4.4	0.000	-4.5%
female	0.178	0.150	1.2	0.238	1.6%
hispanic	1.060	0.193	5.5	0.000	9.4%
black	0.696	0.227	3.1	0.002	6.2%
all_other_races	—	—	—	—	—
foreign_born	0.159	0.213	0.8	0.456	1.4%
age_16_24	0.730	0.249	2.9	0.003	6.5%
age_25_34	1.223	0.228	5.4	0.000	10.9%
age_35_54	0.730	0.210	3.5	0.001	6.5%
educat_lt_hs	0.860	0.161	5.3	0.000	7.6%
educat_certification	-0.245	0.243	-1.0	0.314	-2.2%
educat_associates	-0.979	0.271	-3.6	0.000	-8.7%
educat_bachelors	-0.734	0.198	-3.7	0.000	-6.5%
educat_masters_plus	-1.556	0.361	-4.3	0.000	-13.8%
enrolled	-0.336	0.173	-2.0	0.052	3.0%
health_excellent_verygood_good	-0.533	0.168	-3.2	0.001	-4.7%
curr_emp_pt	1.474	0.182	8.1	0.000	13.1%
worked_last_12m	1.601	0.185	8.7	0.000	14.2%
worked_last_12mago	1.873	0.250	7.5	0.000	16.6%
never_worked	1.714	0.218	7.9	0.000	15.2%
marr_cohab_withkids	0.535	0.235	2.3	0.023	4.8%
single_withkids	1.464	0.221	6.6	0.000	13.0%
single_nokids	0.401	0.202	2.0	0.048	3.6%
northeast	-0.158	0.238	-0.7	0.507	-1.4%
midwest	-0.175	0.160	-1.1	0.274	-1.6%
west	-0.107	0.169	-0.6	0.525	-1.0%
constant	-3.799	0.242	-15.7	0.000	—
N = 3,119					

— Not applicable.

Table G.3: Estimated Logistic Regression Coefficients, Standard Errors, and Percentage Point Effects for Regression Model 3 (Including Standardized Numeracy Proficiency Score among Independent Variables), 16- to 74-Year-Old Individuals, US, PIAAC 2017

VARIABLE	COEFFICIENT	STANDARD ERROR	Z	P>Z	ESTIMATED PERCENTAGE POINT EFFECT
pvnumz	-0.651	0.101	-6.5	0.000	-5.7%
female	0.098	0.145	0.7	0.502	0.9%
hispanic	0.948	0.197	4.8	0.000	8.3%
black	0.555	0.233	2.4	0.017	4.9%
all_other_races	—	—	—	—	—
foreign_born	0.195	0.221	0.9	0.378	1.7%
age_16_24	0.834	0.256	3.3	0.001	7.3%
age_25_34	1.258	0.225	5.6	0.000	11.0%
age_35_54	0.762	0.217	3.5	0.000	6.7%
educat_lt_hs	0.747	0.165	4.5	0.000	6.5%
educat_certification	-0.191	0.250	-0.8	0.446	-1.7%
educat_associates	-0.949	0.269	-3.5	0.000	-8.3%
educat_bachelors	-0.611	0.198	-3.1	0.002	-5.4%
educat_masters_plus	-1.439	0.370	-3.9	0.000	-12.6%
enrolled	-0.315	0.175	-1.8	0.072	-2.8%
health_excellent_verygood_good	-0.535	0.166	-3.2	0.001	-4.7%
curr_emp_pt	1.543	0.190	8.1	0.000	13.5%
worked_last_12m	1.628	0.183	8.9	0.000	14.3%
worked_last_12mago	1.931	0.255	7.6	0.000	16.9%
never_worked	1.623	0.225	7.2	0.000	14.2%
marr_cohab_withkids	0.539	0.244	2.2	0.027	4.7%
single_withkids	1.449	0.231	6.3	0.000	12.7%
single_nokids	0.378	0.208	1.8	0.069	3.3%
northeast	-0.106	0.242	-0.4	0.662	-0.9%
midwest	-0.155	0.166	-0.9	0.348	-1.4%
west	-0.073	0.171	-0.4	0.671	-0.6%
constant	-3.868	0.231	-16.7	0.000	—
N = 3,119					

— Not applicable.

About the Authors

Neeta Fogg is an economist at Rhode Island College. She has led net impact studies of workforce development programs and school-to-work and school-to-college program initiatives. She has conducted longitudinal research of Philadelphia high school graduates and been deeply engaged in the analysis of the labor market impact of literacy and numeracy skills in the United States.

Paul Harrington is an economist at Rhode Island College. Much of his work centers on the way that organizations can better understand the labor market and fashion efforts that can more effectively create and provide improved opportunity and engagement in the labor market.

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Irwin Kirsch (retired) was the Ralph Tyler Chair in Large Scale Assessment and director of the Center for Global Assessment at ETS in Princeton, NJ. In his role as director of the center, he oversaw several teams of research scientists, assessment designers, and platform developers responsible for the development, management, and implementation of large-scale national and international assessments. Over the course of his career, Dr. Kirsch worked in close collaboration with a number of state, national, and international organizations including the World Bank®, UNESCO®, the International Association for the Evaluation of Educational Achievement, and the Organisation for Economic Co-operation and Development® where he was responsible for the development and conduct of the two largest international assessments that provide policy makers and key stakeholders with national and international comparative data on literacy and workforce preparedness, the Program for the International Assessment of Adult Competencies (PIAAC) and the Program for International Student Assessment (PISA). In addition to his assessment work, Dr. Kirsch serves on the board of a nonprofit literacy organization and as a reviewer for several journals. He has published numerous research articles and book chapters dealing with issues around designing, developing, and interpreting cognitive-based scales and has written a number of policy reports using large-scale assessment data that focus on the growing importance of skills and their connections to life outcomes.

Endnotes

1 Robert Haveman, Rebecca Blank, Robert Moffitt, Timothy Smeeding, and Geoffrey Wallace, "The War on Poverty: Measurement, Trends, and Policy," *Journal of Policy Analysis and Management* 34, no. 3 (Summer 2015): 593–638, https://doi.org/10.1002/pam.21846.

2 Large reductions in poverty rates among the US 65 and older population have occurred over the past 50 years primarily because of the growth in Old Age Benefit payments per beneficiary. See Gary V. Engelhardt and Jonathan Gruber, "Social Security and the Evolution of Elderly Poverty," Working Paper 10466, National Bureau of Economic Research, Cambridge, MA, May 2004, https://www.nber.org/system/files/working_papers/w10466/w10466.pdf.

3 Gordon M. Fisher, "The Development and History of Poverty Thresholds," *Social Security Bulletin* 55, no. 4, (Winter 1992): 1–14, https://www.ssa.gov/policy/docs/ssb/v55n4/v55n4p3.pdf.

4 Stephanie Riegg Cellini, Signe-Mary McKernan, and Carolina Ratcliffe, "The Dynamics of Poverty in the United States: A Review of Data, Methods, and Findings," *Journal of Policy Analysis and Management* 27, no. 3 (Summer 2008): 577–605, https://doi.org/10.1002/pam.20337; Isabel V. Sawhill, "Poverty in the U.S.: Why Is It so Persistent?" *Journal of Economic Literature* 26, no. 3 (September 1988): 1073–1119, https://www.jstor.org/stable/2726525.

5 This overestimation is the result of the use of educational attainment as a proxy for ability in human capital models. Our analysis of PIAAC data in the United States reveals considerable variability in literacy and numeracy skills at each level of educational attainment, with a surprising large proportion of college graduates with deficient skills, particularly numeracy skills. See Neeta Fogg, Paul Harrington, Ishwar Khatiwada, Irwin Kirsch, Anita Sands, and Larry Hanover, "If You Can't Be With the Data You Love: And the Risks of Loving the Data You're With," The Impact of Human Capital in the American Labor Market Series, ETS, Princeton, NJ, September 2019, https://www.ets.org/s/research/pdf/if-you-cant-be-with-the-data-you-love.pdf.

6 Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, "Skills and Earnings in the Full-Time Labor Market," The Impact of Human Capital in the American Labor Market Series, ETS, Princeton, NJ, September 2018, https://www.ets.org/s/research/pdf/skills-and-earnings-in-the-full-time-labor-market.pdf; Neeta Fogg, Paul Harrington, Ishwar Khatiwada, and Larry Hanover, "Skills and Earnings in the Part-Time Labor Market," The Impact of Human Capital in the American Labor Market Series, ETS, Princeton, NJ, May 2020, https://www.ets.org/s/research/pdf/skills-and-earnings-in-the-part-time-labor-market.pdf; Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, "Skills and the Earnings of College Graduates," The Impact of Human Capital in the American Labor Market Series, ETS, Princeton, NJ, March 2019, https://www.ets.org/s/research/pdf/skills-and-the-earnings-of-college-graduates.pdf; Neeta Fogg, Paul Harrington, Ishwar Khatiwada, Irwin Kirsch, and Anita Sands, "Skills and Labor Market Outcomes of Working-Age Americans," The Impact of Human Capital in the American Labor Market Series, ETS, Princeton, NJ, September 2022, https://www.ets.org/content/dam/ets-org/pdfs/rd/skills-labor-market-outcomes-working-age-americans.pdf.

7 Neeta Fogg et al., "If You Can't Be."

8 See Appendix A for information about the structure and contents of the 2017 PIAAC background questionnaire.

9 The PIAAC public use data file for 2017 can be downloaded from NCES website, https://nces.ed.gov/surveys/piaac/datafiles.asp.

10 Irwin Kirsch and Mary Louise Lennon, PIAAC: A New Design for a New Era, *Large-Scale Assessment in Education* 5, Article 11 (2017), https://largescaleassessmentsineducation.springeropen.com/articles/10.1186/s40536-017-0046-6.

11 See Kentaro Yamamoto, Lale Khorramdel, and Mattias von Davier, "Chapter 17: Scaling PIAAC Cognitive Data," in *Technical Report of the Survey of Adult Skills (PIAAC)* (Paris: Organization for Economic Cooperation and Development, 2013), https://www.oecd.org/skills/piaac/_Technical%20Report_17OCT13.pdf.

12 Of the 3,660 respondents to the 2017 US PIAAC survey, 3,140 respondents had provided a valid response to household income question and 520 respondents did not provide a valid response (141 respondents said that they did not know their household income, 198 refused to answer the question, and 181 were listed in the data file as "not stated or inferred"). Proximate poverty could not be computed for these 520 respondents, and they were therefore excluded from this analysis. Findings in this paper are based in 3,140 respondents who had a valid response to the household income question.

13 Fisher, "The Development and History of the Poverty Thresholds."

14 The weighted poverty income thresholds are calculated (by the US Census Bureau) as weighted averages of poverty thresholds for each group of household size/number of related children under 18. The weights used to compute the weighted average poverty income thresholds are derived from authors' analysis of the Current Population Survey's Annual Social and Economic Supplement, US Census Bureau, Current Population Survey Annual Social and Economic Supplement, Public Use Micro Datafile, 2016 and 2017, https://www.census.gov/data/datasets/time-series/demo/cps/cps-asec.html.

15 The 2017 PIAAC Survey was conducted between March 2017 and September 2017, and the household income question on the survey asked respondents to report their household income over the preceding 12-month period. Depending on the month during which respondents completed the survey, their household income represents income during the 12-month period preceding the period between March 2017 and September 2017. Therefore, the 2017 PIAAC reports household income of respondents over the March 2016 to September 2017 period.

16 Fisher, "The Development and History of the Poverty Thresholds."

17 Patricia Ruggles, *Drawing the Line: Alternative Poverty Measures and Their Implications for Public Policy* (Washington, D.C., Urban Institute Press, 1990); Rebecca M. Blank, "Presidential Address: How to Improve Poverty Measurement in the United States," *Journal of Policy Analysis and Management* 27, no. 2 (2008): 233–254, https://doi.org/10.1002/pam.20323; John Fitzgerald and Robert Moffitt, The Supplemental Expenditure Poverty Measure: A New Method for Measuring Poverty," Brookings Papers of Economic Activity, BPEA Conference Drafts, March 24–25, Brookings Institute, Washington, DC, 2022, https://www.brookings.edu/wp-content/uploads/2022/03/SP22_BPEA_FitzgeraldMoffitt_conf-draft.pdf.

18 Riegg Cellini et al., "The Dynamics of Poverty"; Sawhill, "Poverty in the U.S."

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20 Gary S. Becker, *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education* (Chicago: University of Chicago Press, 1964).

21 See Irwin Kirsch, Henry Braun, Mary Louise Lennon, and Anita Sands, *Choosing our Future: A Story of Opportunity in America* (Princeton, NJ: ETS, 2016), https://www.ets.org/s/research/report/opportunity/ets-choosing-our-future.pdf; and Walter W. McMahon, "The Social and External Benefits of Education," in *International Handbook of the Economics of Education*, ed. Geraint Johnes and Jill Johnes (Cheltenham, UK: Edward Elgar Publishing, 2004), 211–59.

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23 Fogg et al., "Skills and Labor Market Outcomes."

24 Isabel Sawhill and Quentin Karpilow, *Strategies for Assisting Low-Income Families* (Washington, D.C.: Brookings Institution, June 28, 2013) https://www.brookings.edu/wp-content/uploads/2016/06/01-assisting-low-income-families-sawhill.pdf; Matt Barnes and Chris Lord, *Poverty, Economic Status, and Skills: What are the Links*? (York, England: Joseph Rowntree Foundation, November 2013) https://www.jrf.org.uk/report/poverty-economic-status-and-skills-what-are-links (this study uses educational attainment as proxy for skills); Helen F. Ladd, "Education and Poverty: Confronting the Evidence," *Journal of Policy Analysis and Management* 31, no. 2 (2012): 203–227; Richard J. Coley and Bruce Baker, *Poverty and Education: Finding the Way Forward* (Princeton, NJ: ETS, July 2013), https://www.ets.org/s/research/pdf/poverty_and_education_report.pdf.

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28 We found one Canadian study used data from the Longitudinal and International Study of Adults (LISA) to study the connection between skills and low-income status of working-age Canadians. The LISA database combines skills data from PIAAC with household income data. See Andrew Heisz, Geranda Notten, and Jerry Situ, "The Association between Skills and Low Income," Insights on Canadian Society, Statistics Canada, February 24, 2016, https://www150.statcan.gc.ca/n1/en/pub/75-006-x/2016001/article/14322-eng.pdf?st=UH9qcaj-. This study shows a strong link between skills and income inadequacy/low income that continues to persist even after regression controls for education and other demographic factors. The study finds that the link between skills and income inadequacy is somewhat muted after controlling for education and conversely, the link between education and income inadequacy is somewhat muted after controlling for skills.

29 Fogg et al., "If You Can't Be"; Darcy Hango, "University Graduates with Lower Levels of Literacy and Numeracy Skills," Insights on Canadian Society, Statistics Canada, November 4, 2014, https://www150.statcan.gc.ca/n1/en/pub/75-006-x/2014001/article/14094-eng.pdf?st=LXiN7mCh.

30 Fogg et al., "Skills and Earnings in the Full-Time Labor Market"; Fogg et al., "Skills and the Earnings of College Graduates."

31 Madeline J. Goodman, Anita M. Sands, and Richard J. Coley, *America's Skills Challenge: Millennials and the Future* (Princeton, NJ: ETS, 2015), https://origin-www.ets.org/s/research/30079/asc-millennials-and-the-future.pdf.

32 In addition to literacy and numeracy proficiency scores, PIAAC data files also report the following six levels of literacy and numeracy proficiency: below level 1, level 1, level 2, level 3, level 4, and level 5. These levels are based on cut scores that are associated with a range of literacy and numeracy tasks. Appendix C contains details on the six proficiency levels including the range of cut scores and task descriptions for each level of literacy and numeracy proficiency.

33 "Current Population Survey: Concepts," US Bureau of Labor Statistics, last modified, April 10, 2018, https://www.bls.gov/opub/hom/cps/concepts.htm.

34 Our estimate of proximate poverty among working people is surprisingly high. This is primarily because of our definition of the working population which includes all those who were employed at the time of the PIAAC survey. It is a relatively loose definition since it includes all those who were employed at a point in time. Using a much more restricted measure of the working population (those who were employed or actively looking for work for at least half a year [27 weeks]), the US Bureau of Labor Statistics estimated a "working-poor rate" of about 4 percent. See "A Profile of the Working Poor, 2019", BLS Reports 1093, US Bureau of Labor Statistics, May 2021, https://www.bls.gov/opub/reports/working-poor/2019/home.htm. We discuss this in greater detail in the remainder of the section on Proximate Poverty and Employment.

35 Fogg et al., "Skills and Labor Market Outcomes of Working-Age Americans."

36 See Table 3 in Kayla Fontenot, Jessica Semega, and Melissa Kollar, "Income and Poverty in the United States: 2017," Current Population Reports, P60-263, US Census Bureau, Washington, DC, September 2018, https://www.census.gov/content/dam/Census/library/publications/2018/demo/p60-263.pdf. Gaps in the poverty rate by employment intensity were quite similar in other years. The most recent poverty report shows 2021 poverty rates of 1.8 among full-time year-round workers, 12.2 percent among workers with less than full-time, year-round employment, and 30.0 percent among those with no employment during the entire year; see Table A-1 in John Creamer, Emily A. Shrider, Kalee Burns, and Francis Chen, "Poverty in the United States: 2021," Current Population Reports, P60-273, US Census Bureau, September 2022, https://www.census.gov/content/dam/Census/library/publications/2022/demo/p60-277.pdf.

37 See *Technical Notes* in "A Profile of the Working Poor, 2017," Report 1079, US Bureau of Labor Statistics, April 2019, https://www.bls.gov/opub/reports/working-poor/2017/home.htm#technical-notes.

38 "A Profile of the Working Poor, 2019" (Table 1), Report 1093, US Bureau of Labor Statistics, May 2021, https://www.bls.gov/opub/reports/working-poor/2019/home.htm. Working poverty data for 2020 reveals little difference overall working poverty rate (4.1 percent in 2020 versus 4.0 percent in 2019) and working poverty rates among workers by their usual weekly hours of work. See "A Profile of the Working Poor, 2020" (Table 1), Report 1099, September 2022, https://www.bls.gov/opub/reports/working-poor/2020/home.htm.

39 "A Profile of the Working Poor, 2019" (Table 1), Report 1093, US Bureau of Labor Statistics, May 2021, https://www.bls.gov/opub/reports/working-poor/2019/home.htm.

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42 Signe-Mary McKernan and Caroline Ratcliffe, "Events that Trigger Poverty Entries and Exits," *Social Science Quarterly* 86 (A Special Issue: Income, Poverty, and Opportunity); December 2005), 1146–1189; Simon M. Burgess and Carol Propper, "An Economic Model of Household Income Dynamics, with an Application to Poverty Dynamics among American Women," Discussiong Paper Series CASE/9, Center for Analysis of Social Exclusion, London School of Economics, July 1998, https://core.ac.uk/download/pdf/93937.pdf.

43 Riegg Cellini et al., "The Dynamics of Poverty."

44 Ron Haskins and Isabel Sawhill, *Creating an Opportunity Society* (Washington, D.C., Brookings Institution Press, 2009).

45 Brian Goesling, Hande Inanc, and Angela Rachidi, "Success Sequence: A Synthesis of Literature," OPRE Report 2020-41, Office of Planning, Research, and Evaluation, Administration for Children and Families, US Department of Health and Human Services, Washington, D.C., 2020, https://www.acf.hhs.gov/sites/default/files/documents/opre/Success_sequence_review_2020_508_0.pdf.

46 Wendy Wang and Brad Wilcox, "The Power of the Success Sequence," Institute for Family Studies, American Enterprise Institute, May 2022, https://ifstudies.org/ifs-admin/resources/reports/successsequencedisadvantagedya-final.pdf.

47 The other two components of the success sequence—employment and educational attainment—are analyzed separately in the descriptive section. All three elements of the success sequence are included as independent variables in the proximate poverty regressions and the regression findings are presented in the regression section of this paper.

48 Married couple households have the potential of two breadwinners in the household, a benefit that is not available to single parents or single individuals.

49 John G. Orme and Terri Combs-Orme, *Multiple Regression with Discrete Dependent Variables* (New York: Oxford University Press, 2009).

50 Regression model 1 represents the more typical analysis of poverty that is undertaken in the absence of rigorous measures of foundational skills that are not included in most household surveys. This limitation forces the researcher to rely on the educational attainment variable as the only measure of human capital.

51 For ease of interpretation, regression coefficients of independent variables are converted to marginal effects that are presented in Table 5. The marginal effect of each independent variable measures the percentage point change in the likelihood of proximate poverty expected from one unit change in the independent variable. The regression coefficients along with standard errors are presented in Appendix F.

52 "US PIAAC Background Questionnaire, 2017" (Question 8 in Section I), National Center for Education Statistics, https://nces.ed.gov/surveys/piaac/2017-en-household-bq.htm#I_Q08.

53 "Poverty in America: Economic Research Shows Adverse Impacts on Health Status and Other Social Conditions as well as the Economic Growth Rate," Report to Congressional Requesters, GAO-07-344, United States Government Accountability Office, 2007, https://www.gao.gov/assets/gao-07-344.pdf; Dhruv Khullar and Dave A. Chokshi, "Health, Income, & Poverty: Where We Are & What Could Help," Health Policy Brief, Health Affairs, October 2018, (https://www.healthaffairs.org/do/10.1377/hpb20180817.901935/listitem/HPB_2017_RWJF_05_W-1623345913619.pdf); "Poverty and Health – The Family Medicine Perspective (Position Paper)," American Academy of Family Physicians (website), September 14, 2022, https://www.aafp.org/about/poli

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56 Fogg et al., "If You Can't Be."

57 Fogg et al., "Skills and Earnings in the Full-Time Labor Market"; Fogg et al., "Skills and Earnings in the Part-Time Labor Market"; Fogg et al., "Skills and Labor Market Outcomes."

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62 Fogg et al., "Skills and the Earnings of College Graduates."

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