

If You Can't Be With the Data You Love:

And the Risks of Loving
the Data You're With

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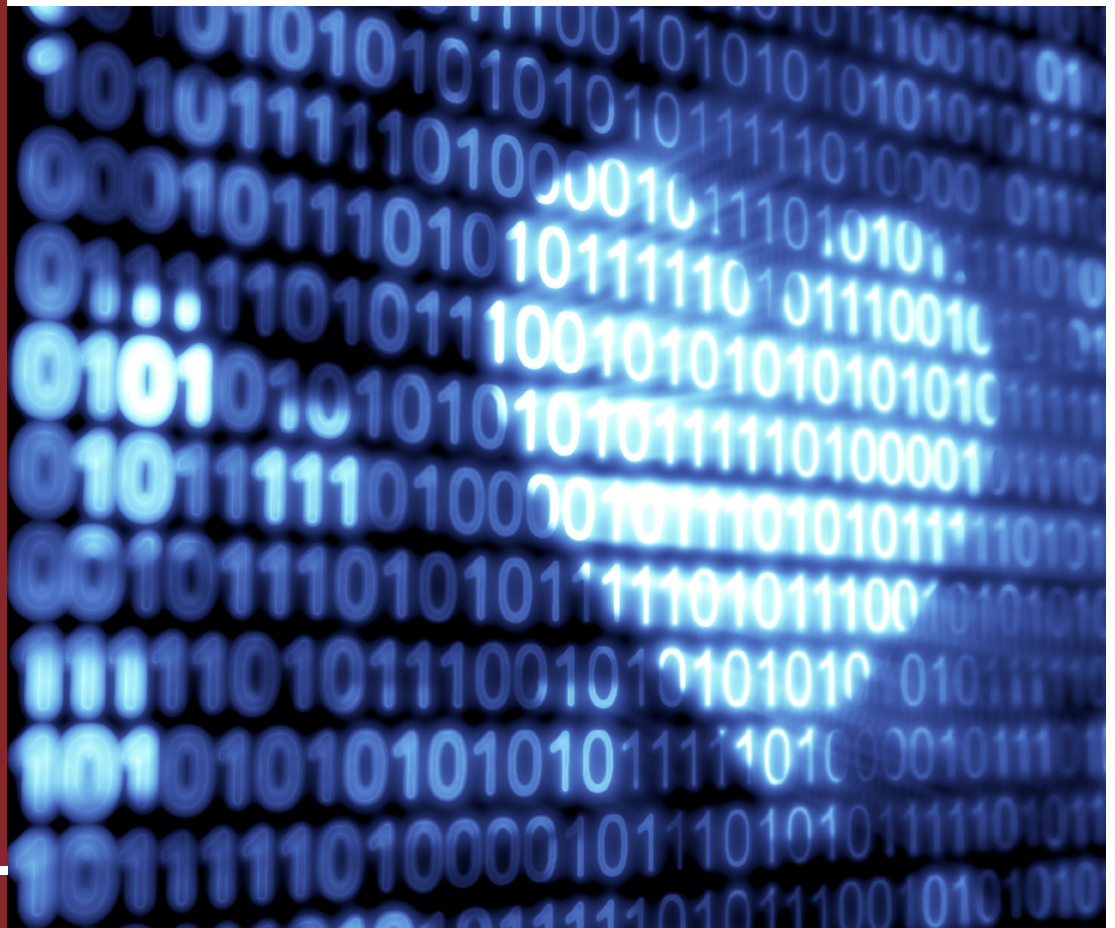


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Preface

Policymakers and others in the United States, driven by a reasonable belief that when individuals have more education they will be better prepared for today's economy and have a better chance at favorable life outcomes, have recently redoubled efforts to improve rates of attaining credentials. On the surface, these efforts appear to be paying off. Today, a greater proportion of high school students are graduating on time than ever before, and among those who do not, most end up with a high school degree by their early 20s. What's more, the data show that the millennial generation has obtained the highest levels of postsecondary education of any previous generation in U.S. history.

However, as Shakespeare once observed, "All that glitters is not gold." Mounting evidence, including this new paper, suggest that data on educational attainment and results from an array of skills assessments are telling divergent stories. In fact, recent research that examines the literacy and numeracy skills of America's millennial generation finds high levels of skills deficits. What's more, according to research on trends in fourth- and eighth-grade scores in the National Assessment of Educational Progress (NAEP; better known as the "Nation's Report Card"),^[1] the pattern of increasing scores and decreasing achievement gaps among race-ethnicity groups, evident in the first few years of the 2000s, has leveled off.

Data on education in the United States has been formally collected since the late 19th century when Congress first passed legislation establishing a department to monitor the nation's educational progress. Of course, what constitutes being educated—and closely related, the way to measure progress toward that goal—has varied over time. From its beginnings until the middle of the 20th century, information on education inputs—such as numbers of teachers, schools, and students, as well as enrollment and attainment data—were used to understand the nation's educational progress. But, with critical increases in the need for highly skilled workers rising rapidly toward the second half of the 20th century, especially after America's Sputnik moment—when the Soviet Union overtook our nation in the space race and concerns began to mount that public education wasn't meeting demands—a move toward including measures of skill proficiency, or outputs, was added.^[2] While perhaps an oversimplification, one could say skills data emphasized the quality of educational progress, while attainment and enrollment data emphasized the quantity.

However, as we advance deeper into the 21st century, two troubling and paradoxical shifts appear to be emerging. First, at a time when higher levels of skills are essential for the long-term success of individuals—and the nation as a whole—we appear to be losing ground despite rising enrollment and attainment. Second, and in some ways more perplexing, we are seeing a move away from seeking to ensure that educational attainment comes with skills.

In this paper, the authors highlight the critical disadvantages of focusing on educational attainment as the sole or primary marker of productive ability. They do this by comparing two estimates of employed adults in the United States believed to have foundational skill deficits—one relies on educational attainment data as a proxy for skill deficiencies, while the other utilizes skills data from a large-scale assessment of adults. The underlying theory behind using educational attainment as a proxy for skills is, quite reasonably, that the more education you have, the less likely, on average, you are to have a skills deficit. With this estimate, for example, those who dropped out of high school would be classified as deficient, while those with a bachelor's degree would be assumed proficient. The second estimate, on the other hand, is based on actual skills information from the Programme for the International Assessment of Adult Competencies (PIAAC), an international large-scale

assessment of adult skills in literacy, numeracy, and problem solving in technology-rich environments. For this approach, lack of skills is determined by performance on a set of literacy and numeracy tasks, regardless of education level attained.

Through their analysis of attainment and skills data, the authors reveal that using educational attainment as a proxy for skill deficits results in large errors in terms of both the size and composition of those with low skills. These findings suggest extreme caution when using educational attainment as the only or primary measure of the productive ability of American students and adults.

Indicators such as educational attainment are created, adopted, and used because they are believed to measure what we care about. What's more, they provide a framework that guides our thinking, policies, and actions toward achieving important national, state, and local goals. The waning ability of educational attainment to accurately measure progress on what we care about—the population having essential knowledge and skills, as shown in this and other research—has vast consequences felt by those without the skills they need despite a degree that signals otherwise. It is lived by those who take initiative and pursue higher education but either aren't equipped to succeed or struggle in programs that do little to foster skill development, although they do acquire debt. It also raises critical questions about the desirability of public policies that focus on educational credentials without acknowledging the levels of skills that are associated with those credentials.

Allowing students to attain degrees and diplomas with low levels of literacy skills, particularly as those skills become even more critical for successful navigation of our complex world, diminishes the fundamental promise of education.

—Paul Harrington and Irwin Kirsch

References

"Graduation Test Update: States that Recently Eliminated or Scaled Back High School Exit Exams" (Updated May 2019), National Center for Fair and Open Testing, <http://www.fairtest.org/graduation-test-update-states-recently-eliminated>.

Madeline Goodman and Anita Sands, *Too Big to Fail: Millennials on the Margins* (Princeton, NJ: Educational Testing Service, 2018), <https://www.ets.org/research/report/opportunity-too-big-to-fail/millennial>.

Madeline J. Goodman, Anita M. Sands, and Richard J. Coley, *America's Skills Challenge* (Princeton, NJ: Educational Testing Service), <https://www.ets.org/s/research/29836/>

Susanna Loeb, "Low-Performing Students No Longer Making Gains on NAEP," *Education Next*, April 10, 2018.

Notes

¹ NAEP is a measure of the academic proficiencies of 4th-, 8th-, and 12th-grade students. Surveys of math, reading, and writing of 4th and 8th graders are conducted every two years: See About NAEP: A Common Measure of Student Achievement, National Center for Educational Statistics, <https://nces.ed.gov/nationsreportcard/about/>.

|| Beginning in the 1980s, a series of reports were published that focused on the links between educational performance, literacy skills, and the U.S. economy including *A Nation at Risk*, (National Commission on Excellence in Education, 1983), *Strategy for U.S. Industrial Competitiveness* (The Committee for Economic Development, 1984); *A Nation Prepared: Teachers for the 21st Century* (Carnegie Corporation Forum on Education and the Economy, 1986), and *Toward a More Perfect Union* (Ford Foundation Project on Social Welfare and the American Future, 1988).

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The authors would like to acknowledge the tireless work of Sallie Glickman, former Director of the Philadelphia Workforce Board. Sallie has been a force for improving the foundational skills of disadvantaged adults around the nation. In the nearly two decades we have worked with Sallie, she has tirelessly worked for a better understanding of the central role that skills should play in workforce programming for adults and in the design of strategies to bolster the skills of adults seeking prosperity in American labor markets.

We would also like to recognize the work of Johan Uvin, who serves as President of the Institute for Educational Leadership in Washington D.C. Throughout his career at the state and federal level, and now in the nonprofit arena, Johan has brought great intellectual insight as well as program and policy savvy to adult skills development.

Both Sallie and Johan encouraged the authors to delve more deeply into the question of proxy measures of skill.

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Lastly, we are grateful to John Sabatini for organizing a review process that has considerably strengthened this paper.

Introduction

Measures of educational attainment such as high school graduation and college enrollment rates are at center stage in discussions of educational progress, frequently serving as benchmarks of high school performance.¹ Almost across the board, those rates show encouraging signs. A greater proportion of high school students are graduating on time than ever before, while most who do not graduate on time end up with a high school degree by their early 20s, and an overwhelming majority of high school graduates are enrolling in college. Race-ethnic groups have shared in the upward trend, with high school completion rates rising the most for Black and Hispanic students, and increases in the college enrollment rate of Black, and especially Hispanic, students outpacing even those of White high school graduates.²

If the goal is to increase and expand the overall level of human capital in the society, these measures paint a promising picture and bode well for Americans—and America's future. However, when the lens is focused more sharply on the actual skills held by students and adults in the United States, the image we see shifts dramatically. Many are leaving upper secondary and postsecondary education with degrees, yet they lack the skills they'll need for future success in education or the labor market. That means that although both policymakers and researchers tend to rely on educational attainment as a gauge for what our students know, the data are telling us a misleading tale.³

American employers place a high value on skills and effectively find and reward individuals with them. In particular, there are substantial independent earnings gains for those with a bachelor's or higher degree, and similarly large earnings gains for higher levels of literacy and numeracy proficiency, both for prime age full-time workers and for college graduates.⁴

The other side of the coin is that obtaining a degree while lacking the skills it purports to represent is a significant problem. There is an earnings penalty to those who lack adequate levels of skills—in other words, skills matter. Furthermore, new findings from PIAAC reveal that poor literacy and numeracy skills contribute to adverse life outcomes beyond just purely earnings, including a greater risk of unemployment and not having health coverage.

Over the past 20 years, we have witnessed significant gains in educational attainment, with little evidence of a commensurate gain in skills. For example, recent research that examined the literacy and numeracy skill proficiencies of the American millennial generation found that while it has achieved the highest level of educational attainment of any previous generation in American history, the share of this cohort with deficits in essential skills is troublingly large.⁵ What's more, according to research on trends in fourth- and eighth-grade scores in NAEP,⁶ the pattern of increasing scores and decreasing achievement gaps among race-ethnicity groups, evident in the first few years of the century, has leveled off—especially in the area of mathematics.⁷

An extreme example of this paradoxical relationship between attainment and skills has recently come to light in the City of Detroit. The School District was sued by students who argued that the district had operated in a way as to deprive them of their constitutional right to "access to literacy."⁸ In 2017, NAEP reading and math scale scores of eighth-grade students in Detroit were lower than those of any other large city in the nation,⁹ with 96 percent in math and 93 percent of Detroit's eighth graders in reading scoring at or below basic levels.¹⁰ Even though NAEP achievement levels state that scores at the basic level denote only partial mastery of the knowledge and skills required for proficiency in reading and math, Detroit achieved a near 80 percent (78.2) on-time graduation rate in 2017.¹¹

The primary goal of this paper is to highlight the critical disadvantages of focusing on educational attainment data as a stand-in for the level and distribution of skills across the population, which has a real human cost when we fail to see that millions of Americans lack adequate skills despite their diplomas and degrees.

First, we'll provide additional background on the nature of the problem of overreliance on educational attainment data as well as what those statistics tell us as far as graduation and college enrollment rates. Then we'll see what data from PIAAC, an international large-scale assessment of adult skills, independently shows. We will then proceed to demonstrate the problems intrinsic in using educational data as a proxy for skills. Then we will look through the lens of a methodology, derived from a reasonably well-crafted approach used in Detroit, that relies largely on educational attainment to see the story it tells about the size and composition of the American population lacking essential skills. Finally, we will use the current gold standard—measurements of literacy and numeracy from PIAAC—and show the wide difference between the two measures.¹²

As we pursued this work, however, we were ever mindful of what the late, great Harvard economist James Medoff advised his graduate students: If you can't be with the data you love, then you should love the data you're with. The pragmatics behind loving the data you're with are clear from the wide number of studies carried out by economists and social science researchers who utilize proxies to represent an issue of interest. This makes some sense: Large-scale sample surveys of households that include direct measures of skills and that are statistically valid may be the data we love, but their development is quite costly and their availability quite scarce. Indeed, proxy measures and approximations—*the data you're with*—dominate social and economic research despite the mixed results.¹³

A Word about the Data

To bring a tailored meaning to this study, we evaluated the *essential literacy standards* skill levels for college graduates against a more stringent standard than we did in our analogous evaluation for those with no college degree. The reason for using different PIAAC performance standards for these two groups is that different levels of skills are needed for occupations tied to college-level skills than for occupations that are not. Although measures of the employment and earning advantages of earning a bachelor's degree abound, careful studies of these advantages find that gains accrue only to college graduates who find employment in college labor market occupations, generally in a professional, managerial, or technical field that utilizes their more advanced education. College graduates who fail to find employment in the college labor market have earnings that are about equal to their high school graduate counterparts.¹⁴

Please also note that we limited our analysis of the PIAAC data to employed persons, as we were interested in measuring the size of skill deficiencies within the nation's workforce—those who have passed a basic labor market test and found work. Adults who were unemployed or not in the labor force were excluded from our study.¹⁵

Divergent Measures: Educational Attainment vs. Essential Skills

A 2006 California appeals court decision regarding a state legislative requirement that students pass an exit exam to receive a high school diploma delineated well the differences between educational attainment and skills:

“

*The purpose of education is not to endow students with diplomas, but to equip them with the substantive knowledge and skills they need to succeed in life. A high school diploma is not an education, any more than a birth certificate is a baby. Its purpose is to symbolize the holder's acquisition of a certain level of knowledge and skills. Students who successfully completed their high school educations, but who did not receive diplomas for some reason (for example, because their school records were destroyed in a natural disaster), would still in fact possess the same level of education as persons with high school diplomas. As we have observed earlier, on the other hand, students who did not successfully complete high school, but who were awarded their diplomas anyway, would not, in fact, have acquired a high school education.*¹⁶

”

Despite the remonstrations of the California appeals court, the use of educational attainment and other common sample survey measures as a proxy for human capital is widespread. Data on educational attainment, earnings, and poverty status, along with other indicators, are widely available at the national, state, and local level through a number of federal statistical programs, most commonly the U.S. Census' Current Population Survey (CPS) and its American Community Survey (ACS). Yet direct measures of skills of adults are not as readily available. Since the early 1990s, there have been only a handful of surveys of adult literacy in the United States, and they have been conducted only about once a decade or so.¹⁷

So, as much as researchers and analysts might love to rely on the skills results, those who want to use such solid data are constrained by the data and measures contained in the public-use data files provided by statistical agencies. Moreover, the sample sizes of both the CPS and ACS surveys are large compared to sample surveys measuring adult skills that have been conducted in the United States in the past.¹⁸ In short, statistically valid measures of a wide range of demographic, economic, social, and housing traits of the resident population for states and localities are readily available from these surveys, but data on adult skills are hard to come by.

Researchers interested in understanding human capital characteristics and their role in the labor market usually must rely on measures of educational attainment instead of direct measures of literacy and numeracy proficiencies. Reliance on proxy measures of skills are

especially necessary at the state and local levels as there are essentially no comparable measures of literacy and numeracy skills of the adult population available, including for population and labor force studies.

Indeed, much of the research literature related to the economics of human capital investment relies on the level of educational attainment as a proxy for human capital traits, including literacy and numeracy. The use of educational attainment as a measure of workforce skills or state or regional talent pools is commonplace, and economic development organizations regularly focus on the educational attainment of the employed in a region.¹⁹

The authors of this paper have shared the experience of relying on proxy measures of skills of the working-age population and labor force when direct measures were not available. However, as we demonstrate in this paper, the use of proxy measures of skill can result in large misclassifications of individuals as being skills deficient or not.

But first, let's obtain a fuller picture of what measures of educational attainment show. It was in 2010–2011 that the U.S. Department of Education created a standardized measure of "on time" high school completion for students entering ninth grade: the adjusted cohort graduation rate. Although the use of educational attainment as a proxy measure of skills has been standard practice dating back decades, when economists began to examine population characteristics to help explain differences in productivity and living standards around the world,²⁰ this was the first time that careful and systematic measures of high school completion across states and localities became available for analysis.²¹ With their improved quality, the use of these measures exploded.

What they show is that the proportion of high school freshmen who graduated high school on time (in four years) has increased considerably since national and state data were first collected. The rate increased from 79 percent in 2010–2011 to 84 percent by 2015–2016.

While not all high school freshmen graduate on time, most eventually earn a high school diploma or its equivalent. The 2009 High School Longitudinal Study of students entering ninth grade in 2009 found that by 2016, 92 percent had earned a diploma or equivalent.²² Findings from the CPS indicate that the share of 18- to 24-year-olds with a high school diploma or equivalent increased from 88 to 93 percent from 2005 to 2015. Especially large gains in high school attainment were found among Black (86% to 92%) and Hispanic (70% to 88%) young adults.

As for college enrollment, the national state and local data on college enrollment available are less standardized. They include the proportion of seniors taking SAT[®] and ACT[®] tests²³ and, in some instances, findings from National Student Clearinghouse (NSC[®]) cohort studies of graduating senior classes of high schools in states.²⁴ National data on immediate college enrollment of graduating high school seniors are measured in the October Supplement to the CPS. The CPS findings reveal that in recent years, the proportion of high school graduates who enroll in college in the fall after completing high school has been relatively steady, hovering in the 67 to 70 percent range. But there have been gains in college enrollment by students in households closer to the bottom of the nation's income distribution, markedly narrowing income gaps in college enrollment. Differences in initial college enrollment by race-ethnicity have also narrowed, with especially large gains in postsecondary enrollment among recent Hispanic high school graduates.²⁵

While about two-thirds of high school graduates enroll in college right after high school, a substantial share of graduates delays enrollment. The Educational Longitudinal Study of 2002 found that about 85 percent of high school sophomores eventually enroll in college.²⁶ Thus, it seems that achieving the goal of "college for all" is close at hand.

As we mentioned, one would ordinarily expect a commensurate improvement in skills to accompany these recent gains in enrollment and attainment. But, when skills data from U.S. and international surveys of students and adults are examined, a troubling pattern emerges. Emma Brown, an investigative reporter for the *Washington Post*[®], published an article in April 2016 in which she noted that while 82 percent of high school seniors graduated on time in 2014, NAEP data revealed that only 37 percent were judged to be academically prepared for college coursework in reading.²⁷ Similarly, the percentage of 12th-grade students who scored proficient or better on 12th-grade NAEP in math and science ranged between 20 and 30 percent. A similar concern regarding overall skill levels among U.S. millennials (young adults ages 16–34) was recently reported. U.S. millennials ranked last in numeracy skills, along with Spain and Italy, on the recent PIAAC international assessment of adult skills, and 16th out of 22 countries in literacy.²⁸

Essential Skills Deficits of the Working-Age Population

Proxy Measures

It was a 2018 report from Detroit, which sought to enumerate the city's adult population with essential skill deficits,²⁹ that gave us the means of comparison and the impetus to compare "the data we're with" (educational attainment) to "the data we love" (skills). The motivation of the authors for their report from the Corporation for a Skilled Workforce, a Michigan-based organization dedicated to increasing economic opportunity and prosperity, was similar to our motivation for this one. They wrote: "The consequences of ... foundational (essential) skills gaps are profound. For employers, this greatly limits the number of Detroiters who possess essential competencies required at hiring. For job seekers with skill gaps, it means their opportunities for getting a good job and having opportunities to advance are few. For the city, it means a large proportion of residents struggle to sustain themselves and their families, with many forced to rely on public assistance to survive."³⁰

Since no direct measures of adults' skills were available for the population of Detroit (or any other state or locality in the nation), the study authors' only viable option was to develop local proxy measures based on variables included in the ACS public-use microdata sample records for the city.³¹

In an attempt to get at skill deficiencies, then, the authors used the following available, mutually exclusive measures as proxies for skill deficits. There were four categories. For our purposes, we show only two of them as they represent 95 percent of what the study found to be the skills-deficient population.³²

- Educational Attainment (alone): Adult residents who do not have a high school diploma or its equivalent.
- Low Earnings: Residents with a high school diploma and no postsecondary schooling who have low wages.

The findings of the Detroit skills study were grim. An estimated 200,000 working-age nonelderly city residents aged 16 to 64 were found to be skill deficient—more than 40 percent of the overall resident population of Detroit in that age category. Looking in more detail at those 200,000 working-age, nonelderly residents—figures generated by using attainment (and attainment coupled with earnings) as a proxy for skills—more than half (51 percent) were categorized as such based on the "low earnings" category, their education status tied in with earnings. An additional 44 percent was based on "educational attainment alone."

Measuring and Comparing Skills Deficits Using PIAAC Data

However, does this educational attainment-based approach generate an accurate view of skill deficiencies in the adult population? PIAAC data provide us with a unique opportunity to address this question. Using PIAAC data would allow us to examine the effectiveness of using what seem to be reasonable and level-headed proxies to extrapolate the size and composition of the employed skill-deficient population in the United States.

The PIAAC study sample is large (and costly) with more than 9,000 respondents, and some 3,700 more to be added to the data files from 2017. PIAAC data provides national estimates of literacy and numeracy skills for adults ages 16–65, along with key demographic variables including race/ethnicity, gender, labor-force status, and highest level of educational attainment, among a host of other variables. These data can be used to produce measures of skill proficiency of the adult population that can be connected to a vast array of personal characteristics, behaviors, and life outcome measures. For example, the extensive labor market information gathered in the PIAAC database, when linked to measures of skills, has provided important new insights into the impact of literacy and numeracy skills on the employment and earnings experiences of adults. Some of these studies have raised important questions about the desirability of public policies that focus on educational credentials with little consideration to skills development associated with those credentials.³³

The downside of PIAAC is that like earlier national skills surveys, its per-unit cost of response is quite high, and so it has a comparatively small sample size, which effectively rules out the development of direct, sample-based measures of adult literacy and numeracy at the state and local level.³⁴

For our analysis, we utilized the PIAAC sample for the United States to explore relationships between the skills proxy measures of educational attainment and earnings adopted by the Detroit study authors, and generated estimates of the size and composition of the employed population in the country with skills deficits for select education/earnings groups.³⁵

We then compared these findings with actual measures of literacy skills for those same education/earnings groups. In other words, we compared the size and characteristics of the skills-deficient population based on proxy measures—the data we're with—with direct measures of actual literacy skill proficiencies of the adult population derived from PIAAC survey data—the data we love.

We examined the actual literacy skills of U.S. workers in the two main categories of adult working-age population with skills deficits used in the Detroit study: a) those without a high school diploma or equivalent and b) those with a high school diploma but earning low wages.³⁶

We contend that using proxy measures of skill deficits can introduce two kinds of misclassifications regarding both the size and composition of those with a skills deficit: erroneously *including* employed persons with higher skills in the skill-deficient workforce and erroneously *excluding* employed persons with low skills. Both types of misclassification alter not only the overall size of the skills-deficient population, but also the basic demographic composition of this population. This fact should be of concern to both researchers and policymakers in that the use of these types of proxies can lead to important policy errors including misallocation of financial resources for education, training, and related human capital investment purposes in the public interest.

The Interrelationship between PIAAC Literacy Scores and Educational Credentials

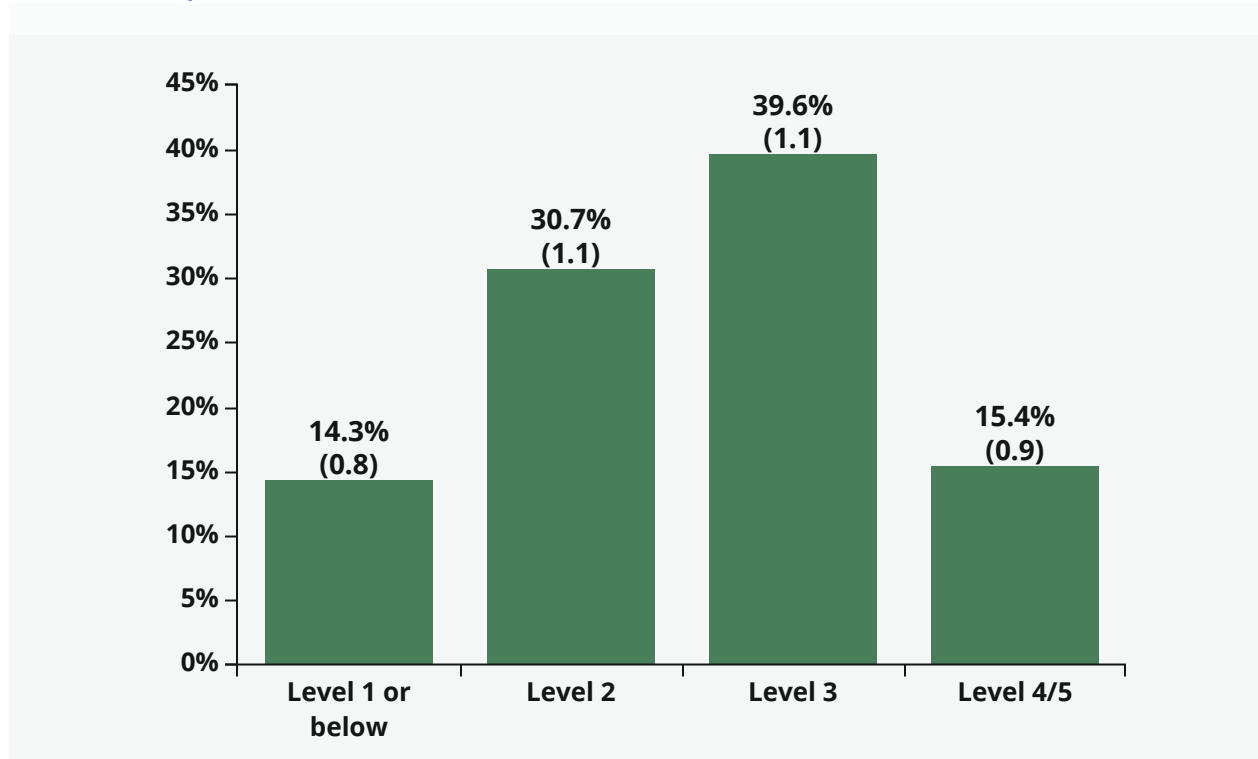
Below, we examine literacy proficiency in the context of PIAAC. Literacy scores are grouped into five categories representing distinct levels of literacy proficiency:

- Level 1 or below reflects the rather limited ability associated with being able to read a short text and locate a single piece of information or enter some personal information into a document. A score at this level signals skill in reading a short, simple paragraph, understanding basic vocabulary, and the meaning of sentences. For persons with no college degree, we include those who have literacy scores of level 1 or below in our measure of the number of employed persons with skill deficits.
- Level 2 reflects the ability to read a more complex text, compare and contrast some information, and paraphrase and make low level inferences from a text. For persons who have earned an associate's, bachelor's, or advanced degree, we count all persons with literacy skills at or below level 2 as skills deficient since, as noted earlier, literacy skills above this level are needed to effectively participate in the market for jobs requiring college-level skills.
- Level 3 signals the ability to read more lengthy and dense texts. Individuals can identify, interpret, and evaluate pieces of information requiring more complex levels of inference. Those proficient at this level can identify and disregard irrelevant text to find the correct answer. Level 3 proficiencies and higher have been found to be associated with more favorable economic and social outcomes.³⁷
- Level 4 is an indicator of the ability to integrate, interpret, and synthesize information from complex or lengthy documents. Complex inference and use of background knowledge is important to interpret and evaluate evidence and persuasive arguments.
- Level 5 demonstrates an ability to seek and integrate information from a variety of dense text sources, synthesize this information and identify contrasting points of view, and evaluate evidence-based arguments.

Using the PIAAC national data, we present findings about the overall distribution of employed U.S. adults across the literacy levels (we combine levels 4 and 5 due to sample-size restrictions among employed adults in the nation; Figure 1). It is important to note that the skill levels of employed persons are, on average, higher than those of the population of all adults. Labor-force participation itself is associated with higher levels of literacy skills relative to the general population. Also, among those adults who participate in the labor force, unemployed persons have lower literacy skills than those who are employed.³⁸

Large differences in literacy skills among employed Americans were found in our analysis of the PIAAC data. Among employed adults, the PIAAC survey found that 14 percent demonstrated literacy proficiencies that placed them at or below literacy level 1 (Figure 1). Proficiency at this level reflects minimal abilities to access and identify information in text, to integrate and interpret this information, and to evaluate the information a reader gleans from a text or document, skills that are associated with life outcomes.

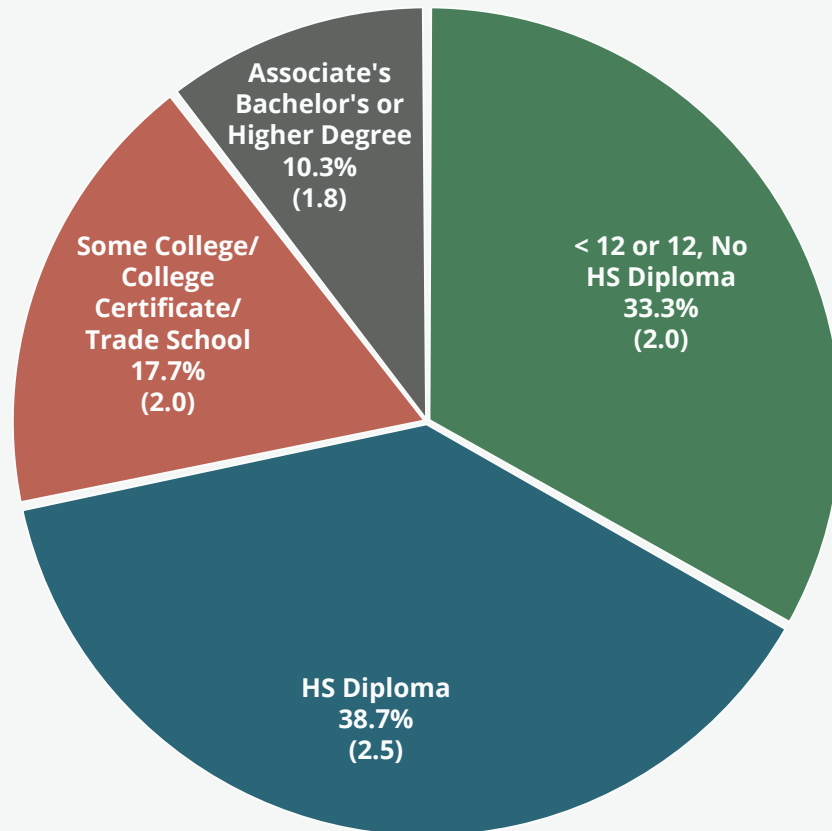
Figure 1: Distribution of Employed Adults by Literacy Score Level (Standard Error in Parentheses)



Source: 2012/2014 U.S. PIAAC Surveys, Restricted Use File (RUF), tabulations by authors.

Comparing using level of educational attainment alone: The first major measure of deficient skills used in the Detroit study is level of educational attainment. Findings in Figure 2 present the connection between educational attainment and low skills by examining the educational attainment of workers with literacy skills at or below level 1. We find that among the 18 million working American adults with literacy skills at or below level 1, only one in three (33.3%) did not obtain a high school degree or equivalent. Two-thirds (66.7%) of all employed persons with the lowest literacy proficiency have a high school diploma or higher level of education.

Figure 2: Distribution of Employed Persons with Literacy Score at or Below Level 1, by Level of Educational Attainment (Standard Error in Parentheses)



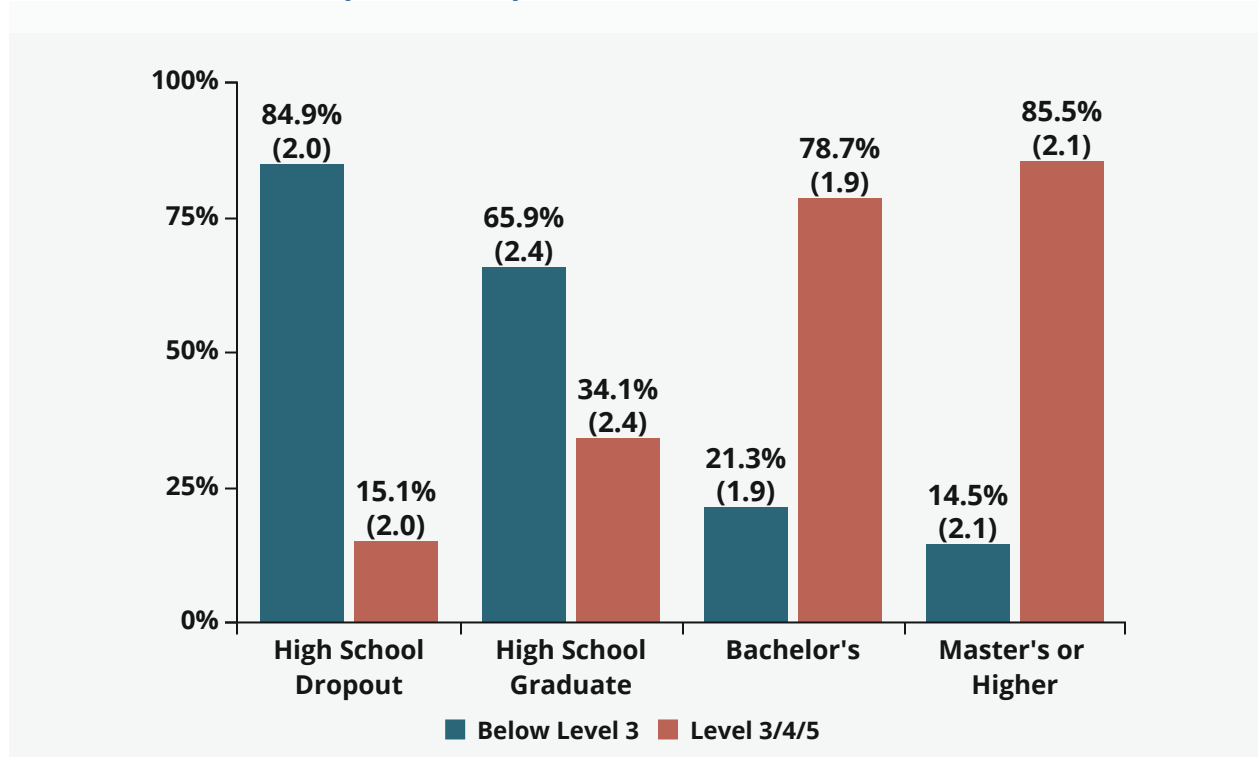
Source: 2012/2014 U.S. PIAAC Surveys, Restricted Use File (RUF), tabulations by authors.

High school graduates with no postsecondary education make up almost 40 percent of employed adults with very low literacy scores. What is most surprising about these findings is the large share of the low literacy workers who have enrolled in the nation's postsecondary education system. One in four employed persons with very low literacy scores has enrolled in college at some time. Even more remarkably, one in ten received a college degree.

As we noted previously, the nation has experienced a substantial rise in four-year high school completion rates in recent years without corresponding gains in NAEP 12th-grade proficiency scores. This suggests, as do our findings, that academic credentials are no guarantee of literacy proficiency.

A look at the findings in Figure 3 confirms the disconnect between credential attainment and skills. This figure examines the skill level of employed adults by their highest level of educational attainment and reveals a positive but varied connection between educational attainment and skills. Persons who complete college degree programs are generally expected to have considerably higher literacy skills. Nevertheless, PIAAC literacy skills data reveal that among employed persons with a bachelor's degree, about one in five (21.3%) have literacy skills scores below level 3. More surprisingly, one in seven (14.5%) of those with advanced degrees (master's or higher) score below level 3 on the PIAAC literacy scale.

Figure 3: Distribution of Employed Persons, Ages 16–65, by Highest Level of Educational Attainment and Literacy Proficiency (Standard Error in Parentheses)



Source: 2012/2014 U.S. PIAAC Surveys, Restricted Use File (RUF), tabulations by authors.

As described earlier, we've adopted two separate tiers of literacy standards for this study: a higher minimum literacy level for college graduates and a lower minimum literacy level for those with no college degree because the earnings premium for college graduates relative to a high school credential accrues only if they work in a field using college-level skills.³⁹ Therefore, given the large qualitative differences in occupational skill requirements for college labor market occupations (as well as the accompanying employment and earnings advantages of employment in these occupations), we opted to utilize a minimum literacy of level 3 for college graduates based on requirements for employment in such occupations. We opted to use a minimum literacy of level 2 as the standard for those with less than a college education, based on the likelihood that these individuals will work in occupations not requiring the proficiencies demanded in the nation's college labor market.

Still, it is useful to recognize that skills at or above level 3 are often adopted as a significant cut point in the data because of the association between skills at these levels and favorable economic and social outcomes.⁴⁰ That two in three (65.9%) employed high school graduates with no college degree have literacy skills below this minimum (level 3) is a worrisome finding for those concerned with both income inequality and economic growth.

When we examine the size of the employed adult population with low skills (Table 1), a disturbing picture materializes. More than 10 million employed adults have completed high school (without earning any type of college degree) but have literacy skills that place them below level 2, that is, they have very low skills. Less surprising, an additional 6.1 million employed high school dropouts fall into this category, for a total of 16.6 million below level 2.

Applying a higher literacy standard for those who earn a college degree, as discussed above, we find that 12.4 million college graduates demonstrate low literacy proficiency, achieving a score that places them below level 3.⁴¹

Adding the results from using these two standards, then, we estimate that nearly 29 million employed Americans do not meet minimal literacy skills levels that might reasonably be associated with their level of educational attainment.

Table 1: Size of the Literacy Skills Deficient Employed Population in the U.S., by Highest Level of Educational Attainment, 2012—2014

HIGHEST LEVEL OF EDUCATION	NUMBER	PERCENT	STANDARD ERROR
Level 1 or Below (No College Degree)			
Less than 12, or 12 (no HS Diploma)	6,149,174	37.1%	2.1
High School Graduate (No College Degree)	10,440,256	62.9%	2.1
Total Skills Deficient (No College Degree)	16,589,430	100.0%	†
Level 2 or Below (College Grads Only)			
Associate's Degree	4,686,747	37.9%	2.9
Bachelor's Degree	5,348,418	43.2%	3.3
Master's or Higher Degree	2,346,937	19.0%	2.4
Total Skills Deficient (College Degree)	12,382,101	100.0%	†
Total Employed but Skills Deficient	28,971,531	22.3%	1.0
Total Employed/Not Skills Deficient	100,719,781	77.7%	1.0
Total Employed	129,691,312	100.0%	†

† not applicable.

Source: 2012/2014 U.S. PIAAC Surveys, Restricted Use File (RUF), tabulations by authors.

It's worth noting that while the literacy and numeracy scale scores are positively related, they are not perfectly correlated. If we were to adopt a somewhat broader measure of skill deficiency that included adults with low scores on either the literacy or numeracy scales, the number of workers with skill deficiencies actually would be considerably higher than the number based on the literacy measure alone.

Clearly, using educational attainment as a proxy for skills paints a misleading picture when trying to estimate the size of the employed population with low literacy skills. The problem is compounded when we delve more deeply into the distribution of skills by, for example, racial and ethnic groups.

PIAAC Literacy Skills and Educational Credentials by Race-Ethnicity

Understanding the differences between educational attainment and literacy skill proficiencies is especially important when the discussion is focused on communities with high poverty rates, where residents tend to be members of underserved—often minority—populations. Many of these communities lack access to the resources needed to create the large human capital gains required to eliminate disparities for their residents.⁴²

As we've argued, relying on educational attainment to gauge skill deficits results in a sizable misreading of the skills attainment for the total employed population, but as we will demonstrate, these differences are far more pronounced for minority populations that are much more likely to live in resource-poor communities like Detroit, which has seen gains in on-time high school completion rates but little gain in measured academic proficiency scores. The findings in Table 2 compare the distribution of literacy skills for White/Asian workers with those of Black/Hispanic workers for each level of educational attainment below the college degree level. We did not examine White, Asian, Black, and Hispanic workers separately because of insufficient sample size across race-ethnic groups. Therefore, we decided to group Black and Hispanic, who are often labeled *underserved* minorities in social science research, and Whites and Asians, who are not considered underserved.

The findings reveal large literacy gaps between employed White/Asian and Black/Hispanic adults within each level of educational attainment, gaps in important information that are masked if using educational attainment as a surrogate for adequate skills.

High school dropouts: The PIAAC survey found that about 19 percent of Black/Hispanic adult workers in the United States were high school dropouts compared to 6 percent of White/Asian employed adults. This represents a large difference in the share of adults without a high school diploma. However, when we compare the literacy levels of employed White/Asian high school dropouts with those of their Black/Hispanic counterparts, we find even more extraordinary differences.

Table 2: Comparison of Literacy Level Distribution within Non-College Degree Educational Attainment Levels between White/Asian and Black/Hispanic Employed Adults (Standard Errors in Parentheses)

CATEGORIES OF PROFICIENCY / EDUCATIONAL ATTAINMENT LEVEL	WHITE/ASIAN SHARE OF EMPLOYED PERSONS (COL. 1)	BLACK/HISPANIC SHARE OF EMPLOYED PERSONS (COL. 2)	PCT. POINT DIFFERENCE (COL. 1 MINUS COL. 2)
Less than 12 Years (Not a High School Graduate)			
Overall	6.3% (0.3)	18.6% (1.1)	-12.3% (1.1)*
Level 1 or below	‡(†)	74.6% (4.3)	‡(†)
Level 2	49.3% (3.9)	‡(†)	‡(†)
Level 3	25.0% (3.5)	‡(†)	‡(†)
Level 4/5	‡(†)	‡(†)	‡(†)
High School Graduate			
Overall	23.2% (0.4)	29.5% (1.1)	-6.3% (1.3)*
Level 1 or below	16.0% (2.0)	35.9% (3.9)	-19.9% (4.5)*
Level 2	43.6% (2.4)	44.3% (4.4)	-0.7% (5.1)
Level 3/4/5	40.5% (3.0)	19.9% (3.7)	20.6% (4.7)*

Note: Data for cells with "‡" are suppressed as they did not meet the minimum ETS sample size of 62; "†" not applicable; "*" statistical significance at .01 level

Source: 2012/2014 U.S. PIAAC Surveys, Restricted Use File (RUF), tabulations by authors.

At least three-quarters of employed White/Asian workers without a high school diploma or its equivalent had literacy proficiency scores at level 2 or above. That's in stark contrast to the three quarters of Black/Hispanic workers whose scores were below level 2.

High school graduates: A closer look at Table 2 reveals that the size of the literacy skills difference by race-ethnicity is very large not just among those who left high school without a degree or its equivalent, but also among high school graduates. Among employed high school graduates, we find that 36 percent of employed Black/Hispanic graduates have developed only minimal literacy skills that place them below level 2, more than double the share of White/Asian high school graduates (16%).

College graduates: The findings in Table 3 compare the distribution of White/Asian and Black/Hispanic college graduates within different levels of college degrees by their literacy proficiency levels. The comparison reveals large gaps in literacy proficiency by race-ethnicity at the associate's, bachelor's, and master's degree level. About 19 percent of White/Asian graduates with an associate's degree or higher had scaled literacy scores that placed them below level 3 compared to more than twice as many (42 percent) of their Black/Hispanic counterparts. That is, those Blacks and Hispanics that have an associate's degree or higher are more likely to have very low proficiencies than their White/Asian counterparts.

Table 3: Comparison of Literacy Level Distribution within College-Degree Educational Attainment Levels between White/Asian and Black/Hispanic Employed Adults (Standard Errors in Parentheses)

EDUCATIONAL ATTAINMENT AND LITERACY LEVEL	WHITE/ASIAN SHARE OF EMPLOYED PERSONS (COL. 1)	BLACK/HISPANIC SHARE OF EMPLOYED PERSONS (COL. 2)	PCT. POINT DIFFERENCE (COL. 1 MINUS COL. 2)
Associate's Degree or Higher			
Overall	47.6% (0.8)	25.6% (1.0)	22.0% (1.1)*
Below Level 3	18.7% (1.6)	41.9% (3.3)	-23.2% (3.7)*
Levels 3/4/5	81.3% (1.6)	58.1% (3.3)	23.2% (3.7)*
Bachelor's Degree or Higher			
Overall	37.3% (0.5)	16.9% (0.8)	20.4% (0.9)*
Below Level 3	15.3% (1.6)	36.1% (4.1)	-20.8% (4.4)*
Levels 3/4/5	84.7% (3.5)	63.9% (6.8)	20.8% (7.7)*

* Statistical significance at .01 level.

Source: 2012/2014 U.S. PIAAC Surveys, Restricted Use File (RUF), tabulations by authors.

The Interrelationship between PIAAC Literacy Skills and Low Wages

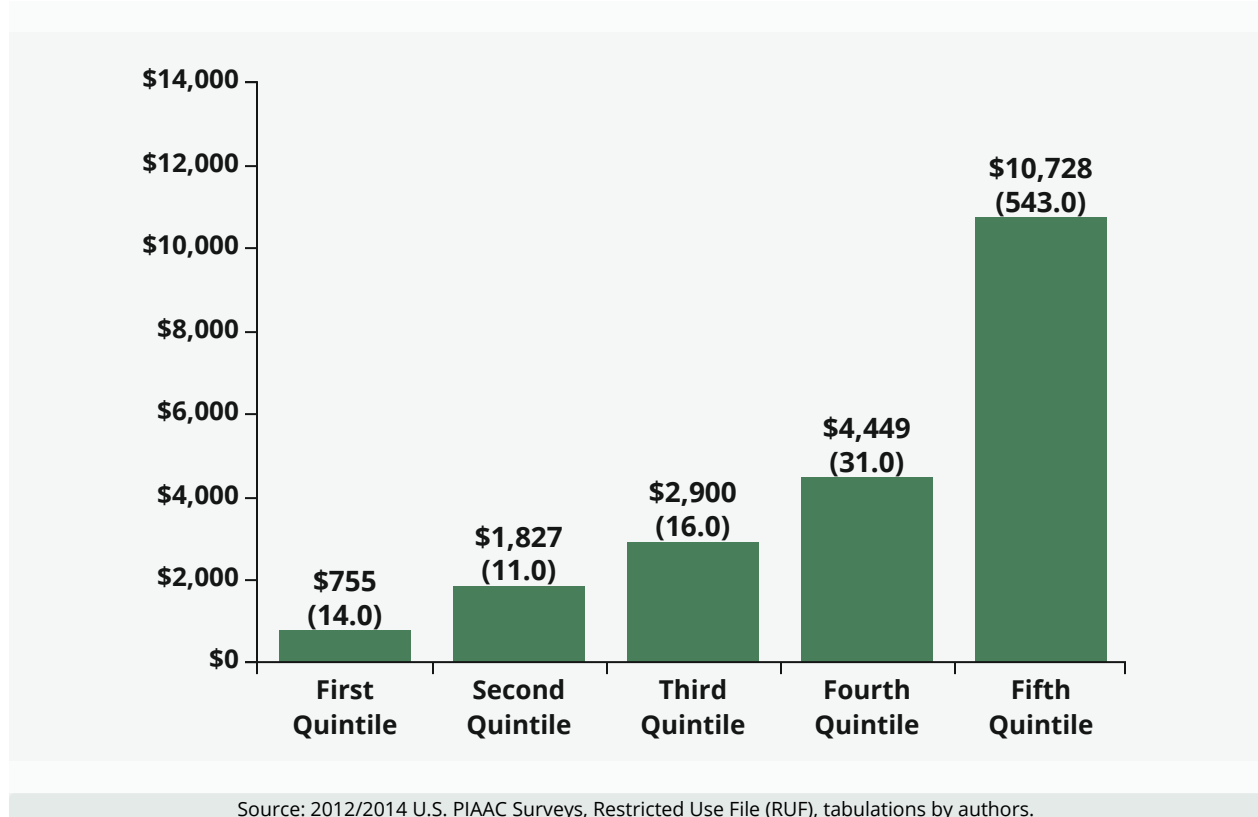
The second key indicator that the Detroit study uses to estimate the size of the skill-deficient population in Detroit is to assign that status to employed persons with high school degrees, but no postsecondary schooling, who earn low wages. Essentially, the Detroit study assumed that all low-wage workers with a high school degree were skill deficient. We examine this assumption using PIAAC data to measure the literacy proficiencies of workers at various points along the earnings distribution. Since the Detroit study does not indicate how they defined a low-wage worker and supplies no measures of the wages or earnings of these workers, we have defined low-wage workers as persons in the lowest 20 percent of the national earnings distribution as measured by monthly pay.⁴³

We used PIAAC data to create a monthly earnings distribution for all employed persons in the nation by ranking employed persons in the order of their monthly earnings. We then created five approximately equal-sized groups of these employed persons (earnings quintiles) and then computed the mean monthly earnings of all workers within each grouping.

The findings of this analysis are presented in Figure 4. Similar to earnings distribution studies based on other data, the PIAAC data find large earnings differences between those at the top of the nation's earnings distribution and those at the bottom. Employed persons within the top fifth of the nation's monthly earnings distribution had average monthly earnings of over \$10,700 at the time of the PIAAC survey administration. Those with earnings in the middle of the earnings distribution (third quintile, income between 40th and 60th percentile of the earnings distribution) had mean monthly earnings of \$2,900. Persons working in jobs that placed them in the bottom fifth of the earnings distribution earned an average of just \$755 per month at the time of the PIAAC survey (Figure 4).⁴⁴

We use the bottom quintile to define low-wage workers. At \$755 per month, this would mean annualized earnings of just over \$9,000 per year for the mean worker in the bottom of the earnings distribution.

Figure 4: Mean Monthly Earnings of Employed Persons by Earnings Quintile (Standard Error in Parentheses)



The findings in Table 4 below examine the distribution of literacy skill levels of workers in each quintile of the earnings distribution in the nation. As the table illustrates, each earnings quintile is composed of about 26 million employed persons. The table examines how employed persons in each income quintile are distributed across literacy levels.

The literacy proficiencies of workers in each earnings quintile are quite different. For example, we find that 45 percent of persons employed in low-wage jobs (the bottom quintile) have strong literacy proficiencies (level 3 and above), equal to the standard we expect for college degree holders. (In contrast, when we examine the literacy proficiencies of the highest earners in the nation, we find that more than one in five, or 22.4 percent, have skill scores below level 3). By relying on low earnings as a key criterion to identify those with weak skills, the Detroit study proxy approach includes a large number of persons with strong literacy skills who work in low-wage jobs, many in part-time positions. It's important to note that part-time employment is largely voluntary.⁴⁵ Students, retirees, and persons with family responsibilities often opt for part-time work, so it should not be surprising to find that a substantial share of workers with low monthly wages have strong literacy proficiencies.⁴⁶

Table 4: Distribution of Employed Persons within Each Earnings Quintile by Level of Literacy Proficiencies (Standard Error in Parentheses)

EARNINGS QUINTILES	LEVEL 1 OR BELOW	LEVEL 2	LEVEL 3	LEVEL 4/5	NUMBER OF EMPLOYED PERSONS
First	18.9% (2.1)	36.2% (2.5)	35.8% (2.9)	9.1% (1.3)	25,897,452
Second	23.8% (2.1)	37.5% (2.3)	30.5% (2.0)	8.2% (1.3)	26,015,579
Third	16.3% (1.7)	33.4% (2.6)	38.8% (2.3)	11.4% (1.3)	26,075,744
Fourth		36.4% (2.4)	47.0% (2.6)	16.6% (1.9)	26,081,213
Fifth		22.4% (2.3)	46.0% (3.1)	31.5% (2.5)	25,915,736

Note: May not add up to 100% due to rounding.

Source: 2012/2014 U.S. PIAAC Surveys, Restricted Use File (RUF), tabulations by authors.

Table 5 presents findings from the PIAAC survey on the literacy proficiencies of high school graduates with no college degree by their position in the earnings distribution of all workers. A look at the data reveals that including all low-wage workers at this level of education, as the Detroit study approach does, substantially overstates the size of the skills-deficient population in the nation.

Nationally, the PIAAC data finds 8.1 million high school graduates (with no college degree) working at low wages. However, just 21 percent, or 1.7 million, of these low-wage high school graduates achieve literacy scores below level 2—the standard we might expect for high school graduates with no college degree.

A second major limitation of relying on measures of low-wage workers as a proxy definition of skill deficits among employed high school graduates is the large number of adults with very low skills who are not included in the Detroit approach's low-pay measure of skill deficiency. Table 5 indicates that the Detroit approach fails to include (using our assumptions to define low income as the bottom quintile of monthly earnings) 5.4 million low-skill high school graduates with monthly earning levels that place them in all quintiles (second through fifth) above the bottom in earning distribution.

Table 5: Distribution of Employed High School Graduates (No College Degree) within Each Earnings Quintile by Literacy Score Level (Standard Errors in Parentheses)

EARNINGS QUINTILES	BELOW LEVEL 2	LEVEL 2	LEVEL 3, 4, & 5	TOTAL EMPLOYED HS GRADUATES (NO COLLEGE DEGREE)
Number				
First	1,725,806	3,283,444	3,130,430	8,139,680
Second	2,099,379	3,503,270	2,091,670	7,694,319
Third, Fourth, & Fifth	3,332,677	7,218,132	5,728,210	16,279,019
Total	7,157,861	14,004,847	10,950,310	32,113,018
Distribution				
First	21.2% (3.2)	40.3% (4.0)	38.5% (3.8)	100.0%
Second	27.3 (4.2)	45.5% (4.4)	27.2% (3.7)	100.0%
Third, Fourth, & Fifth	20.5% (2.4)	44.3% (3.4)	35.2% (3.7)	100.0%
Total	22.3% (1.8)	43.6% (2.1)	34.1% (2.4)	100.0%

Source: 2012/2014 U.S. PIAAC Surveys, Restricted Use File (RUF), tabulations by authors.

In other words, defining skill-deficient high school graduates on the basis of their earnings results in the omission of nearly 5.4 million persons who have a high school diploma and low skills but monthly earnings that place them above the bottom one-fifth of the nation's monthly earnings distribution. This excludes 79 percent of high school graduates with the lowest literacy scores in the nation. If we were to apply a higher standard of skills proficiency, that is, include persons with level 2 literacy skills as having skills deficits, the Detroit skills deficit measure would exclude an additional 10.7 million high school graduates with level 2 scores but earnings above those in the bottom one-fifth of the earnings distribution.

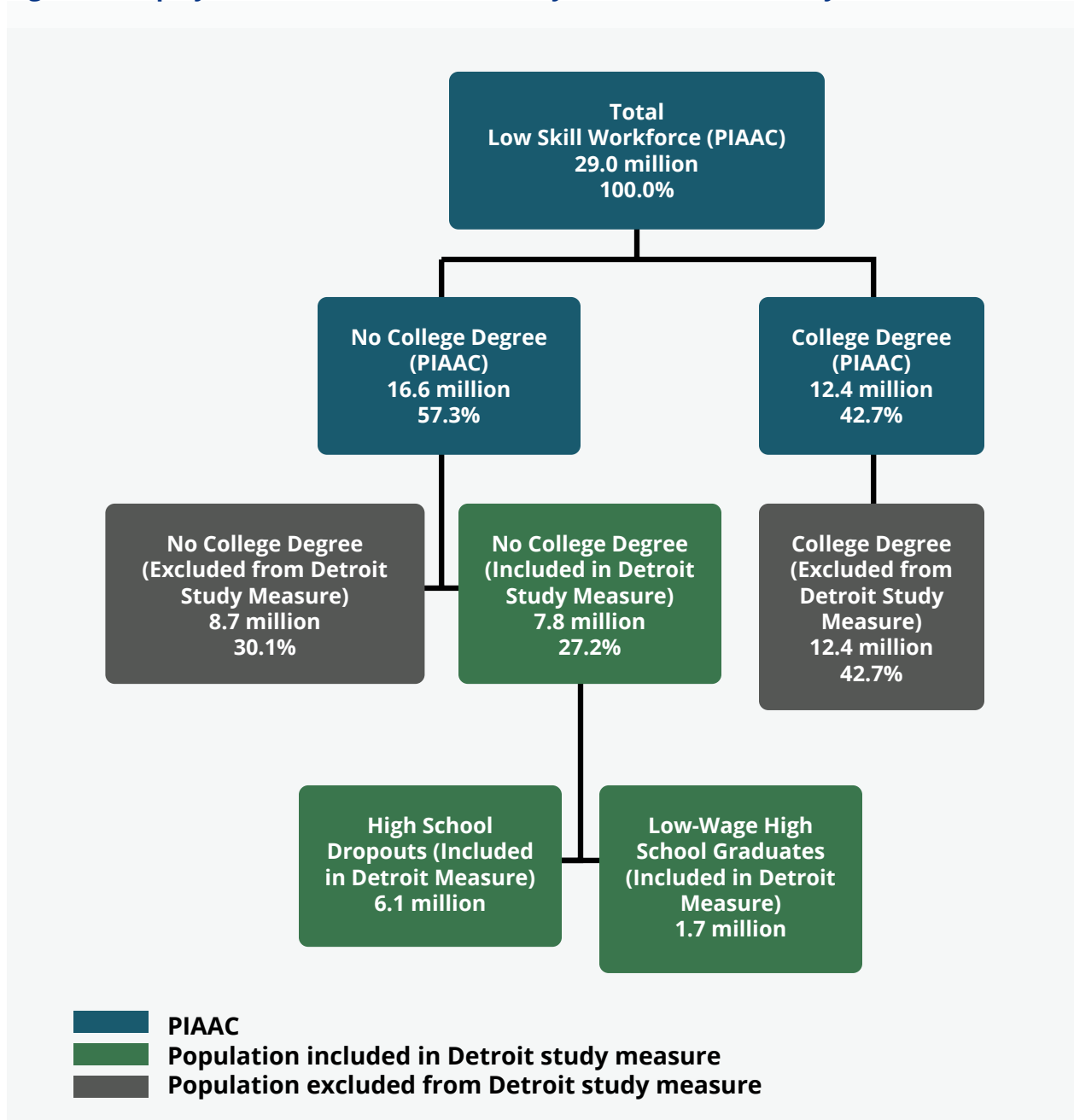
Although the data in Table 4 do suggest a positive connection between skills and earnings, the findings in Table 5 suggest that this relationship is highly complex and that monthly earnings of workers are determined by many factors, ranging from the obvious, like full-time versus part-time work status, to more subtle earnings determinants, ranging from compensating wage differentials to work experience in differing labor market segments.

What is the Utility of the Essential Skills Proxy Measure?

The Detroit study analysts were tasked with creating an estimate of the size and characteristics of the working-age population with essential skills deficits in the absence of direct measures of literacy and numeracy measures. The only reliable household survey that contains relevant measures that could be used as proxies for essential skills is the ACS. Given the questions on the ACS survey, the researchers made some reasonable assumptions about who is most likely to possess poor skills in the city. First, the authors assumed that educational attainment and skills are positively associated with one another (which, of course, they are) and so opt to identify those with the lowest level of educational attainment as a major part of those who lack skills. Second, the authors assumed that skills and the earnings of workers are positively correlated (which they are). For low earners, the authors took the further precaution of limiting this group to only low-wage workers with a high school diploma.

Both of these assumptions appear level-headed and, in the absence of any direct measures of literacy or numeracy skills, are probably as good a set of proxy measures as any. Yet when we test these measures against the literacy proficiencies of adults in the nation by the same proxy educational attainment and low earnings status, we find that these measures do not serve well as an effective proxy for skills.

Our analysis of PIAAC data found that 29.0 million employed persons in the nation had low literacy proficiencies. As can be seen on the left side of Figure 5, out of that total of those identified employed persons with low skills, 16.6 million had not earned a college degree, accounting for over half (57.3%) of the skills-deficient workforce in the nation (with literacy skills at or below level 1). Applying proxy measures omits 8.7 million (52.5%) of the 16.5 million in this low-skilled employed population without a college degree (labeled as "less than associate's degree"). On the right side of the figure, we see that utilizing PIAAC data on skills identified an additional 12.4 million employed adults with low literacy skills who have earned a college degree. This group is completely excluded from the Detroit study measure of skill-deficient workers. Overall, utilizing the Detroit skills proxy measures excludes about 21 million employed persons nationwide who are identified as skill deficient based on their literacy skill scores.

Figure 5: Employed Persons with Low Literacy Skills: PIAAC vs. Proxy Measures

The educational attainment/earnings proxy measure of skill deficits among employed adults also results in the erroneous inclusion of a large number of persons with stronger literacy skills (Table 6). When we applied the proxy measures to national data, we found that the measures wrongly included 6.4 million employed high school dropouts ("less than high school degree") in the skill-deficient workforce. These dropouts had literacy scores that placed them at level 2 or higher. Similarly, we found that 6.4 million low-wage high school graduates ("less than associate's") that are included under the Detroit study measure also had literacy scale scores that placed them at level 2 or above. Overall 12.8 million high school dropouts and low-wage high school graduates are erroneously included as skill deficient under the Detroit study measure.

Table 6: Estimated Number of Employed Americans, Ages 16–65, with Skill Deficiencies: Proxy Measure vs. PIAAC Skills Measure (in millions)

CATEGORY	PROXY MEASURE (DETROIT INDICATORS)	PIAAC SKILLS MEASURE*	DIFFERENCE BY OMISSION	DIFFERENCE BY COMMISSION
Less than High School Degree	12.5	6.1	†	6.4
Less than Associate's (High School Degree [including Some College-No Degree]), Low Wage Earners	8.1	1.7	†	6.4
Less than Associate's (High School Degree [including Some College-No Degree])	0	8.7	8.7	†
College Degree (Associate's and above)	0	12.4	12.4	†
Total	20.6	28.9	21.1	12.8
			Total Difference: 21.1 + 12.8 = 33.9	

† not applicable

* Inclusion if: (1) below an associate's degree (less than high school or high school degree or some college, but no degree) and scored at or below level 1 on PIAAC, (2) attained an associate's degree or more, but scored below level 3.

Figure 5 and Table 6 reveal two essential problems with relying on educational attainment and earnings status as proxy measures of skill deficits in the nation's workforce. The first problem is a sin of omission. The skills proxy measures approach results in failing to identify a large majority of the skills-deficient employed population in the nation. Indeed, we find that reliance on this measure missed over 21 million employed persons in the nation with skill deficits.

The second problem is a sin of commission. The educational attainment/earnings measure results in the erroneous inclusion of 12.8 million employed persons with skills above those we would include in a PIAAC-based direct measure of low literacy skills.

The combined magnitude of these misclassifications is large. In fact, the total absolute size of the combined omission and commission misclassifications in estimating the population of employed persons with a skills deficit is nearly 34 million employed persons. This not only represents a radical mismeasure of the size of the skills-deficient population, but also creates a troubling distortion of the composition of this population.

Implications

Research and evaluation practitioners, especially those at the state and local level, are often pressed to create measures of economic and social outcomes that are important for developing education, workforce, and even economic development policy. Educational attainment has become the primary measure, and frequently the sole measure, of the human capital traits of the population of an area. Most social and economic policy decisions touch in important ways on the human capital proficiencies of the population—as measured by the level of educational attainment of adults. Yet the evidence is clear that attainment and skill, although positively related, are far from the same thing. While there has been increased emphasis on attainment as a measure of outcome for the nation's secondary and postsecondary system, there is reason to be concerned that there has been little corollary gain in literacy and numeracy skills of young people or adults.

Surely, it's true that more of both credentials and skills can pay off in the labor market. However, as we have demonstrated, the connection between the two seems more tenuous than warranted by use of attainment as a proxy measure of skills.

Researcher Mark Dynarski, discussing the recent rise in on-time high school completion rates, observed: "Today's elementary and middle school students will move on to high school, and one day they may graduate. Did they accomplish a real milestone, or were they just moved along? They are owed an answer."⁴⁷

Our answer to Dynarski's question is that today more than 10 million employed high school graduates were moved along with literacy skills at the basic or below level, and over 12 million employed college graduates completed their college education, but did not achieve commensurate levels of proficiency.

In other words, the extensive use of educational attainment as a measure of productive ability indicates that educational attainment is increasingly ineffective at assessing outcomes. Measures—statistics—are created, adopted, and used to track what we care about. They help guide our thinking, our policy, and our actions toward achieving that something. The waning ability of the educational attainment measure to represent productive ability has vast consequences. Consequences are felt by those individuals without the skills they need, although granted a degree that signals otherwise. It is lived by those who take initiative and pursue higher education but either aren't equipped to succeed or struggle in programs that do little to foster skill development, although they nevertheless acquire debt. And, it raises critical questions about the desirability of public policies that focus on educational credentials with little consideration to skills development associated with those credentials.⁴⁸

However, we are all too aware that, as much as we love the comprehensive skills data that comes from a survey like PIAAC, its availability is limited. Data on educational attainment abounds. Our advice to researchers and policymakers, then, is simple. Love the attainment data you're with, but never unconditionally, and always be mindful of the types of variances that this report shows are apt to be present. Learn to realize that increases in graduation rates may be masking what's actually going on in the classrooms. And whenever you can get your hands on the skills data you love, use it as much as possible. It will improve your chances of getting better human capital investment policy in place.

Appendix

Table A-1: Earnings Distribution of All Employed Nonelderly Adults in Detroit and Michigan

QUINTILES	MEAN	MEDIAN	SUM	N	EARNINGS DIST.
Detroit					
1	5,617	5,562	243,508,013	43,351	3.6%
2	15,918	15,572	705,147,173	44,298	10.4%
3	26,285	25,892	1,136,841,177	43,250	16.8%
4	37,816	37,414	1,516,810,889	40,110	22.4%
5	75,452	63,705	3,175,944,545	42,092	46.9%
Total	31,808	25,728	6,778,251,796	213,102	100.0%
Michigan					
1	6,848	6,895	6,033,087,104	880,949	2.9%
2	20,510	20,583	17,735,304,161	864,712	8.6%
3	34,701	34,579	30,234,357,679	871,287	14.6%
4	54,209	52,582	47,228,345,562	871,224	22.8%
5	121,829	94,681	105,977,868,151	869,891	51.1%
Total	47,546	34,380	207,208,962,656	4,358,063	100.0%

Source: 2015, 2016, and 2017 American Community Surveys (ACS), public use files, U.S. Census Bureau, tabulations by authors.

About the Authors



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Neeta Fogg is Research Professor at the Center for Labor Markets and Policy at Drexel University; **Paul Harrington** is Professor and Director of the Center; **Ishwar Khatiwada** is an Economist at the Center.

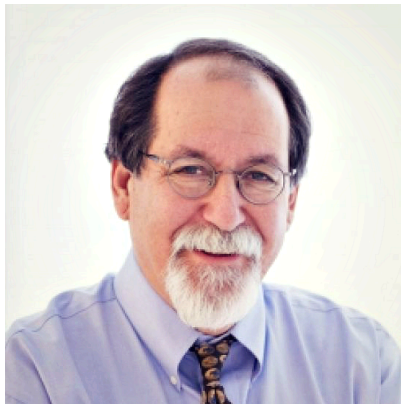
These authors have worked together for many years exploring various measures of human capital and the ways in which these human capital traits are valued in the labor market relative to other traits. Their research in this area has focused on four key measures of human capital: behavioral character traits, social skills, occupational knowledge, and literacy and numeracy. They have employed a variety of research techniques such as statistical analysis of large-scale databases with human capital measures, longitudinal analysis of educational progress and outcomes at the state and local level, net impact evaluation methods, and interviews with hundreds of employers, educators, organized labor leaders, and youth groups.

A sample of their research and evaluation projects in recent years includes studies of the impact of disability on a variety of education and employment outcomes. They have also studied the nature of youth disconnection in cities across the nation. The authors have engaged in net impact evaluation studies of program interventions by high schools and workforce development programs. They have produced a series of papers on the relationship between college education and labor-market outcomes of those with college degrees at the undergraduate and graduate level. Related to this has been a set of papers examining the underutilization in the U.S. labor markets of foreign-born college graduates with degrees earned abroad. A key research focus of the authors in recent years has been assessing impacts of an aging population on the labor force and its implications on the delivery of long-term care to this rapidly aging population.

The authors have published numerous research monographs, book chapters, and articles in these research areas. Some of their recent publications include *Gray Warnings: Challenges in the Direct Care Workforce*; *Opportunity Rising: Increases in Human Capital Investment and Declines in Disconnection among Teens and Young Adults in Los Angeles*; *The Human Capital Investment Gap: Understanding the Diminished Prospects of Disconnected Youth in Los Angeles*; *From Diplomas*

to Degrees: A Longitudinal Study of College Enrollment and Graduation Outcomes of High School Graduates from the School District of Philadelphia; The 2018 Summer Job Outlook for American Teens; The Collapse of the Labor Market for 16- to 24-Year-Olds; and U.S. Teens Want Work.

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Irwin Kirsch is the Ralph Tyler Chair in Large Scale Assessment and Director of the Center for Global Assessment at Educational Testing Service in Princeton, New Jersey. In his role as director of the center, he oversees several teams of research scientists and project managers who are responsible for the management, development, and implementation of various large scale international assessments as well as the creation of policy reports focusing on human capital and education.

Over the course of his career, Kirsch has 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 (IEA), and the Organisation for Economic Co-operation and Development (OECD), where he currently serves as the International Survey Director for both PISA (Programme for International Student Assessment) and PIAAC (Programme for the International Assessment of Adult Competencies).

In addition to his assessment work, Kirsch is a member of the ETS Research Management Team, serves as an ad hoc reviewer for several journals, and has authored or co-authored a series of monographs for ETS on education, health, and workforce readiness issues. His most recent policy report, titled *Choosing Our Future: A Story of Opportunity in America*, seeks to provide understanding and communicate about the dynamics that govern the distribution and transmission of opportunity and proposes a framework for policies to expand opportunity for all Americans.



Anita Sands

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Endnotes

- 1 For an interesting discussion on college preparation, see: Cynthia G. Brown, "All Students Need Common Foundational Skills," <https://www.educationnext.org/students-need-common-foundational-skills/>; and Robert Schwartz, "Multiple Pathways Can Better Serve Students," *Education Next*, Summer 2014, <https://www.education-next.org/multiple-pathways-can-better-serve-students/>.
- 2 *The Condition of Education*, U.S. Department of Education, National Center for Education Statistics, 2018, https://nces.ed.gov/programs/coe/pdf/coe_cpb.pdf.
- 3 Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, "Educational Attainment, Foundational Skills and Worker Earnings," *New England Journal of Higher Education*, January 15, 2019. <https://nebhe.org/journal/educational-attainment-foundational-skills-and-worker-earnings/>; Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Skills and Earnings in the Full-Time Labor Market* (Princeton, NJ: Educational Testing Service, 2018), <https://www.ets.org/research/report/earnings-full-time-labor-market/>; Neeta Fogg, Paul Harrington, and Ishwar Khatiwada, *Skills and the Earnings of College Graduates* (Princeton, NJ: Educational Testing Service, 2019), <https://www.ets.org/research/report/earnings-college-graduates>.
- 4 Ibid.
- 5 Madeline J. Goodman, Anita M. Sands, and Richard J. Coley, *America's Skills Challenge* (Princeton, NJ: Educational Testing Service), <https://www.ets.org/s/research/29836/>; and Madeline Goodman and Anita Sands, *Too Big to Fail: Millennials on the Margins* (Princeton, NJ: Educational Testing Service, 2018), <https://www.ets.org/research/report/opportunity-too-big-to-fail/millennial>.
- 6 NAEP is a measure of the academic proficiencies of fourth-, eighth-, and 12th-grade students. Surveys of math, reading, and writing of fourth and eighth graders are conducted every two years: See *About NAEP: A Common Measure of Student Achievement*, U.S. Department of Education, National Center for Educational Statistics, <https://nces.ed.gov/nationsreportcard/about/>.
- 7 Susanna Loeb, "Low-Performing Students No Longer Making Gains on NAEP," *Education Next*, April 10, 2018, <https://www.educationnext.org/low-performing-students-no-longer-making-gains-naep/>.
- 8 Lorelie Laird, "Right to Learn Advocates for Detroit Students Say There's a Constitutional Claim to Literacy," *ABA Journal*, March 2017, http://www.abajournal.com/magazine/article/constitutional_right_to_learn. A similar right-to-access-to-literacy lawsuit against the state government is proceeding in California. See: Christine Hauser, "Too Many Children in California Can't Read, Lawsuit Claims," *New York Times*, December 6, 2017, <https://www.ny-times.com/2017/12/06/us/california-literacy-lawsuit.html>.
- 9 Fourth-grade reading and math NAEP scale scores also placed Detroit last in fundamental skill proficiency scores among all big city school districts in 2017. See *The Nation's Report Card, Data Tools District Profiles* <https://www.nationsreportcard.gov/profiles/districtprofile?chart=1&sub=RED&sj=XQ&sfj=NP&st=MN&year=2017R3>.
- 10 Basic level math scores mean that students understand arithmetic operations on whole numbers, fractions, and percentages. Students in the eighth grade with basic level reading scores are able to locate information, identify statements of main ideas, and make simple inferences from texts.
- 11 "Michigan's Statewide Graduation Rate Hits 80 Percent Graduation, Graduation Rate Increases 0.53 Percent, Dropout Rate Declines," Michigan Center for Educational Performance, February 21, 2018 press release, available at <https://www.michigan.gov/som/0,4669,7-192-26847-460814--,00.html>.
- 12 For a discussion of the PIAAC program in the United States, see "What is PIAAC?", U.S. Department of Education, National Center for Education Statistics, <https://nces.ed.gov/surveys/piaac/>.
- 13 Proxy measurement of social and economic activity is not limited to the realm of human capital. One important example is the measurement and interpretation of consumer spending and its meaning for judging changes in the standard of living over time. See: Arnold Klingman, "The Post Industrial State," *National Affairs*, Summer 2018, <https://www.nationalaffairs.com/publications/detail/the-post-industrial-state>.
- 14 Our college labor market classification is based on qualitative differences in the proficiencies required to perform effectively within an occupation, based on analysis of the U.S. Department of Education's O*NET System. For a description, see Fogg et al., *Earnings of College Graduates*.

- 15 Other studies, as one might expect, reveal that jobless adults have lower literacy and numeracy scores compared to their employed counterparts. However, if we were to include jobless adults in the study, the effect would be to disproportionately increase the measure of low-skill, nonelderly adults in the nation.
- 16 O'Connell v. Superior Court, 141 Cal. App. 4th 1452, 1478, 47 Cal. Rptr. 3d 147, 167 (Cal. App 1 Dist. 2006).
- 17 The National Adult Literacy Survey in 1992 was followed by the International Adult Literacy Survey in 1994, the National Assessment of Adult Literacy (NAAL) in 2003, and most recently PIAAC in 2012.
- 18 For example, the CPS has a sample of about 60,000 households per month and the ACS sample includes about 3.5 million households over the course of a year. In contrast, the PIAAC sample consists of about 9,000 households, the NAAL sample about 19,000.
- 19 In fact, a review of some of the proposal materials submitted by East Coast cities in the recent Amazon HQ2 competition reveals that most highlighted the educational attainment of the regional workforce as well as the number or share of employed persons with a college degree. These measures served as proxies in these proposals for skills, talent pools, and similar synonyms for the stock of human capital.
- 20 See Frederick Harbison, *Human Resources as the Wealth of Nations* (London: Oxford University Press, 1973); and Theodore Schultz, *Investing in People: The Economics of Population Quality* (Berkeley, CA: University of California Press, 1980).
- 21 "Public High School Graduation Rates," *The Condition of Education, Letter from the Commissioner*, U.S. Department of Education, undated, https://nces.ed.gov/programs/coe/indicator_coi.asp.
- 22 Alexandria Walton Radford, Laura Burns Fritch, Katherine Leu, and Michael Duprey, *High School Longitudinal Study of 2009 (HSL) Second Follow-Up*, National Center for Education Statistics, U.S. Department of Education, February 2018, <https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2018139>.
- 23 National Center for Education Statistics, *Digest of Education Statistics, 2016, Table 219.65*, High School Completion Rate of 18- to 24-Year-Olds Not Enrolled in High School (Status Completion Rate), by Sex and Race-Ethnicity: 1972 Through 2015.
- 24 For example, the Rhode Island Department of Education has used NSC to track its public high school graduating seniors into the postsecondary system for a decade. NSC provides unit record data along with summary reports of immediate college enrollment after high school along with extensive records on postsecondary retention and completion to participating state and local education agencies and private schools.
- 25 "Immediate College Enrollment Rate," *The Condition of Education*, January 2018, https://nces.ed.gov/programs/coe/indicator_cpa.asp.
- 26 Erich Lauff, Steven J. Ingalls, and Elise Christopher, *Educational Longitudinal Study of 2002 (ELS2002): A First Look At 2002 High School Sophomores 10 Year Later*, U.S. Department of Education, National Center for Educational Statistics, January 2014, <https://nces.ed.gov/pubs2014/2014363.pdf>. It is useful to note that just 3 percent of these 2002 sophomores had not earned a high school diploma or its equivalent.
- 27 Emma Brown, "U.S. High School Seniors Slip in Math and Show No Improvement in Reading," *Washington Post*, April 27, 2016, https://www.washingtonpost.com/local/education/us-high-school-seniors-slip-in-math-and-show-no-improvement-in-reading/2016/04/26/9b8f033e-0bc8-11e6-8ab8-9ad050f76d7d_story.html?noredirect=on&utm_term=.09e47b638fd6.
- 28 Goodman, Sands, and Coley, *America's Skills Challenge*.
- 29 The *Detroit Adult Foundational Skill Development: Challenges and Solutions* defines "foundational skills" (what we label here as "essential skills") as ". . . the basic, entry-level skills that are common across most workforces and industries, upon which most occupational skills are built. They are prerequisites for success in most jobs and careers. They include reading, math and English language proficiency; work readiness and basic professional skills; digital literacy skills; and career management skills." Mary Freeman, Larry Good, and Vickie Choitz, *Detroit Adult Foundational Development*, Corporation for a Skilled Workforce, June 2018, 4, http://skilledwork.org/wp-content/uploads/2018/07/Detroit-Adult-Found-Skill-Development-6_18_18-1.pdf.
- 30 Ibid.

- 31 Even up-to-date nationwide data is sparse. National sample surveys that directly measure adult literacy and numeracy are conducted infrequently. The PIAAC survey was begun in the United States in 2012. Prior to that, there had been only three other large-scale sample surveys designed to measure essential skills among adults conducted in the United States, beginning in 1992. Prior to PIAAC, the most recent was NAAL (2003). See *History of International Adult Literacy Assessments*, National Center for Education Statistics, <https://nces.ed.gov/surveys/piaac/history.asp>.
- 32 The other two are (a) Limited English-Speaking Proficiencies (but not Low Earnings), and (b) Combined Limited English and Low Earnings. Each group represented about half of the remaining 5 percent of Detroit's skills-deficient population. Note that the ACS limits questions about skills to a self-assessment of English-speaking skills for persons whose first language is not English.
- 33 Tongyun Li, Matthias von Davier, Gregory Hancock, and Irwin Kirsch, *The Predictions of Labor Force Status: Implications From the International Adult Skills Assessment*, Research Report No. RR-16-11 (Princeton, NJ: Educational Testing Service, 2016), <https://doi.org/10.1002/ets2.12097>.
- 34 However, it is possible to prepare indirect measures of state and even substate proficiencies using methodologies such as small area estimation.
- 35 As noted earlier, we limited our analysis of the PIAAC data to nonelderly employed persons. This restriction paints a somewhat brighter picture of skills among adults as we opted not to present measures for all adults regardless of labor-force status. Adults who are unemployed or not in the labor force have significantly lower literacy and numeracy scores compared to their employed counterparts.
- 36 These two categories accounted for most of the foundational skills deficit measure estimated in the Detroit study.
- 37 Goodman et al., *America's Skills Challenge*; Organisation for Economic Co-operation and Development, *Time for the U.S. to Reskill?: What the Survey of Adult Skills Says* (Paris: OECD Skills Studies, OECD Publishing 2013), <http://dx.doi.org/10.1787/9789264204904-en>; U.S. Department of Education, Office of Career, Technical, and Adult Education, *Making Skills Everyone's Business: A Call to Transform Adult Learning in the United States* (Washington, DC: Author, 2015).
- 38 Andrew Sum, *Literacy and the Labor Force*, Office of Educational Research and Improvement, U.S. Department of Education, National Center for Educational Statistics, 1999; Bobby D. Rampey, Robert Finnegan, Madeline Goodman, Leyla Mohadjer, Tom Krenzke, Jacquie Hogan, Stephen Provasnik, and Holly Xie, *Skills of U.S. Unemployed, Young, and Older Adults in Sharper Focus*, U.S. Department of Education, National Center for Educational Statistics, 2016, <https://nces.ed.gov/pubs2016/2016039.pdf>.
- 39 Fogg et al., *Earnings of College Graduates*.
- 40 Sands and Goodman, *Too Big to Fail*; Goodman, Sands and Coley, *America's Skills Challenge*.
- 41 There were 1.9 million employed persons with an earned college degree who had level 1 or lower literacy scores, representing about 10 percent of all employed persons at this level.
- 42 See for example: Sean F. Reardon, Demetra Kalogrides, and Ken Shores, *The Geography of Racial/Ethnic Test Score Gaps*, CEPA Working Paper No. 16-10, Stanford Center for Education Policy Analysis, 2019, <http://cepa.stanford.edu/wp16-10>; Adam Gamoran, *The Future of Educational Inequality in the United States: What Went Wrong, and How Can We Fix It?*, William T. Grant Foundation, 2015, <https://wtgrantfoundation.org/library/uploads/2015/11/The-Future-of-Educational-Inequality-Adam-Gamoran.pdf>; Irwin Kirsch, Henry Braun, Mary Louise Lennon, and Anita Sands, *Choosing Our Future: A Story of Opportunity in America* (Princeton, NJ: Educational Testing Service, 2016), <https://www.ets.org/research/report/opportunity/choosing-our-future>.
- 43 The Detroit study found that about 104,000 employed residents with only a high school diploma were employed at low wages and thus classified as skills deficient. Total employment of the entire 16-and-over population in Detroit averaged about 225,000. The implied high share of employed high school graduates working at low wages is unsurprising as median annual earnings of the resident employed were just \$39,500; statewide annual earnings averaged just over \$69,000 during 2015. See Data Profiles for Michigan and Detroit Michigan, American Community Survey, <https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2012/>.
- 44 For those interested in Detroit's and Michigan's earnings distributions, see the Appendix.

- 45 Over the last 20 years, an average of just over 80 percent of all part-time employment in the nation was voluntary: authors' analysis of Current Population Survey Public Use Micro sample data files, various years.
- 46 There are reasons to believe that some share of involuntary part-time workers may be higher-skilled workers in occupations with low skill requirements, especially those dislocated from full-time jobs and subsequently re-employed involuntarily in part-time positions. See Henry S. Farber, *Job Loss in the Great Recession and Its Aftermath: U.S. Evidence from the Displaced Workers Survey*, NBER Working Paper No. 21216 (Cambridge, MA: National Bureau of Economic Research, 2015), <https://doi.org/10.3386/w21216>.
- 47 Mark Dynarski, "Is the High School Graduation Rate Really Going Up?" *Education Next*, May 7, 2018, <https://www.educationnext.org/is-high-school-graduation-rate-really-going-up/>.
- 48 Li et al., *Labor Force Status*.



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