Center on Children and Families at BROOKINGS

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Middle Childhood Success and Economic Mobility

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Executive Summary

This study uses data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (ECLS-K) to analyze competencies that children need to master by the end of elementary school, the extent to which they are doing so, what might be done to improve their performance, and how this might affect their ultimate ability to earn a living and their chances of being middle class by middle age. **Both academic skills and socio-emotional skills contribute** to core competency. We measure core competence at age eleven using five outcomes: **math skills, reading skills, self-regulation, behavior problems, and physical health.**

- **62% of children have core competence by the spring of fifth grade**, while 38% do not meet the benchmark on one or more of the five measures.
- Though there are substantial gaps in achievement by gender, race, and socioeconomic status, **differences by subgroup decrease in magnitude when we control for demographics and school readiness at age 5.**
- Achievement gaps by race and socioeconomic status widen over the course of elementary school; **the gap between black and white children nearly doubles between kindergarten and fifth grade**.

The paper concludes with a discussion of how **middle childhood interventions** such as a social emotional learning program or a whole school reform program like Success For All might **improve short- and long-term outcomes for low-income children**. Preliminary results from the Social Genome Model indicate that **such programs might raise annual family income at age forty by four percent**—approximately $2,400 for a family of four.

The authors thank Helen Ladd and Sean Reardon for invaluable insight and suggestions at earlier stages.

Introduction

American children's educational performance is not what it needs to be in a twenty first century economy. In international assessments of 34 developed countries, U.S. students rank 14th in reading and 25th in math.[1] Moreover, despite the greater need for an educated work force and an educated citizenry, there has been little improvement over the last few decades in test scores measured at age 9 on the NAEP assessments, particularly on the reading assessment.[2] Finally, gaps by socioeconomic status (SES) and race remain large. Our research shows children from better-off families succeed at twice the rate of poorer children, with similar gaps between black and white kids. While racial gaps have narrowed somewhat, gaps by SES have actually grown over time (Reardon 2011).

Middle childhood success is not simply an end in itself, though surely well-educated children are a laudable goal. We are interested in middle childhood success as both a consequence of early childhood experiences and as a predictor of later success. Our research shows that a child with solid academic and social skills at age 11 is nearly twice as likely to graduate from high school with a good GPA and without having engaged in risky behaviors, and therefore is also more likely to pursue a post-secondary degree, earn a higher income, and be middle class by middle age.

This research reinforces that success begets success: good outcomes at one stage pave the way for positive outcomes later in life. Thus, our interest in elementary school interventions is as much about whether that child will be able to support herself and her family at age 40 as it is about whether her math scores are acceptable at age eleven.

This paper addresses the kind of competencies that children need to master by the end of elementary school, the extent to which they are doing so, what might be done to improve their performance, and how this might affect their ultimate ability to earn a living and their chances of being middle class by middle age.

The paper proceeds as follows: first, we describe the kinds of competencies we and other experts believe children should have achieved by age 10 or 11. Then, we provide data on how many children have achieved these competencies and how this varies by gender, race, SES, and other attributes of the children, as well as how these relationships change over the course of elementary school. Finally, we briefly review what's known about ways of improving these competencies and illustrate how two particular interventions, Success for All and social-emotional learning, might affect these children's long-term prospects.

Our analysis draws on data and modeling being conducted by a group of scholars associated with the Brookings Institution's Social Genome Project. The Social Genome Project, or SGP, is a life cycle model being developed to answer questions about social mobility and to assess a variety of policies designed to increase the proportion of children who become "middle class by middle age." The project involves building a simulation model of mobility over much of the life cycle—from the pre-natal stage to age 40, which we divide into five distinct life stages: early

[1] Ranking of 15-year-old students in 34 OECD countries. Source: 2009 Program for International Student Assessment, OECD.
[2] National Center for Education Statistics. See http://nationsreportcard.gov

childhood, middle childhood, adolescence, transition to adulthood, and adulthood. Such a model will allow policy makers to compare the simulated effects of various policy interventions at different points in the life cycle on outcomes in middle age. For example, we can try to estimate the answer to such questions as how many more individuals would achieve middle class status if access to early childhood education were expanded, or if more individuals attained post-secondary degrees.

Defining Core Competence

We measure core competence at age eleven using five outcomes: math skills, reading skills, self-regulation, behavior problems, and physical health. These outcomes fall into three domains: cognitive and academic skills, social-emotional skills, and physical health. Each of the domains is both an intuitively important part of development in the elementary years as well as widely recognized in the economic and developmental literature as having long term effects.

Academic skills. Early academic skills—particularly in math and reading—are important predictors of later school achievement and high school completion (Ensminger and Slusarkick 1992; Alexander, Entwisle and Horsey 1997; Finn, Gerber and Boyd-Zaharias 2005; Duncan and Magnuson 2011). The academic skills that children learn in elementary school, such as reading comprehension and simple mathematical operations, are the foundation of later learning and necessary for success in the working world. Longitudinal research shows that children's cognitive abilities are predictive of adult earnings (Murnane, Willet and Tyler 2000). Our definition of academic success requires a child to master the math and reading skills which are considered appropriate for fifth graders by the end of that school year. In math, this includes multiplication and division, fractions, and the ability to solve word problems. In reading, this includes basic vocabulary and comprehension skills as well as more advanced skills like literal inference and identification of tone and purpose.

Social-emotional skills. Attention and other self-regulating behaviors in middle childhood have been linked to achievement during the school years, and some evidence suggests that self-discipline or good study habits are at least as important as academic ability in determining school achievement (Duckworth and Seligman 2005; Duncan and Magnuson 2011). We define social-emotional success as demonstrating the ability to pay attention in class, control one's temper, stay organized, persist in completing tasks, and other skills that indicate self-control and ability to learn. We also include the absence of problem behaviors such as arguing, fighting, and anger in the social-emotional domain because of likely links to educational attainment, future earnings, and crime (Duncan and Magnuson 2011).

Physical Health. Finally, the third domain, physical health in childhood, has been linked to adolescent and adult health, as well as educational attainment and earnings (Case and Paxson 2006). A child who is limited or preoccupied by health concerns cannot dedicate the required energy to her schooling, especially if she must miss a significant portion of the school year.

While any definition of middle childhood success is somewhat arbitrary and requires a subjective judgment call, we define core competence to mean that a child is no more than one standard deviation below the mean on math, reading, externalizing behavior, or self-regulation

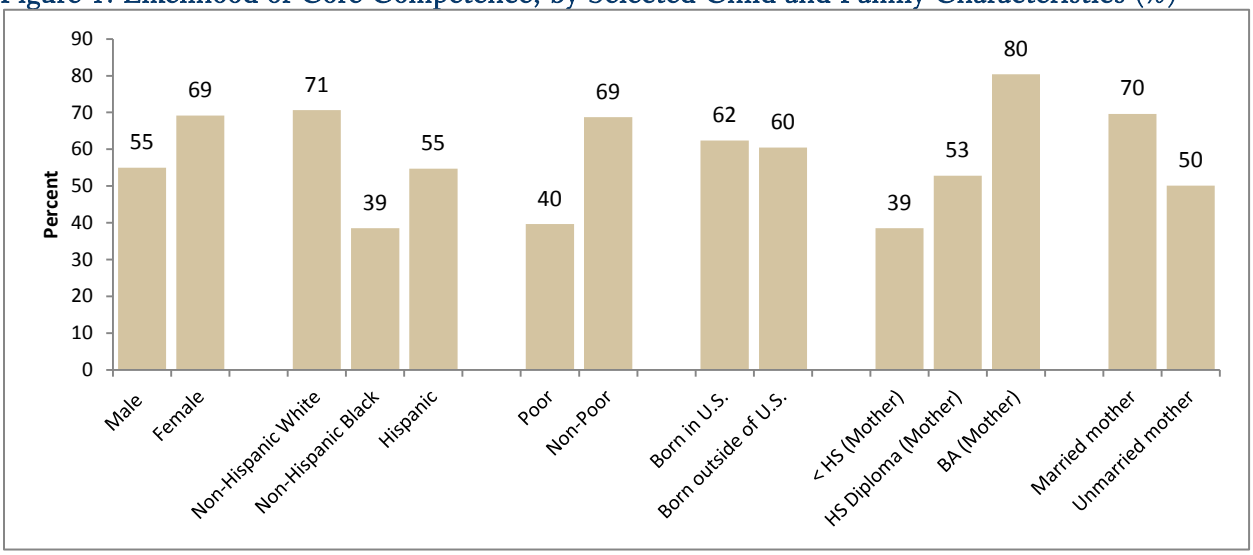
and is in good, very good, or excellent health[3]. If a child fails in one or more of the five measures, he or she is considered to have *not* acquired core competence[4].

The measures of all success metrics come from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (the ECLS-K), a nationally representative survey which follows children from the fall of 1998 when they are all in kindergarten to the spring of 2006 when most are in eighth grade. This data set was selected for its size and for the richness of information on children's home, family, and school environments in order to begin to analyze the factors which influence children's success in middle childhood. For detailed information on how we use the data to operationalize these outcomes, see the appendix.

Findings on Core Competencies

We find that about 62% of children have core competence by the spring of fifth grade, while 38% do not meet the benchmark on one or more of the five measures. As Figure 1 illustrates, when we look at children by subgroups, they differ in the ways we would expect based on prior research and intuition.[5] As we will see in a subsequent section, these gaps do not necessarily persist once one adjusts for a variety of confounding factors that help to explain why some groups do better than others.

Figure 1. Likelihood of Core Competence, by Selected Child and Family Characteristics (%)



See Appendix Table A-1 for supporting data.

[3] Even though nearly all children are in good physical health, we argue that being in poor health is detrimental enough to child development that the 3% who are unhealthy are not core competent.

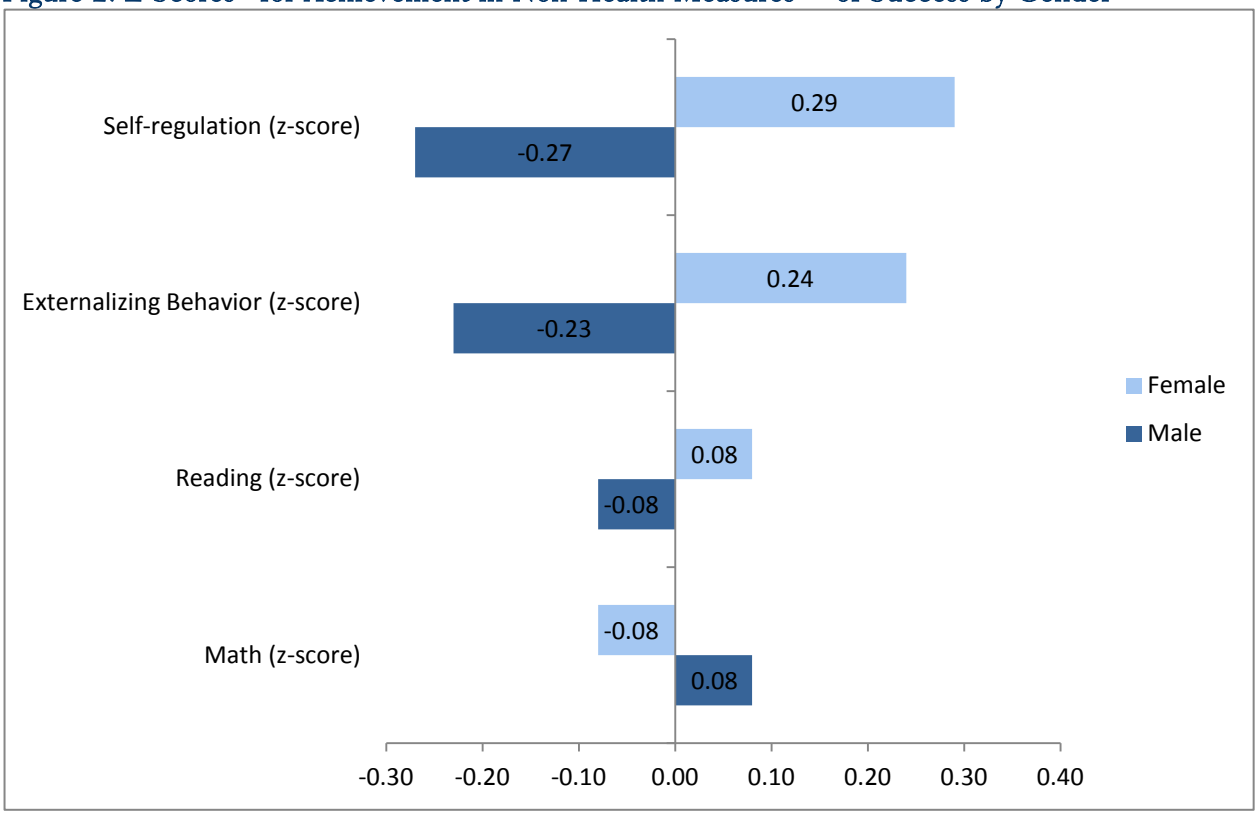
[4] One important point about the middle childhood success index is that while defining and using a yes/no indicator is useful conceptually, we realize that creating somewhat arbitrary cutoffs for each outcome and then aggregating them will inevitably lead to a loss of nuance and complexity when trying to analyze what matters during middle childhood. Therefore, we emphasize that when possible, we examine each of the continuous outcome measures separately as well as in the dichotomous index.

[5] Unless otherwise noted, all differences highlighted in this discussion are statistically significant. See Appendix Table A-1 for detailed results.

Gender

Girls are more successful than boys across each measured outcome with the exception of math scores, and therefore more girls than boys acquire core competence.[6] The difference by gender in the behavioral categories is particularly striking. Girls are on average 0.24 standard deviations above the mean in externalizing behavior and 0.29 standard deviations above the mean in self-regulation; by contrast, boys are, on average, 0.23 and 0.27 standard deviations below the overall mean externalizing behavior and self-regulation scores, respectively.

Figure 2. Z-Scores* for Achievement in Non-Health Measures** of Success by Gender



* Z-scores are obtained by subtracting the mean from each math/reading/externalizing behavior/self-regulation score and dividing by the standard deviation. This creates a distribution with a mean of zero and a standard deviation of one. Thus a z-score of -0.5 means that an individual is half of a standard deviation below the mean.

**Externalizing Behavior is reverse scored so that higher values indicate lower externalizing problems, and hence a competence.

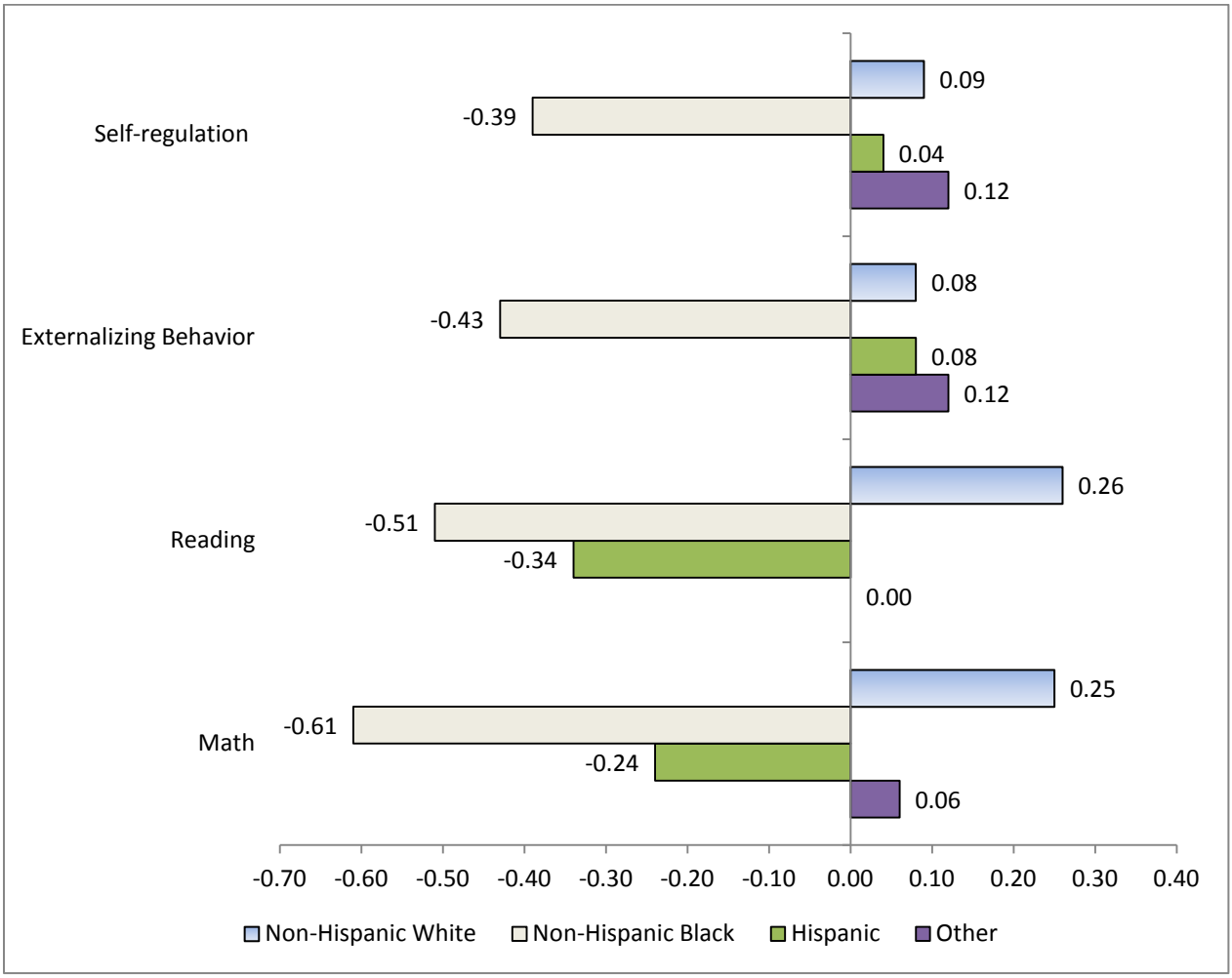
Race

By racial categories, in every domain whites have the best outcomes, followed by Hispanics and blacks.[7] The exception to this pattern is externalizing behavior, where whites and Hispanics

[6] The difference in health by gender (3.4% of boys and 3.2% of girls in bad health) is not statistically significant.
[7] There is also an "other race" category—which includes Asian, native Hawaiian/Pacific islander, American Indian, and more than one race—which we do not discuss here because it is such a diverse group.

have comparable success. The difference between the highest- and lowest-performing racial groups is largest for math skills (a difference between whites and blacks of 0.86 standard deviations) and reading skills (gap of 0.77 standard deviations).

Figure 3. Z-Scores* for Achievement in Non-Health Measures** of Success by Race



* Z-scores are obtained by subtracting the mean from each math/reading/externalizing behavior/self-regulation score and dividing by the standard deviation. This creates a distribution with a mean of zero and a standard deviation of one. Thus a z-score of -0.5 means that an individual is half of a standard deviation below the mean.

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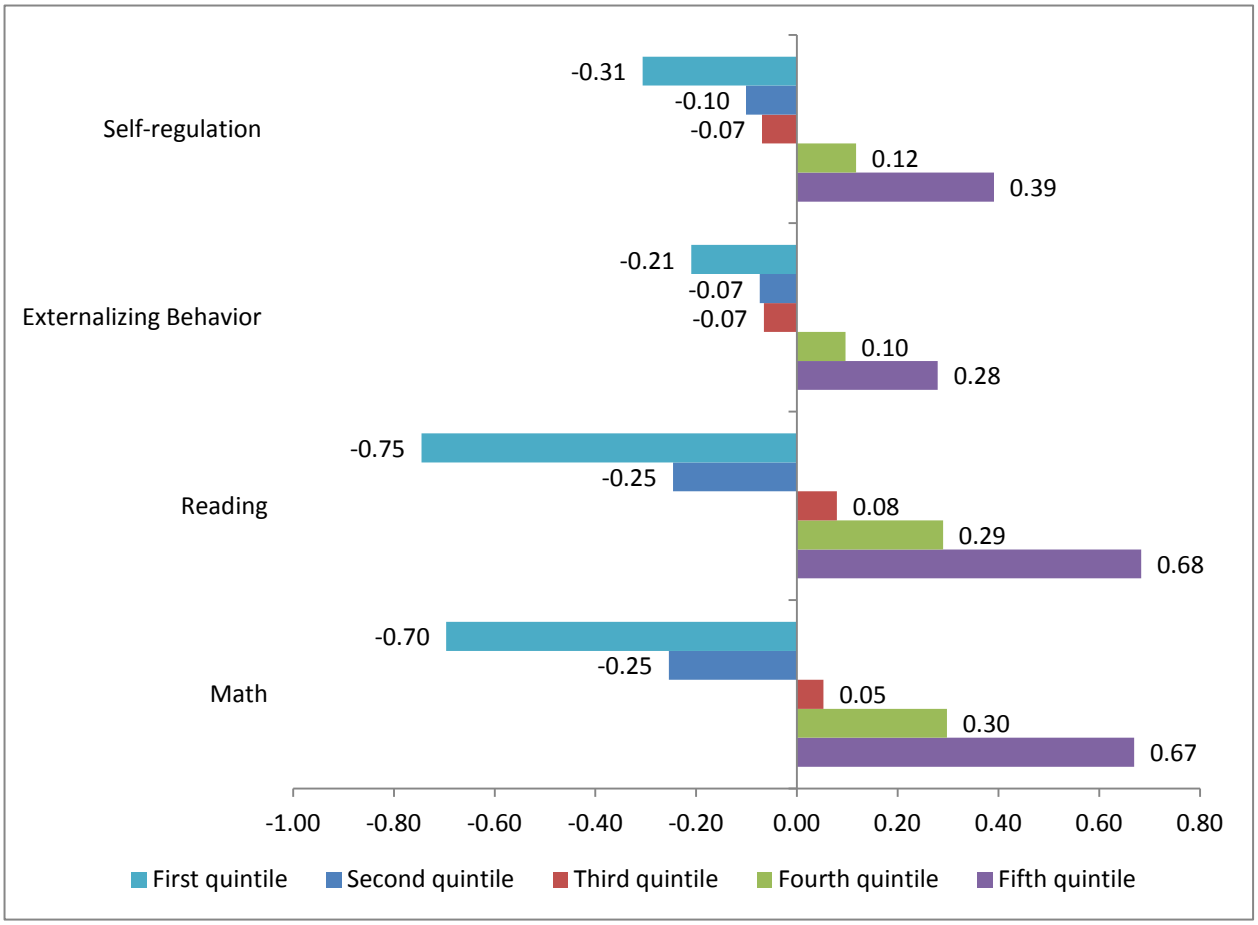
Socioeconomic Status

Children's fifth grade performance also varies with their socioeconomic characteristics. Children below the poverty line do worse across the board than children above the poverty line. Scores tend to be higher among children from households with higher incomes, where the mother has more education, and with higher socioeconomic statuses (a composite of parents' education, parents' occupation, and household income). These differences are more extreme

for measures of academic skills than for social-emotional and behavioral skills. Turning to family structure, children whose mothers are married perform consistently better than other children. Finally, children of immigrant mothers do not differ significantly in overall core competence from their peers whose mothers were born in the U.S. The differences are largest in terms of reading scores, which might be expected, given that children of immigrants presumably do not have as much practice at home with the English language skills needed for reading comprehension. It is worth noting that children of immigrant mothers tend to score higher on the social-emotional outcomes.

Figure 4. Z-Scores* for Achievement in Non-Health Measures** of Success by Socioeconomic Status



* Z-scores are obtained by subtracting the mean from each math/reading/externalizing behavior/self-regulation score and dividing by the standard deviation. This creates a distribution with a mean of zero and a standard deviation of one. Thus a z-score of -0.5 means that an individual is half of a standard deviation below the mean.

**Externalizing Behavior is reverse scored and indicated lower externalizing problems, and hence a competence.

Repeating a Grade

As we would expect, children who for various reasons get off track and are held back a grade perform worse than their peers, particularly academically (see Table 1). Of children who don't repeat any grades, 70% have core competence; of children who repeat at least one grade

in elementary school, only 30% do. The year which children repeat seems to matter. Around 11% of children go through kindergarten twice, and about 20% of children repeat kindergarten, first, second, or third grade. The core competence rates are much worse for children who repeat an elementary grade than for children who repeat kindergarten. However, these results must be interpreted with caution; while many children are held back because they fail to learn the material required, others may be held back for health reasons and do worse academically only because they miss learning material that they might otherwise master. The same is true of children who may get a slow start in elementary school but succeed later on. Additionally, some parents "redshirt" their children, meaning they strategically keep a child in kindergarten an extra year so that the child will be ahead of her classmates when she enters first grade. In these cases, the repeaters will actually do better than their on-track peers.

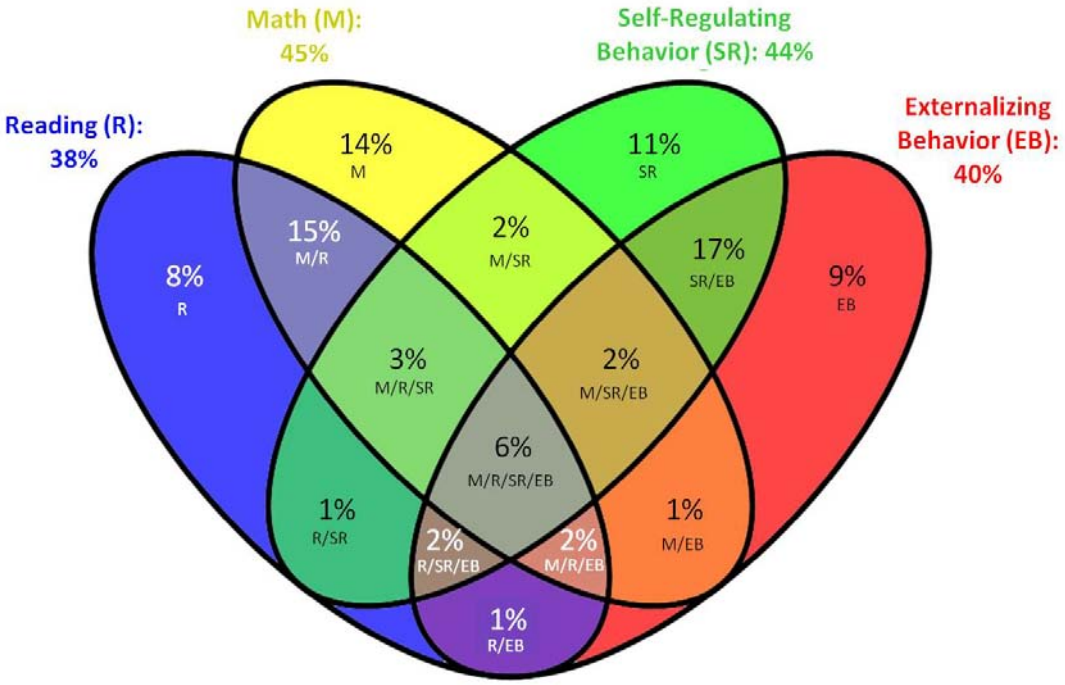
Table 1. Success in Middle Childhood by Repeater Status

	Frequency Distribution (%)	Math	Reading	Self-Regulation	Externalizing Behavior	Health (% in poor or fair health)	Core Competence (%)
By Repeater Status							
Off track (Repeated at least one grade)	19	-0.73	-0.80	-0.38	-0.31	4.98	30
On track	81	0.20	0.22	0.12	0.10	2.67	70

Multiple Deficiencies

We find that about 38% of children do not have core competence by the spring of fifth grade. While 36% of those who don't have core competence fall short of the benchmark at math, reading, or both, roughly the equivalent proportion (37%) fail at one or both social-emotional measures. Another 3% fail to do so because of poor physical health alone. The remaining 24% experience almost every possible combination of success and failure in our areas of measurement (see Figure 5).

Figure 5. Combinations of Problem Areas Among Children Who Fail to Reach Core Competence at Age 11



Note: The other 6% of children at age 11 fail to achieve core competencies because of poor health, either alone or in conjunction with insufficient skills in other areas.

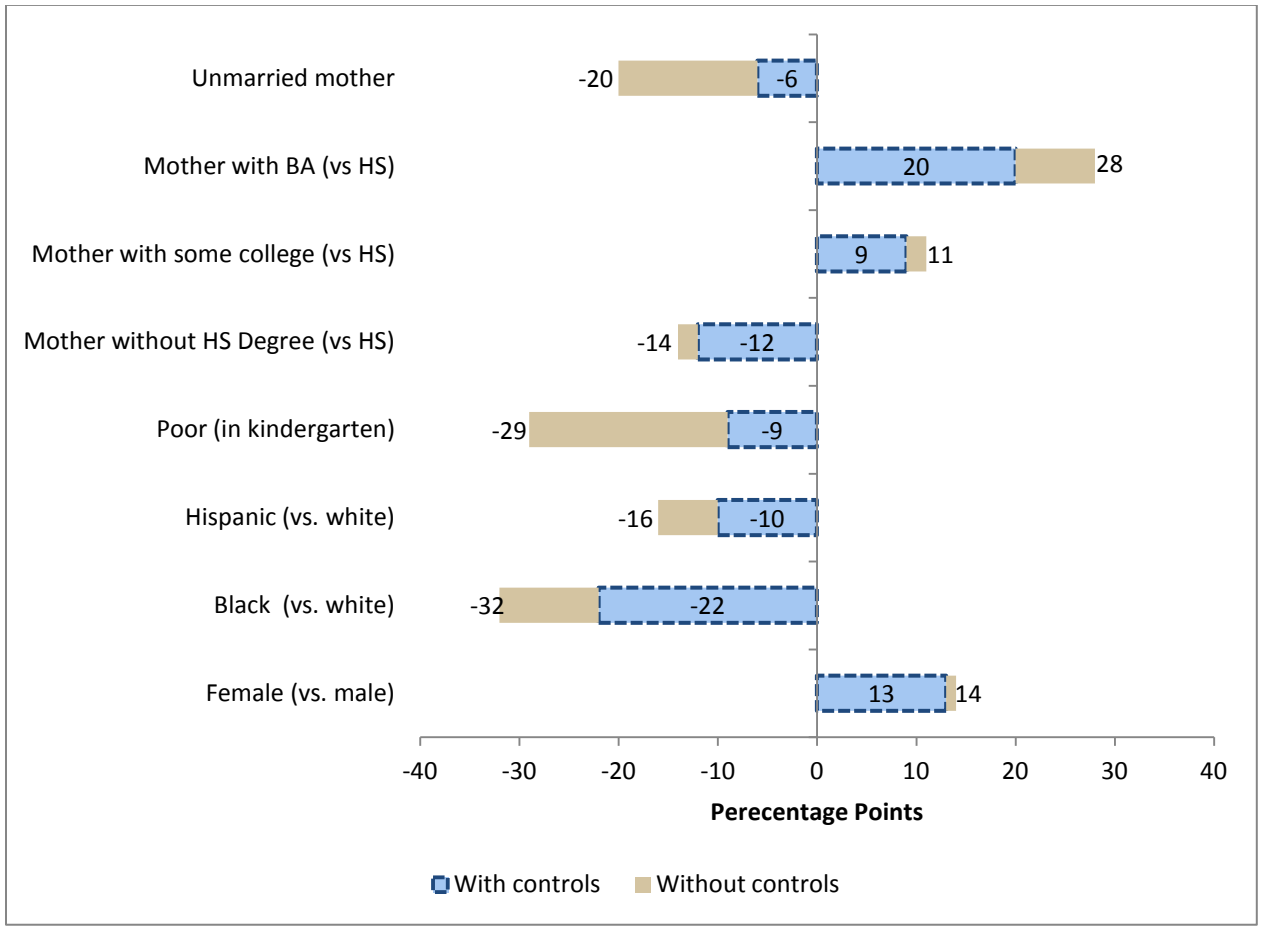
Explaining the Results

While the descriptive results presented above are valuable in their own right and emphasize the gaps in core competence that exist, it is important to try and disentangle the confounding and interrelated effects of each of these characteristics. In reality, none of the child characteristics we've highlighted affect middle childhood outcomes completely independently. It is well documented that race, income, and maternal education are related and that a black child, for example, is more likely to be poor and have a mother who didn't graduate from college. This has a confounding effect on the relationship we see between each of these characteristics and core competence. For this reason, we performed some regression analyses in which we controlled for many of the factors that we believe affect middle childhood achievement (complete results in Appendix Table A-3).

We found that while the differences by subgroup decrease in magnitude when we add in controls, almost all of them remain significant and relatively large. In Figure 6, the blue bars show the smaller—but still sizeable—gaps after controlling for confounding factors. For example, without controls, a black child can be expected to achieve core competence at a rate about 30% lower than a white child; when we add in controls including poverty status and maternal education, the gap is closer to 20% but still significant. This suggests that aside from basic socioeconomic factors, there are other differences between black and white children that

affect student achievement. Possibilities include neighborhood and school quality or something less quantifiable about their developmental history and/or home environments. In a report by the Educational Testing Service, some of these other differences are identified. Minority students tend to have less experienced teachers, experience more teacher turnover, and have slightly larger classes. There is greater student mobility between schools. Minority students also watch more television, and their parents spend less time attending or volunteering for school activities. Other studies have shown that health histories, home environments and parenting practices vary by race and that these factors explain a significant portion of the racial gap.[8] Related to this, less advantaged students also suffer as a result of summer learning loss. Compared to their more advantaged peers, they are less likely to engage in stimulating activities over the summer months and thus fall farther behind (Barton and Coley 2003).

Figure 6. Core Competence Gaps, With and Without Controls



See Appendix Table A-3 for supporting data.

The results also indicate that maternal education is quite important. Compared to a mother who has only a high school diploma, a mother with a college degree is 20% more likely to have a child who is successful. Marital status matters too, but apparently not as much as education; a

[8] For an excellent review of this literature, see Waldfogel (2012).

child whose mother is not married, all else equal, can be expected to achieve core competence at a rate 6% lower than a child whose mother is married.

The regression analysis suggests that being poor decreases core competence by 9 percentage points. That these effects are much smaller than mother's education and decrease with controls suggests that factors that often go hand-in-hand with income, like parents' education, matter more.

Descriptively, children who are school ready at kindergarten entry (defined as having adequate reading, math, self-regulation, and externalizing behavior skills and being in good health) are much more likely to acquire core competence by the end of fifth grade (see Table 2).

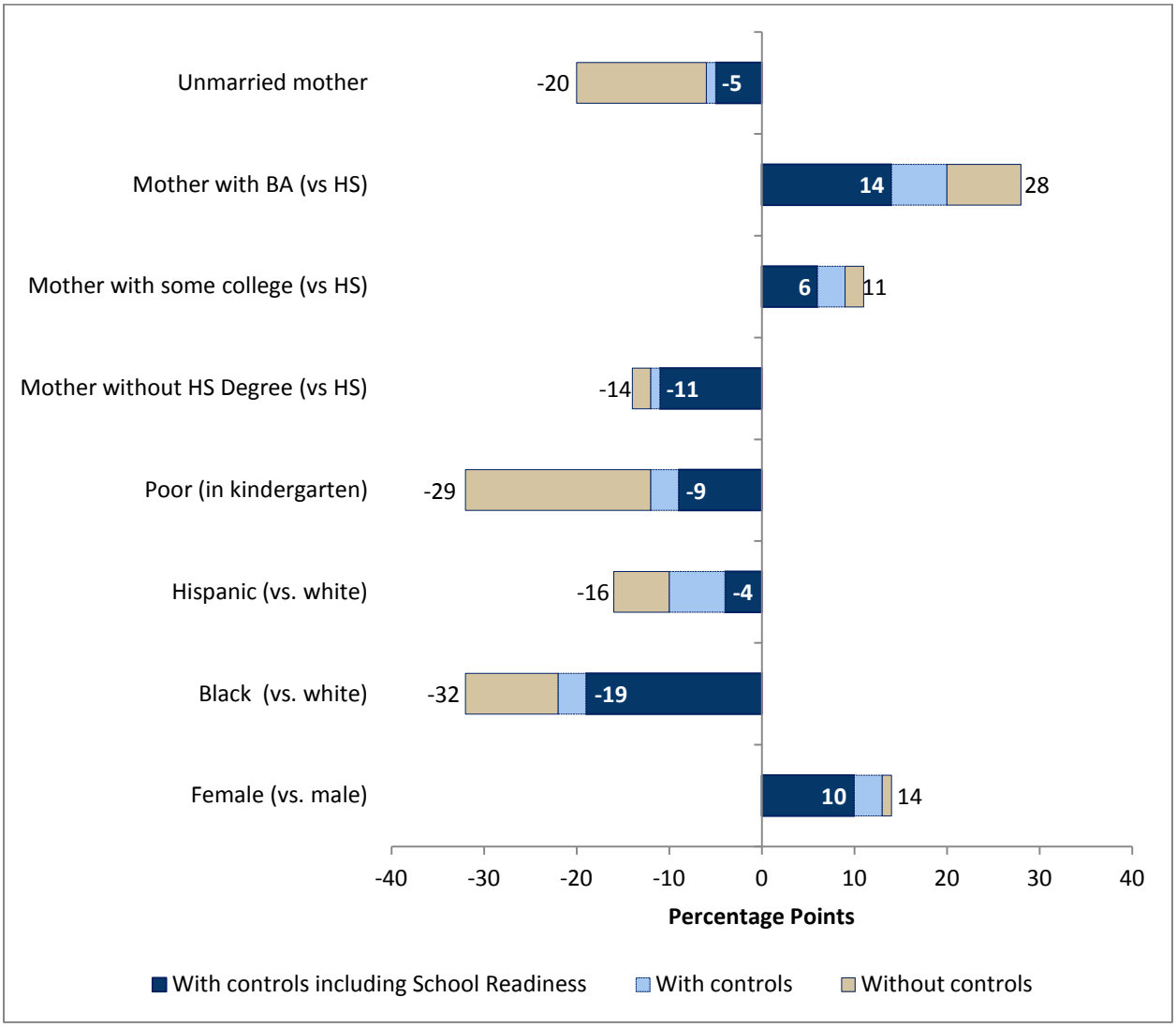
Table 2. Middle Childhood Success by School Readiness in Kindergarten

	Frequency Distribution (%)	Core Competence (%)
School Ready at Kindergarten Entry	72	77
Not School Ready	28	39

When we add a child's school readiness at kindergarten entry as a control in the previous set of regressions, we see that whether or not a child is prepared to enter school is the most predictive characteristic of whether that child will succeed in elementary school. Controlling for race, gender, income, maternal education, family structure, and maternal nativity, a child who is school ready at the beginning of kindergarten is 29% more likely to acquire core competence by the end of fifth grade. This does not necessarily mean that school readiness causes core competence; it may be that because of some unmeasured characteristics like ability or quality of educational inputs, the same children who do well in kindergarten tend to be the ones who also succeed later on. However, it is also likely that a child who masters early learning and behavior skills is better poised to accumulate more advanced skills. Both unmeasured characteristics and school readiness at kindergarten are probably causally related to core competence in fifth grade.

An interesting result from this set of regressions is that once school readiness is added in, the coefficients on the other variables decrease (Figure 7), but most of them remain significant predictors of core competence at age 11. For example, once we control for school readiness, being black or Hispanic does not appear to disadvantage children quite as much; in other words, if a black student and a white student are both school ready at kindergarten, the later achievement gap between them narrows. This points to the importance of intervening early and providing high quality early childhood education to less advantaged and minority children. Hispanic children have been underserved in these programs and black children, although they are often enrolled in Head Start, are not getting as high quality an experience as their white counterparts, according to research published in the *Future of Children* (Magnuson and Waldfogel 2005).

Figure 7. Middle Childhood Success Gap with Various Levels of Controls (in percentage points)



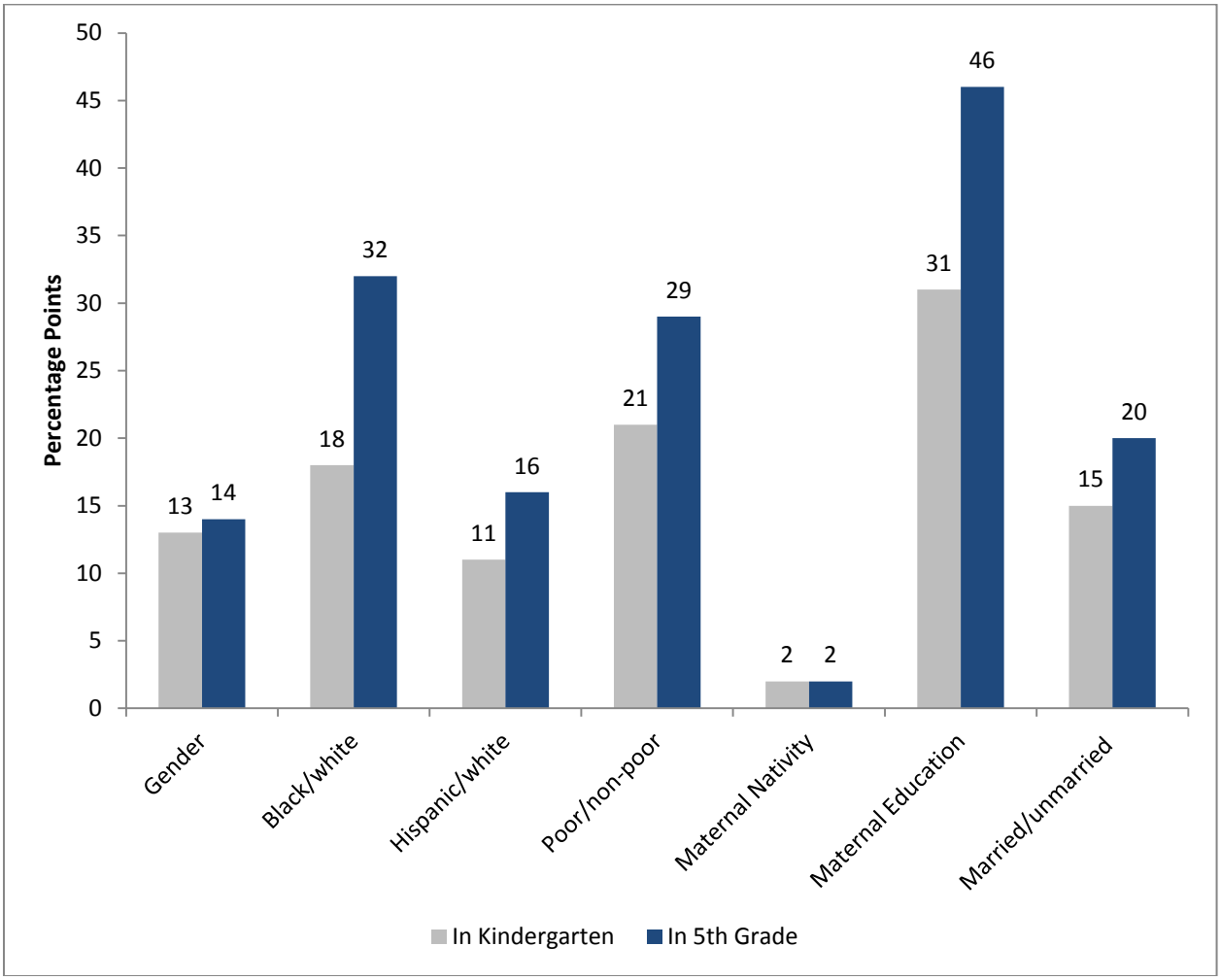
See Appendix Table A-5 for supporting data.

Widening of Gaps Over Time

Since our data set is longitudinal and measures children's cognitive and behavioral performance at every round of data collection, we are able to observe how the relationships discussed above change over time. When school readiness (measured at the start of kindergarten) and core competence (measured at the end of fifth grade) are defined identically, we see that the achievement gaps by race and SES widen over the course of elementary school (see Figure 8). The racial gap nearly doubles: in kindergarten, white children are school ready at a rate 18 percentage points higher than black children; by fifth grade, the gap grows to 32 percentage points.[9]

[9] This finding has emerged in other research as well. See Waldfogel, op cit.

Figure 8: Change in Gaps in Core Competence, Kindergarten to Fifth Grade (in percentage points)



Longer Term Outcomes and Consequences

The consequences of not achieving the core competencies in the early grades are very serious. For some children, they include having to repeat a grade. Repeating a grade is potentially stigmatizing for the children involved, disruptive of their peer groups, and costly for taxpayers who bear the cost of an extra year of schooling. For other children, the consequences include not graduating from high school, not having a chance to go to college, and ending up with insufficient skills to be successful in the labor market. We estimate that compared to those who are not successful in middle childhood, those who achieve success at this stage are about twice as likely to graduate from high school with a 2.5 GPA and without being convicted of a crime or becoming a teen mother (Sawhill, Winship, and Grannis 2012, Fig. 7). Moreover, they are 22 percent more likely to be middle class (household income of about $68,000 or more for a married couple with two children) by age forty.

What Can Be Done to Improve Success in Middle Childhood?

Discussions about how to improve children's school performance have focused on both what can be done by schools themselves and what needs to happen outside of schools and in the home. School reform, in turn, could include more resources, more accountability for results, more effective teachers in the classroom, smaller class sizes, more effective curricula, longer school years or days, and more competition and choice via vouchers or charters. Although a full review of the debate about school reform is beyond the scope of this paper, we note that most experts do not believe that more resources by themselves will have much impact unless they are targeted in effective ways, that accountability is important but must be combined with providing schools the capacity to do better, that teachers are critical but that it's hard to identify good teachers in advance, that class size (holding teacher quality constant) matters but is a comparatively expensive intervention, that few curriculum reforms have been well evaluated or demonstrated big effects, that some charters and some experiments with vouchers have had good or even excellent results but that charters as a whole do not do better than the public schools.[10]

In short, there is no magic bullet. Most likely a combination of these or other reforms will be needed to improve children's competencies in the middle years. Indeed, more holistic approaches or "whole school reforms" that involve simultaneously changing teacher training, curriculum, testing, and the organization of learning have had some success. One such reform that has received considerable attention is Success for All (SFA). Indeed, several reviews give it high marks for its effects on student performance and its cost-effectiveness. A meta-analysis of whole school reform programs from the American Institutes of Research reviewed 121 quantitative studies on SFA, of which 36 were deemed rigorously designed. Of those, 34 studies found conclusive evidence of SFA's effectiveness, and the remaining two found suggestive evidence of the same[11]. The Coalition for Evidence-Based Policy rates SFA as meeting the top tier evidence standard. SFA students scored 25-30% of a grade level higher in reading ability than the control group students, as measured at the end of second grade.

As noted above, one of the interesting findings from our work so far is the importance of social-emotional-behavioral competencies and not just academic competencies. Here again, there is a broad literature detailing a number of different interventions that have been used to improve such competencies, falling under the general category of social-emotional learning (SEL). SEL approaches teaching and learning as more than a purely academic endeavor. Learning is almost always social because it rarely happens without teachers, peers, or family members. Emotions can "facilitate or impede children's academic engagement, work ethic, commitment, and ultimate school success" (Durlak et al. 2011). If emotions and social interactions affect how and how well we learn, then the question is: can schools explicitly teach these skills? A growing body of evidence suggests they can. Social-emotional learning has five core elements: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. Learning to navigate these areas positively impacts children's behavior and reduces emotional distress. These positive outcomes not only directly impact

[10] For excellent reviews, see Jacob and Ludwig in Cancian and Danziger, 2009; Figlio, in Focus, 2007-08; Loeb and McEwan in Levine and Zimmerman, 2010; Rouse and Barrow in McLanahan and Sawhill, FOC, 2006.

[11] *CSRQ Center Report on Elementary School CSR Models*. Comprehensive School Reform Quality Center. American Institutes for Research. (Nov. 2006).

behavioral measures but are also thought to positively influence academic outcomes (Payton et al 2005; Zins et al 2004). A recent meta-analysis of SEL research found that on average, SEL programs improved both conduct problems and academic performance by about a fifth of a standard deviation. For programs that follow SEL best practices (instruction that is sequenced, active, focused, and explicit), the effects grow to about a quarter of a standard deviation (Durlak et al. 2011).

Finally, although as we have seen, most children are reasonably healthy at age 10-11, for those who are not, access to health care is obviously important. We assume that between Medicaid, SCHIP, and the Affordable Care Act, most children are (or will be) covered. But important exceptions may include illegal immigrants, children who live in rural areas, or children whose parents fail to bring them in for care. A recent experiment in New York City, the Family Rewards program, in which parents were offered a reward for making sure their children had insurance and regular check-ups, found that there were only modest effects on the receipt of care, which is already quite high in New York City. But making sure that children get dental checkups, immunizations, and other preventive care is worth pursuing.

In order to estimate the likely impact of providing more disadvantaged children with a program like Success for All or social-emotional learning, we took the estimates (effect sizes) derived from randomized controlled trials of these programs and inserted them into our Social Genome Model. For social-emotional learning, we simulated increasing age 11 reading and math scores by 0.15 standard deviations and decreasing antisocial behavior by 0.2 standard deviations (Payton et al. 2008). For Success for All, we adjusted age 11 reading scores by a range of a lower bound of 0.09 standard deviations to an upper bound of 0.18 standard deviations (Borman et al. 2007, Slavin 2010).[12]

The results show how we might improve outcomes for low-income children if we were able to serve all of those below 200 percent of the poverty line. As shown in Table 3, the proportion of low-income children graduating from college could increase by as much as 4%. We estimate that SEL could improve family income at age 40 by about $2,400 per year and could raise discounted lifetime income by $21,500. If the upper bound of SFA effects were realized, family income at age 40 could rise by $1,500 per year and discounted lifetime family income could rise by $13,000. Once again, we caution that although these estimates control for many possibly confounding factors, and although we have reduced the effect sizes found in the evaluation literature to account for both this fact and the fact that expanding any program almost always dilutes its effectiveness because of difficulties in maintaining the quality of the program as it is taken to scale, these findings nonetheless provide a hopeful glimpse into a future in which more children could aspire to do well in school and climb the ladder to even greater success in adulthood.

[12] The Borman et al. study found effect sizes of 0.21 to 0.33 on various measures of reading skills at the end of second grade. Since our middle childhood outcomes are measured in fifth grade, we adjust the effects downward based on evidence that reading effects tend to be greater for younger children than for older children (Hill et al. 2007).

Table 3. Estimated Change in Outcomes After Middle Childhood Interventions on Children Under 200% FPL at Birth

Outcome	Social-Emotional Learning *% change*	Success for All (lower bound) *% change*	Success for All (upper bound) *% change*
Middle Childhood Success	15%	3%	4%
GPA in last year of high school	1%	0%	0%
High school graduation by age 19	2%	0%	0%
Convicted of a crime by age 19	-3%	0%	0%
Teenage parenthood	-5%	0%	0%
Adolescent Success	4%	0%	0%
Family income (2010$) at age 29	3%	2%	7%
College graduation rate	4%	1%	1%
Transition to Adulthood Success	4%	1%	2%
Family income (2010$) at age 40	4%	1%	3%
Adulthood Success	5%	1%	3%
Increase in Annual Family Income at Age 40:	$2,417	$631	$1,477
Increase in Discounted Lifetime Income:	$21,503	$5,648	$13,040

All incomes in 2010 dollars. Lifetime income is discounted to birth using a real discount rate of 3%. For more on simulation method and calculation of lifetime income, see Winship and Owen (2012).

Appendix on Data

Measurement of Core Competence

Since by our definition middle childhood ends at age 11, all outcomes are measured in the fifth grade round of data collection, when most of the sampled children are between 10 ½ and 12 years old. There are five outcomes which together comprise core competence. They are operationalized in the following ways:

Math: Item response theory (IRT) scale score from a direct child assessment of math skills.[13] We standardized the math score to have a mean of zero and standard deviation of one in the weighted sample.

Reading: IRT scale score from a direct child assessment of reading skills.[14] We also standardized the reading score.

Externalizing behavior: The child's Externalizing Behavior subscale score is created from teacher responses to 5 questions about how often a child argues, fights, or gets angry.[15] We reverse coded the scale so that a higher score indicates "better" behavior, and then standardized the scores.

Self-regulation: An average of the Self-Control and Approaches to Learning subscales, created from teacher responses to 10 questions about child's attentiveness, ability to control temper, eagerness to learn, and overall activity level. After averaging the scales to create one self-regulation score, we standardized the scores.

Health: Created from parental response to a question asking them to rate their child's health on a scale from 1 to 5. The health variable was then dichotomized into either poor/fair health or good/very good/excellent health. This dichotomization avoids placing undue importance on the difference between very good and excellent health, a distinction which is unlikely to be relevant for a child's core competence.

Core competence means that a child is no more than one standard deviation below the mean on math, reading, externalizing behavior, or self-regulation and is in good, very good, or excellent health. If a child fails in one or more of the five measures, he or she is considered to have *not* acquired core competence.

We realize that all the components of middle childhood success are interrelated. We expect children who excel in reading to also do well in math. Similarly, we expect children who have trouble self-regulating to struggle academically. Appendix Table A-2 shows how strongly correlated the various outcomes are with each other. Unsurprisingly, math and reading are very interrelated (correlation coefficient of 0.73), as are the two behavioral outcomes (correlation

[13] The five highest proficiency levels for mathematics include: solving simple multiplication and division problems and recognizing more complex number patterns; demonstrating understanding of place value in integers to the hundreds place; using knowledge of measurement and rate to solve word problems; solving problems using fractions; and solving word problems using area and volume.

[14] The five highest proficiency levels for reading include: understanding words in context; making literal inference; deriving meaning; interpreting beyond text; and evaluating nonfiction.

[15] The Externalizing Behavior, Self-Control, and Approaches to Learning teacher subscales were created by NCES from teacher responses to the Social Rating Scale (adopted from the *Social Skills Rating System, Elementary Scale A ("How Often?")*, F.M. Gresham and S.N. Elliott, 1990).

coefficient of 0.72). Self-regulation is moderately correlated with both math and reading; externalizing behavior is slightly less so.

Our analysis sample includes ECLS-K participants who remained in the survey through 2003-2004 and have child assessment data, parent survey data, and teacher survey data (just under 10,000 children). All numbers are from weighted analyses, using a cross-sectional weight for the fifth grade wave that accounts for both differential initial sampling probabilities and attrition. Note that the weighted sample is not representative of all American children in fifth grade in 2003-2004, but is meant to be representative of children who were in kindergarten in 1998-1999. The target population includes children who were not in fifth grade in the 2003-2004 school year because they were held back one or more years, and it excludes children in fifth grade who started kindergarten earlier but were held back in subsequent years. It also excludes children who immigrated to the U.S. after 1998-1999. For simplicity, we will refer to outcomes measured in 2003-2004 as occurring during fifth grade in the discussion below.

Social Genome Model Data

While the ECLS-K sample is extremely useful in investigating the relationships between a number of important childhood inputs and outcomes, it cannot by itself be the source for the Social Genome Model, which measures mobility over the entire life cycle. In order to answer questions about the paths by which people become middle class by middle age, we need a data set which covers every age prior. Unfortunately, there is no single longitudinal data set that follows a nationally representative cohort from birth through middle age and has the high-quality measures that we need at each life stage, and it would take decades to implement such a study. The SGP solution to this problem was to create a simulated birth cohort by projecting adult outcomes for a cohort of children who are not yet fully grown. We use as our baseline dataset the Children of the National Longitudinal Survey of Youth of 1979 (CNLSY). We use the CNLSY to construct SGM variables at the early childhood, middle childhood, and (for the most part) the adolescent life stages. No respondent in the CNLSY is yet old enough to track into middle age, and so we turn to the earlier NLSY79 cohort—the generation from which the CNLSY children descended—to simulate outcomes for the transition to adulthood and adulthood life stages. We estimate a series of equations to identify the relationship between earlier outcomes and later ones, then apply the estimated coefficients to the CNLSY cohort. The result of this process of simulating outcomes is a longitudinal data set in which individuals pass through five life stages from birth to middle age.[16] This data set, which we call the SGM data set, is what we use here to estimate the effects of two middle childhood interventions on adult success.

[16] See Winship and Owen (2012) for more on how this data set was constructed.

Appendix Table A-1. Overall Success in Middle Childhood by Selected Subgroups

	Frequency Distribution (%)	Core Competence[1] (%)
All	**100**	**62**
By Gender		
Male	51	55
Female	49	69
By Race		
Non-Hispanic White	57	71
Non-Hispanic Black	16	39
Hispanic	19	55
Other	7	66
By Poverty Status (in Fifth Grade)		
Below FPL	23	40
At or above FPL	77	69
By Household Income (in Fifth Grade)		
Less than $25,000	29	44
$25,001 - $50,000	29	58
$50,001 - $100,000	29	75
Greater than $100,000	14	81
By Maternal Nativity		
Born in U.S.	81	62
Born outside of U.S.	18	60
By Maternal Education (in Fifth Grade)		
Less than high school diploma	11	39
High school diploma/equivalent	27	53
Some college/ vocational or technical program	35	63
Bachelor's degree/some grad school	17	80
MA/MS or above	7	84
By Family Structure (in Fifth Grade)		
Married	62	70
Cohabiting	6	52
Single	22	50

[1] A child who has not acquired core competencies has a score of more than one standard deviation below the mean on any one of the four academic/behavioral measures (math, reading, externalizing behavior, self-regulation) and/or is in poor or fair health.

Not all frequencies add up to 100 because not every variable is known for every child due to some missingness. For example, in the family structure category, not listed are children who do not live with their biological mother (about 9% of the weighted sample).

Appendix Table A-2. **Correlations between Components of Success**

	Math	Reading	Self Reg	Extern. Beh.
Math	1	0.73	0.32	0.18
Reading		1	0.34	0.22
Self Reg.			1	0.72
Extern. Beh.				1

Appendix Table A-3. Results from Regressions of Core Competence

	Math	Reading	Extern. Beh.	Self-Reg	Health	**Core Comp**
Female	-.179***	.141***	.452***	.535***	.00373	.124***
	(.03)	(.03)	(.04)	(.03)	(.01)	(.02)
Black	-.525***	-.421***	-.362***	-.278***	-.0211*	-.215***
	(.06)	(.05)	(.07)	(.07)	(.01)	(.03)
Hispanic	-.246***	-.270***	-.0470	-.0409	-.00994	-.105***
	(.05)	(.05)	(.06)	(.05)	(.01)	(.03)
Other Race	-.0575	-.0828	-.0224	.0562	.00979*	-.0348
	(.06)	(.06)	(.06)	(.06)	(.01)	(.03)
logIncome	.156***	.164***	.0293	.0614**	.0113***	.0508***
	(.02)	(.02)	(.02)	(.03)	(.00)	(.01)
Maternal Ed: <HS	-.408***	-.450***	-.0647	-.115*	-.0437***	-.125***
	(.07)	(.07)	(.07)	(.06)	(.01)	(.03)
Maternal Ed: Some College or Voc/Tech	.231***	.219***	.0183	.0307	-.00148	.0897***
	(.04)	(.04)	(.05)	(.05)	(.01)	(.02)
Maternal Ed: B.A./B.S. or higher	.582***	.586***	.225***	.295***	.00295	.182***
	(.05)	(.05)	(.05)	(.05)	(.01)	(.02)
Not Married Mom	-.159***	-.145***	-.133***	-.161***	.000211	-.0531**
	(.04)	(.04)	(.05)	(.05)	(.01)	(.02)
Non Native Mom	.133**	.0222	.225***	.171***	-.0183***	.0459*
	(.05)	(.05)	(.05)	(.05)	(.01)	(.03)
N=	9174	9169	8725	8691	9561	8525
R^2	0.2709	0.2694	0.111	0.1451	0.0225	0.1473

Notes: Results from linear probability models. Significance levels: * p<0.1; ** p<0.05; *** p<0.01. Omitted race category is white; omitted maternal education category is high school diploma. A child who has not acquired core competence has a score of more than one standard deviation below the mean on any one of the four academic/behavioral measures (math, reading, externalizing behavior, self-regulation) and/or is in poor or fair health.

Appendix Table A-4. Change in Gaps in Core Competence, Kindergarten to Fifth Grade

	School Readiness in Kindergarten[1] (%)	Core Competence in Fifth Grade[1] (%)	K gap (highest-lowest)	5th gap
All	**70**	**62**		
By Gender				
Male	64	55	13	14
Female	77	69		
By Race				
Non-Hispanic White	75	71	18	32
Non-Hispanic Black	57	39		
Hispanic	64	55		
Other	66	66		
By Poverty Status (in year of outcome)				
Below FPL	53	40	21	29
At or above FPL	74	69		
By Household Income (in year of outcome)				
Less than $25,000	57	44	28	38
$25,001 - $50,000	70	58		
$50,001 - $100,000	79	75		
Greater than $100,000	85	81		
By Maternal Nativity				
Born in U.S.	70	62	2	2*
Born outside of U.S.	72	60		
By Maternal Education (in Fifth Grade)				
Less than high school diploma	51	39	31	46
High school diploma/equivalent	65	53		
Some college/ vocational or technical program	73	63		
Bachelor's degree/some grad school	81	80		
MA/MS or above	82	84		
By Family Structure (in Fifth Grade)				
Married	76	70	15	20
Cohabiting	61	52		
Single	61	50		

* Maternal nativity is the only category where the relationship between core competence and the category changes from kindergarten to fifth grade. In kindergarten, children whose mothers were born outside the US actually do better than those whose mothers were native-born. Differences are not statistically significant, so we cannot say that core competence differs at all by maternal nativity.

Appendix Table A-5. Results from Regressions of Core Competence with School Readiness at Kindergarten as a Control

	Math	Reading	Extern. Beh.	Self-Reg	Health	**Core Comp**
Female	-.267***	.0716**	.377***	.463***	.000824	.0937***
	(.03)	(.03)	(.04)	(.04)	(.01)	(.02)
Black	-.496***	-.422***	-.305***	-.209***	-.0154	-.187***
	(.06)	(.06)	(.08)	(.08)	(.01)	(.03)
Hispanic	-.136***	-.155***	-.0252	-.0158	-.000512	-.0417
	(.05)	(.05)	(.06)	(.06)	(.01)	(.03)
Other Race	-.0835	-.0899	.0253	.107*	.00230	-.0157
	(.06)	(.06)	(.06)	(.06)	(.01)	(.03)
logIncome	.136***	.136***	.0101	.0406	.00487	.0346***
	(.02)	(.02)	(.03)	(.03)	(.00)	(.01)
Maternal Ed: <HS	-.366***	-.446***	-.0630	-.131	-.0131	-.109***
	(.08)	(.08)	(.11)	(.09)	(.01)	(.04)
Maternal Ed: Some College or Voc/Tech	.173***	.124***	-.0120	.00250	.00211	.0658***
	(.04)	(.05)	(.05)	(.05)	(.01)	(.02)
Maternal Ed: B.A./B.S. or higher	.500***	.466***	.168***	.242***	.00509	.132***
	(.05)	(.05)	(.05)	(.05)	(.01)	(.02)
Not Married Mom	-.113**	-.102**	-.0948*	-.148***	-.00412	-.0434*
	(.04)	(.05)	(.06)	(.05)	(.01)	(.02)
Non Native Mom	.167***	.105**	.194***	.186***	-.00331	.0627**
	(.05)	(.05)	(.05)	(.06)	(.01)	(.03)
School Ready (at kindergarten entry)	.511***	.488***	.494***	.525***	.0203**	.291***
	(.04)	(.04)	(.06)	(.05)	(.01)	(.02)
N=	7214	7211	6887	6865	7483	6769
R^2	0.3235	0.293	0.1559	0.2064	0.0122	0.2067

Notes: Results from linear probability models. Significance levels: * p<0.1; ** p<0.05; *** p<0.01. Omitted race category is white; omitted maternal education category is high school diploma. A child who has not acquired core competence (school readiness) has a score of more than one standard deviation below the mean on any one of the four academic/behavioral measures (math, reading, externalizing behavior, self-regulation) and/or is in poor or fair health at the end of fifth grade (beginning of kindergarten).

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