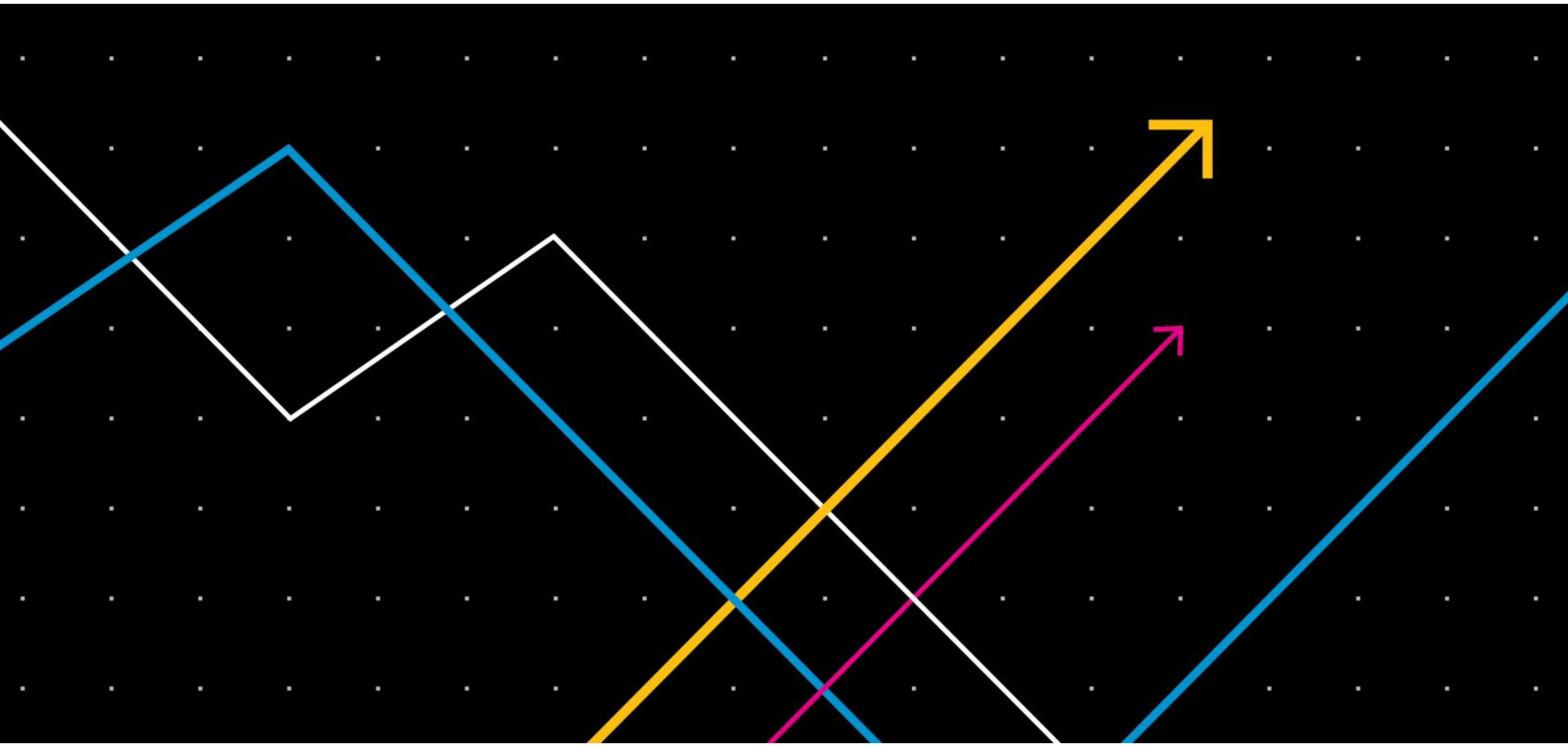

TECHNICAL REPORT

Social Genome Model Analysis of the Bridgespan Group's Billion-Dollar Bets to Improve Social Mobility

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About This Paper

Social mobility in the United States has seen renewed focus in social and economic policy discourse. As we look for ways to create effective ladders of mobility out of poverty, policymakers, practitioners, and philanthropy all have a role to play. The Bridgespan Group sought to identify big investments philanthropic actors could make that would improve social mobility. To come up with these investments, Bridgespan asked, "How could philanthropy make the biggest improvement on social mobility with a gift of $1 billion?"

To "create practical resources for donors passionate about creating social impact," the Bridgespan team, with Bridgespan senior fellow Jim Shelton and guidance from an 18-member advisory board, developed the following:

1. A frame that lays out major factors of "what matters most" for social mobility, drawing from an extensive research base on what needs to be in place for an individual to be part of the middle class by middle age
2. An outline of an often underutilized– range of tools at the disposal of a philanthropist to support sustainable systemic and field level changes
3. A series of illustrative "bets"—and estimates of impact—that offer concrete roadmaps for high-leverage investments totaling $1 billion with the potential for sustainable change

More information on Bridgespan's work can be viewed at http://www.bridgespan.org/social-mobility-resources.

The Bridgespan Group drew upon social mobility research and collaborated with a range of leaders and organizations, including the Urban Institute (Urban).

In support of Bridgespan's research project, researchers from Urban provided expert consultation in relevant areas and participated in working sessions to provide feedback on materials in progress. Institute fellow Erika Poethig was a member of the advisory board. A distinct role Urban played on this project was to work with the Bridgespan group to use the Social Genome Model (SGM) to provide estimates of impact for specific bets.

This paper describes the analytic work we undertook to support Bridgespan's broader research and engagement efforts regarding its research on $1 billion bets to improve social mobility. The paper provides a technical explanation for the projected impact of the bets, which we calculated using the Social Genome Model.

Bridgespan's $1 Billion Bets to Improve Social Mobility

Bridgespan identified four interrelated factors that affect social mobility: building individual and family competencies, addressing structural inhibitors, transforming communities to support better outcomes, and enabling infrastructure to support effective implementation of these factors at scale. Using these factors as a framework, Bridgespan selected six bets that they developed in depth, outlining specific investments or interventions for each bet, estimating the potential costs associated with each investment, estimating the reach of the bets, and estimating their potential return on investment. The six bets and specific investments were as follows:

1. Improve early childhood development through scaling of low-cost technology applications
2. Establish clear and viable pathways to careers by supporting greater market emphasis on competency development and alternative credentialing
3. Reduce unintended pregnancies by expanding access to and awareness of effective contraception options, including long-acting, reversible contraception
4. Decrease overcriminalization and overincarceration by encouraging governments to experiment with policies and alternative sentencing practices that reduce criminal convictions
5. Create place-based strategies to ensure access to opportunity across regions
6. Build the continuous learning and improvement capacity of social service delivery agencies

Where applicable, we used the Social Genome Model to analyze the potential impact of these bets. The Bridgespan Group selected a related but not identical set of interventions to the ones we simulated for our analysis. The interventions we assessed using the SGM are described below.

About the Social Genome Model

The SGM is a life-cycle model of human development. It is a policy simulation tool through which we can examine how circumstances and actions at developmentally significant life stages reverberate through a person's life. The model begins with circumstances at birth and progresses through five life stages (early childhood, middle childhood, adolescence, transition to adulthood, and middle age), predicting a concise set of success measures at the end of each life stage. These success measures reflect the best available evidence from the empirical literature on child development and human capital.

The model is ideal for asking "what if" questions about factors that promote or impede future success. What if we improved infant health and expanded programs raising children's reading scores? What if we provided effective high school mentoring and postsecondary job training or apprenticeship programs? The model can trace the effect of interventions like these on outcomes such as school performance, high school graduation, and adult income. In this way, it enables us to conduct "virtual policy experiments," which can estimate whether the costs of policy interventions might be offset by the eventual benefits.

The SGM, developed at the Brookings Institution, is now a collaboration among Brookings, Urban, and Child Trends. The model is structured as a series of regression equations in which outcomes at each life stage depend on outcomes in all prior life stages, plus contemporaneous factors.

There are two version of the model. The original version, the SGM-79, uses data from the Children of National Longitudinal Survey of Youth 1979 (CNLSY), which represents children born in the 1980s and 1990s and provides data for the birth, early and middle childhood, and adolescent stages. No respondent in the CNLSY is old enough to track through adulthood, so the model imputes their adult values based on the National Longitudinal Survey of Youth 1979 (NLSY79). The SGM -97, which draws on the National Longitudinal Survey of Youth 1997 (NLSY97), focuses on young adult transitions. These data begin with circumstances at birth and skip to a set of five closely spaced life stages (middle childhood, early adolescence, adolescence, early transition to adulthood, and transition to adulthood). The SGM-97 follows a cohort of US children born between 1980 and 1984 from 1997 to 2011 and includes retrospective data on family circumstances at the time of birth.

Improving Early Childhood Development

Many low-income children enter kindergarten lacking the necessary social, emotional, and cognitive development to succeed in school, which has long-term implications on academic and professional success. The first “$1 billion bet” focuses on improving early childhood development.

Social and Policy Intervention

Early childhood education programs are an important human capital investment in young children, particularly children from economically disadvantaged families (Heckman 2006). We examined the research on the effect of preschool on kindergarten preparedness. In a widely cited meta-analysis of research on this relationship, Duncan and Magnuson (2013) found a weighted average effect of 0.21 standard deviation improvement for measures of cognition and achievement at school entry.

SGM Intervention

We simulated this intervention in the SGM-79 by increasing standardized scores in children’s age 5 Peabody Individual Achievement Test (PIAT) reading and math scores by 0.21 standard deviations each. PIAT scores are one of the most widely used assessments of cognitive ability for children ages 5 and up. To simulate an intervention applied to a low-income population, we increased age 5 scores for children in the SGM-79 samples whose parents had a family income 200 percent or less of the federal poverty level at the time the focal child was born. That is, we applied the intervention to poor and near-poor families only.

Lifetime Impact

Increasing age 5 reading and math scores by 0.21 standard deviations for children from poor and near-poor households resulted in increases in discounted lifetime family income, as shown in table 1. The mean improvement in discounted lifetime family income is $15,768, a weighted average across the four SGM-79 samples. Although there was some variation in the “effect” (differences in discounted lifetime family income) across samples, there was not a clear pattern to suggest systemic differences across gender or racial group. A previous meta-analysis also did not find gender differences in the effects of early childhood programs (Magnuson et al. forthcoming).

TABLE 1

Simulated Effects of Improving Early Childhood Development on Adult Family Income (dollars)

	Preintervention	Postintervention	Difference
Total sample	**655,599**	**671,366**	**15,768**
Black male sample	562,100	581,115	19,015
Black female sample	554,885	570,401	15,516
Nonblack male sample	647,939	662,921	14,982
Nonblack female sample	696,995	713,028	16,033

Source: Urban Institute analysis using SGM-79.

Notes: Earnings are in constant 2010 dollars. Total sample includes a weighted total of the following sample sizes: *N* = 1,169 black men; *N* = 1,165 black women; *N* = 3,430 nonblack men; *N* = 3,220 nonblack women.

Bridgespan Intervention

The Bridgespan Group also identified technology-enabled tools that may provide benefits similar to traditional preschool. These tools provide information and programming to facilitate healthy parenting or direct educational benefit for children under age 5. For example, Text4Baby is a text messaging service that provides pregnant women and new mothers with tips to support early parenting and increase access to critical health care interventions in the first months of a child's life. For more information on this and other technology-enabled tools to improve early childhood development, please see "Supporting Holistic Child Development from Birth through Kindergarten," forthcoming from the Bridgespan Group, soon to be available at http://www.bridgespan.org/social-mobility-resources.

Establishing Pathways to Careers

Building and strengthening pathways to careers is another way to improve earning potential and social mobility. Higher levels of education correspond, on average, to higher levels of employment and higher wages. For the millions of young adults who do not pursue or complete a bachelor's degree, certification training—completing a program of job-related course work—is an alternate path to increased incomes. This $1 billion bet focuses on establishing pathways to careers by increasing certification rates for young adults.

Social and Policy Intervention

We simulated an aspirational social intervention that would increase certification completion for all young adults from poor and near-poor family backgrounds (family income of 200 percent or less of the federal poverty level) who have not earned a four-year degree or certificate by age 25. We used this aspirational intervention to focus on the average effects for people successfully receiving a certificate, rather than the possible efficacy of a given program for improving certification. There are several examples of successful interventions that aim to improve persistence and completion of credentialing programs. One example is the Accelerated Study in Associate Programs (ASAP) for City University of New York (CUNY) students, which provides supports to help students complete certification programs. The program increased completion rates from 22 to 52 percent in implementing campuses in the CUNY system (CUNY 2015). Such examples lend credence to providing interventions that can spur greater credentialing rates within specific regions.

SGM Intervention

For this bet, we simulated the aspirational intervention of earning a four-year college degree at age 25. Because certification completion—which is the focus of Bridgespan's bet—is not a variable in the SGM, we are unable to simulate it. However, SGM does include college completion. For this analysis, we used college completion as a proxy for certification completion. Although this approach will likely generate an upper-bound estimate on the benefits of certificate programs, research on certification finds that certificate programs often approximate the estimated causal effect of a four-year college degree on earnings (Carnevale, Rose, and Hanson 2012).

We used the SGM-97 version of the model to run this analysis because it is the only version that allows us to simulate an intervention that occurs during the transition to adulthood (age 20 or later). Because the SGM-97's data source only extends to age 29 rather than to middle age at age 40, as the SGM-79 does, we limit our analysis to outcomes at age 29 and do not attempt to estimate a discounted lifetime impact on incomes.

Impact on Income

A low-income person without a college degree or certificate earns, on average, $27,158 a year by age 29 (in 2010 dollars). Our simulations indicate that by earning a certificate by age 25, personal earnings at age 29 would increase $4,953 to $32,111 a year (table 2). These estimates should be taken as an upper-bound effect of the possible true effect of universal certification, as they are derived from a regression-adjustment of a college degree as a proxy for completing a certification program.

TABLE 2

Simulated Effects of Certification Program Completion on Personal Income at Age 29 (dollars)

	Preintervention	Postintervention	Difference
Total sample	**27,158**	**32,111**	**4,953**
Black male sample	20,264	24,050	3,786
Black female sample	17,922	24,063	6,141
Nonblack male sample	32,389	37,726	5,338
Nonblack female sample	24,729	29,293	4,565

Source: Urban Institute analysis using SGM-97.
Notes: Earnings are in constant 2010 dollars. Total sample includes a weighted total of the following sample sizes: *N* = 1,169 black men; *N* = 1,165 black women; *N* = 3,430 nonblack men; *N* = 3,220 nonblack women.

Completing a certification program can also influence an individual's family structure and thereby influence family income. The SGM simulations of certification based on four-year degree completion indicate that benefits of certification on family incomes are almost three times the corresponding benefits for personal earnings (tables 2 and 3). For the total samples, the simulated effect on family incomes is $13,879, while the simulated personal earnings effect on individuals is $4,953.

Table 3 shows results from the SGM-97 for simulated family incomes following the intervention to increase certifications among young adults from poor and near-poor families.

TABLE 3

Simulated Effects of Certification Program Completion on Family Income at Age 29 (dollars)

	Preintervention	Postintervention	Difference
Total sample	**56,066**	**69,945**	**13,879**
Black male sample	31,173	39,545	8,373
Black female sample	33,772	38,865	5,093
Nonblack male sample	59,787	74,410	14,623
Nonblack female sample	60,541	76,159	15,618

Source: Urban Institute analysis using SGM-97.
Notes: Earnings are in constant 2010 dollars. Total sample includes a weighted total of the following sample sizes: *N* = 1,169 black men; *N* = 1,165 black women; *N* = 3,430 nonblack men; *N* = 3,220 nonblack women.

We strongly advise that the family income simulations be interpreted with caution because we used four-year degrees as a proxy for certifications, with respect to family income at age 29. Our concern derives from the fact that family income depends not only on personal income but also on marital status and spousal income.

Regarding marital status and spousal income, four-year degree completion and certification are different from each other in the following ways:

1. In the United States, people tend to marry people of similar education levels, especially college graduates. This means that a college graduate is very likely to marry another college graduate, with corresponding effects on spousal income and on family income. Marriages are less likely to be endogamous with respect to certification, so one might expect spousal incomes (and family incomes) to rise less from certification than from four-year degree completion.
2. Four-year college graduates tend to have different timing of early adult life course events, compared with nongraduates. At age 29, many married couples consisting of college graduates have no children and have two full-time earners. Certification is less likely to affect family timing decisions; therefore there is reason to believe that family incomes will be less affected by certification than by marriage.

Lifetime Impact

To simulate the effects of completing a certification program at age 25, used the SGM-97 because it is the only version of the model that can simulate interventions applied at age 20 and older. Unfortunately, the SGM-97's data source only extends to age 29 rather than to middle age at age 40. As a consequence, we limit our analysis to outcomes at age 29 and do not attempt to estimate a discounted lifetime impact on incomes.

Reducing Overcriminalization

The cumulative risk of having a criminal record by young adulthood in the United States is high, particularly for minority youth (Brame et al. 2014). This risk varies by race and gender, with black males at highest risk of arrest by age 18. Involvement in the criminal justice system at an early age makes one more likely to experience immediate negative consequences that reverberate across one's life course and contribute to barriers to social mobility. This $1 billion bet focuses on reducing overcriminalization.

Social and Policy Intervention

We simulated an aspirational intervention that would reduce overcriminalization of youth. We modeled an intervention that would reduce the proportion percentage of youth with a criminal record at age 19 by half. Some evidence-based programs have reduced criminalization at a similar rate, and several states have implemented policies that have significantly reduced levels of incarceration. Additionally, there have been more attempts to develop alternative sentencing and diversion practices—often fueled by pay for success initiatives targeting cost savings from lower conviction and incarcerations rates. Lastly, there are programmatic interventions associated with reductions in teenage convictions. For example, the California Nurse-Family Partnership (NFP) program has reduced teen convictions by 43 percent through the long-term effects of their home visiting services (Miller, n.d.).

SGM Intervention

We simulated the effect of a hypothetical intervention that would reduce the percentage of people with a criminal record by age 19 in the SGM-79 samples by half (table 4). We describe our findings in terms of the benefits in lifetime family income for a person whose teen criminalization was simulated to have never happened. We used SGM-79 because it is the version of the model that can measure incomes to age 40, a measure necessary to estimate a lifetime impact on family income.

To assess the percentage of the population with a criminal record by age 19, we based our estimates on findings from Brame and colleagues (2014).

TABLE 4

Simulated Reductions in Percentage of People with Criminal Records by Age 19 for SGM-79 Samples

	Preintervention	Postintervention
Total sample	**20.1**	**10.10**
Black male sample	33.5	16.75
Black female sample	13.1	6.55
Nonblack male sample	25.6	12.80
Nonblack female sample	13.5	6.75

Source: Urban Institute analysis using SGM-97.
Note: Total sample includes a weighted total of the following sample sizes: *N* = 1,169 black men; *N* = 1,165 black women; *N* = 3,430 nonblack men; *N* = 3,220 nonblack women.

Lifetime Impact

Reducing criminalization by age 19 resulted in increases in discounted lifetime family income (table 5).

TABLE 5

Simulated Effects of Reducing Criminalization of Individuals under Age 19 by 50 Percent on Discounted Lifetime Family Incomes (dollars)

	Preintervention	Postintervention	Difference
Total sample	**693,805**	**714,725**	**22,756**
Black male sample	515,799	549,125	33,325
Black female sample	511,123	519,095	7,973
Nonblack male sample	745,505	777,239	31,733
Nonblack female sample	703,569	717,461	13,892

Source: Urban Institute analysis using SGM-97.
Notes: Earnings are in constant 2010 dollars. Total sample includes a weighted total of the following sample sizes: *N* = 1,169 black men; *N* = 1,165 black women; *N* = 3,430 nonblack men; *N* = 3,220 nonblack women.

If we define our treated group as people who would have had a teen conviction but who did not as a result of the intervention, the estimated improvement in lifetime family income would be $22,756. The effect (differences in discounted lifetime family income) varied across samples, particularly between the male and female samples in each racial group. The results suggest that the benefits of the intervention might be greater for male youth (both black and nonblack) than for female youth. However, given the relatively small percentage experiencing youth criminalization in the female samples, we caution against conclusions about possible systemic differences across gender groups.

Reducing Unintended Pregnancy

Unplanned childbearing contributes to high rates of child poverty in the United States (Sawhill and Venator 2014), with effects that continue throughout one's life course.

This $1 billion bet focuses on how reducing mistimed births can influence a child's life trajectory. Reducing mistimed pregnancies— postponing a birth until the mother intends to have a birth—can shift many variables that influence a child's life trajectory, such as the mother's age, education level, and marital status; the family's income at the time of the birth; and the cognitive, emotional, and learning environments provided by parents.

Sawhill, Karpilow, and Venator (2014) analyzed the impact of reducing unintended pregnancies using an earlier version of the SGM-79 whose parameters were estimated using a pooled sample of youth across race and gender lines. The following describes the methodology and findings of that analysis, focusing on how discounted lifetime family income might change across the sample of children whose mistimed births are simulated to be on-time births.

Social and Policy Intervention

This analysis simulates an aspirational intervention in which all births that a woman would report as unintended and mistimed would still occur but would be postponed by the number of months or years equal to the mother's response for how much sooner her pregnancy occurred than she wanted. In other words, the intervention would result in postponing mistimed births to match the mothers' fertility intentions.

SGM Intervention

The SGM does not contain information on intentionality of births so data sources outside the SGM are required to simulate the number of women who had mistimed births and by how long those births were mistimed. Sawhill, Karpilow, and Venator (2014) combined SGM-79 with the 2006–10 National Survey of Family Growth (NSFG) to identify women who reported that their birth was mistimed or unwanted and estimate how postponing a child from a mistimed to an on-time birth could affect the child's success in later life.

The NSFG gathers survey data on family life, marriage, pregnancy, infertility, and contraception. We used data from the NSFG to identify women who reported that the birth of their child was mistimed or unwanted. For women who reported mistimed births, Sawhill, Karpilow, and Venator (2014) also identified the mother's self-reports of how much sooner her pregnancy occurred than she intended.

Sawhill, Karpilow, and Venator (2014) used the NSFG data to develop estimates of

1. the probability of a mistimed birth as a function of a woman's age at the child's birth, race, ethnicity, education, and family income at her own birth; and
2. the number of years a woman with a mistimed birth wished to delay that birth, as a function of a woman's age at the child's birth, race, ethnicity, education, and family income at her own birth.

By inserting the NSFG coefficients into the SGM-79, Sawhill, Karpilow, and Venator (2014) estimated 23 percent of births in the SGM-79 were mistimed, with the mother's preferring the births occur 2.8 years later on average.

Based on this analysis, Sawhill, Karpilow, and Venator (2014) adjusted several variables in the SGM to simulate which children in the SGM would constitute the 23 percent to be identified as mistimed, the duration of the postponement to be simulated for each mistimed birth, and the lifetime impact of the simulated postponement across the 23 percent of births estimated to be mistimed. This included the following inputs that together constituted the SGM intervention to approximate all mistimed births being simulated as on-time births:

1. Maternal age at the time of the child's birth was increased by an average of 2.8 years for mothers estimated to have mistimed births.
2. Maternal educational attainment at the time of the child's birth was increased by 0.7 years for young teen mothers (Kane et al. 2013) and by 6.1 percent per year of delay for mothers ages 18 and older (Herr 2008).
3. Marital status of the child's parents at the time of birth was shifted to make mothers 4.4 percent more likely to be married at the time of birth for each year the birth was postponed, up to age 29.
4. Family income at child's birth was increased by 3.9 percent for each year the birth was postponed.
5. Standardized scores for parental cognitive stimulation when the child was age 2 or younger were increased according to regression analysis based on the mother's change in age at child's birth, marital status, educational attainment, and family income at child's birth.

6. Parental emotional support measured when the child was age 2 or younger was increased according to regression analysis based on the mother's change in age at child's birth, marital status, education attainment, and family income at child's birth.
7. Early childhood verbal ability at ages 3 and 4 was increased according to regression analysis based on the mother's change in age at child's birth, marital status, educational attainment, and family income at child's birth.

Impact on Income

Increasing the mother's age at the child's birth by an average of 2.8 years and adjusting the six related factors detailed above resulted in a mean improvement in discounted lifetime family income of $52,261 for the 23 percent of the SGM sample whose births were delayed by the simulated intervention to postpone mistimed births. For this bet, there is no breakdown by gender or race. Sawhill, Karpilow, and Venator (2014) used a version of the SGM-79 that did not include separate estimates for subsamples by gender or race.

TABLE 6

Simulated Effects of Delaying Mistimed Births to the Age the Mother Desires on Discounted Lifetime Family Incomes (dollars)

	Preintervention	Postintervention	Difference
Total sample	731,200	783,461	52,261

Source: Sawhill, Karpilow, and Venator (2014) analysis using SGM-79.
Notes: Earnings are in constant 2010 dollars. Total sample includes a weighted total of the following sample sizes: *N* = 1,169 black men; *N* = 1,165 black women; *N* = 3,430 nonblack men; *N* = 3,220 nonblack women.

LIMITATIONS

Sawhill, Karpilow, and Venator (2014) noted several important factors that increased the uncertainty of their findings. First, they did not directly measure the intentionality of a birth but instead used estimates from regression modeling to categorize a child as mistimed or unwanted. Their imputed levels of mistimed births in the SGM-79 simulation was approximately that of the NSFG sample, but their imputations for the amount of time a birth is delayed had a slightly different distribution than that of the NSFG sample. Second, their analyses assumed that the effects of delaying a child were the same regardless of the birth order of the child; there is little research on the varying impacts of delaying childbirth by birth order to provide guidance on this issue. Additionally, Sawhill, Karpilow, and Venator's (2014) imputations from the NSFG of how long a child would be delayed are based on a mother's response to a hypothetical question of how much later she would have ideally had the child. The mother's response might over- or underestimate what the true delay would have been or other changes in their childbearing preferences.

Lastly, because maternal education level at birth is such an influential factor in the life of a child, many of the effects of delaying births relies on estimates of how much delaying a birth improves a woman's educational attainment. Hence, the quality of the results depends on how well the SGM identifies the effect of delaying a mistimed birth on a mother's educational attainment.

Continuous Learning and Improvement

The final $1 billion bet the Bridgespan Group proposed focuses on increasing the public and nonprofit sectors' capacity to test, implement, and continuously improve evidence-based policies. To illustrate the potential impact of such an investment, Bridgespan focused on what it would look like to improve the delivery of formal early child care in 15 target cities.

Social and Policy Intervention

We simulated a hypothetical intervention that would improve both cognitive and noncognitive skill development for young children entering kindergarten. The intervention we simulated on cognitive development was the same as the method we used for the "Improving Early Childhood Development" bet, described earlier in this paper, which modeled the effects of preschool on kindergarten readiness based on published findings of randomized controlled experiments (Duncan and Magnuson 2013). The intervention on noncognitive development reflects a growing appreciation of the importance of noncognitive skill development in childhood for future academic and life success (Duckworth and Gross 2014; Heckman and Rubinstein 2001; Heckman, Stixrud, and Urzua 2006) but are not scaled to findings on the effects of any specific social or policy program.

SGM Intervention

We simulated improvements in cognitive and noncognitive performance using variables measured at age 5 in the SGM-79. For measures of cognitive performance, we simulated increases of 0.21 standard deviations in age 5 PIAT reading and math scores; for measures of noncognitive skills, we reduced standardized scales for hyperactivity and antisocial behavior measured at age 5 by 0.21 standard deviations. The hyperactivity and antisocial behavior scales are based on age-standardized subscales from the Behavior Problems Index.

We simulated an improvement of 0.21 standard deviations for these two variables to demonstrate the lifetime effects of noncognitive score improvements for changes that are comparable to the changes in cognitive scores.

We simulated the effects of improving these age 5 scores for poor and near-poor children—that is, children in the SGM-79 samples whose parents had a family income of 200 percent or less of the federal poverty level at the time the focal child was born.

Lifetime Impact

Simulated improvements in age 5 hyperactivity and antisocial behavior scores resulted in a mean improvement in discounted lifetime family income of $8,810, also a weighted average across the four SGM-79 samples (table 7). Improving age 5 reading, math, hyperactivity, and antisocial behavior scores by 0.21 standard deviations for children from poor and near-poor families increased discounted lifetime family income (tables 7 and 8). The first bet (see table 1) showed that raising age 5 math and reading scores increased lifetime family earnings by $15,768 on average, with some variation across racial and gender groups. The benefit of improving noncognitive ability at age 5 is relatively less than improving cognitive ability.

TABLE 7

Simulated Effects of Improving Age 5 Hyperactivity and Antisocial Behavior Scores on Discounted Family Income (dollars)

	Preintervention	Postintervention	Difference
Total sample	**655,599**	**664,409**	**8,810**
Black male sample	562,100	574,302	12,202
Black female sample	554,885	562,771	7,885
Nonblack male sample	647,939	656,203	8,265
Nonblack female sample	696,995	705,922	8,927

Source: Urban Institute analysis using SGM-79.

Notes: Earnings are in constant 2010 dollars. Total sample includes a weighted total of the following sample sizes: *N* = 1,169 black men; *N* = 1,165 black women; *N* = 3,430 nonblack men; *N* = 3,220 nonblack women.

TABLE 8

Simulated Effects of Increasing Age 5 Cognitive and Noncognitive Ability on Discounted Family Income (dollars)

	Benefit of improving cognitive ability	Benefit of improving noncognitive ability
Total sample	**15,768**	**8,810**
Black male sample	19,015	12,202
Black female sample	15,516	7,885
Nonblack male sample	14,982	8,265
Nonblack female sample	16,033	8,927

Source: Urban Institute analysis using SGM-79.

Notes: Earnings are in constant 2010 dollars. Total sample includes a weighted total of the following sample sizes: *N* = 1,169 black men; *N* = 1,165 black women; *N* = 3,430 nonblack men; *N* = 3,220 nonblack women.

This analysis estimates substantial gains in lifetime family income as a result of social or policy interventions that increase cognitive performance at age 5, plus smaller but still substantial gains from changes that increase noncognitive performance. However, the 0.21 standard deviations improvements in noncognitive skills are not based on any specific social program or policy, as we were able to do for the 0.21 standard deviations improvements in cognitive skills. For more information on interventions in formal early childhood education settings that may improve noncognitive performance, see http://www.bridgespan.org/social-mobility-resources.

The SGM-79 treats the effects of improvements in cognitive and noncognitive skills as additive effects. We don't know whether improvements in noncognitive skills might duplicate some of the effects on cognitive skills (in which case the added benefit of noncognitive skills would be *smaller* than the SGM results), or whether improvements in noncognitive skills add to improvements in cognitive skills (in which case the added benefit of noncognitive skills would be *larger* than the SGM results).

Conclusion

Barriers to social mobility for low-income people are rooted in several complex and interrelated factors. Through its Billion Dollar Social Mobility Bet Project, the Bridgespan Group sought to identify specific ways philanthropic actors can work strategically to address these factors and increase social mobility in the United States. Where applicable, we used the Social Genome Model to estimate the potential impact of these investments. We simulated interventions that aim to: Here

1. improve early childhood development,
2. establish pathways to careers,
3. decrease rates of overcriminalization and overincarceration,
4. reduce unintended pregnancies
5. build the continuous learning and improvement capacity of social service delivery agencies.

We have varying levels of confidence about the simulations we modeled for these bets. Our findings indicate that while the impact on personal or family income varies across these interventions, investments in each of these areas have a role to play in improving social mobility.

In addition to the five bets we used the Social Genome Model to estimate, the Bridgespan Group identified a bet focused on the exogenous factors that affect social mobility: structural racial and economic segregation that contributes to communities of concentrated poverty. Many of our Urban Institute colleagues have noted that living in a high-poverty neighborhood has dramatic implications for one's life outcomes. Turner and her coauthors (2014) emphasize that breaking the cycle of persistent poverty requires sustained interventions at many levels. They also highlight the importance of place-conscious strategies, which focus on the places poor families live. To ensure low-income families can live in communities rich with opportunity, revitalizing high-poverty neighborhoods *and* supporting mobility to low-poverty areas is critical (Turner 2015).

As conversations around the state of social mobility in the United States continue to percolate, the Bridgespan Group's Billion -Dollar Social Mobility Bet project adds a practical lens to the discourse; it outlines an actionable set of philanthropic investments to boost social mobility. This paper describes our analysis using the SGM, which helps size the potential impact of these investments. Investments in each of Bridgespan's six bets can help improve social mobility for the poor in the United States.

Appendix A. Calculating Discounted Lifetime Income

In the SGM-79, we can estimate the impact of an intervention on lifetime income. This measure has particular utility for performing a cost-benefit analysis comparing the upfront cost of an intervention against an estimated increase in discounted lifetime income that might be an impact of that intervention. To estimate a preintervention value for lifetime family income, we use the Social Genome Model outputs for family income at ages 29 and 40. We calculate the slope between these two ages as follows:

$$\textit{29-to-40 slope} = (\overline{Income_{40}} - \overline{Income_{29}})/11 \qquad (1)$$

Assuming linear income growth for simplicity, we can assign a mean income value for every age between 29 and 40 using this slope. For example, the estimated mean income value at age 30 is $(\overline{Income_{29}}) + 1 * (\textit{29-to-40 slope})$. Estimating income at ages under 29 and over 40 is more complicated because earnings growth flattens and declines as workers age. Using the 2011 Current Population Survey, we obtain three slopes between average family incomes at different ages: 22 to 29, 29 to 40, and 40 to 62. We then calculate two ratios: the ratio of the 22-to-29 slope to the 29-to-40 slope and the ratio of the 40-to-62 slope to the 29-40 slope. The ratio of 22-to-29 family income to 29-to-40 family income in the Current Population Survey is 1.70; the ratio of 40-to-62 income to 29-to-40 income is -0.19. We apply these ratios to the observed 29-to-40-slope in our SGM data to find estimated 22-to-29 and 40-62 slopes for our data. The two estimated slopes are used in the same way as the actual 29-to-40 slope to find income values for ages 22 to 28 and 41 to 62. Each income (i.e., income at age 22, age 23, age 24, etc.) is discounted from birth using a real discount rate of 3 percent. So discounted age 40 income is $\frac{\overline{Income_{40}}}{1.03^{40}}$.

Finally, lifetime family income is the sum of every discounted income:

$$discounted\ lifetime\ income = \sum_{i=22}^{62} \frac{\overline{Income_i}}{1.03^i} \qquad (2)$$

To find the *change* in lifetime income that results from an intervention, we estimate lifetime income for the postintervention target population. We subtract discounted lifetime income in the preintervention target population from discounted lifetime income in the postintervention target population to estimate the impact of the intervention as change in discounted lifetime income. (A planned innovation in the SGM will involve estimating lifetime income and other lifetime measures by articulating a link between the SGM and the Dynamic Simulation of Income Model (DYNASIM)housed at the Urban Institute.)

Appendix B. Life Stages and Variables in the Social Genome Model

TABLE B1

Life Stages and Corresponding Outcomes for the CNLSY/NLSY79 Social Genome Model

Stage	Variable	Description
Circumstances at Birth	Gender	Dichotomous variable indicating the sex of the individual; the omitted category consists of males
	Race	Dichotomous variables indicating whether the child is black, Hispanic, or other; the omitted category consists of white children
	Maternal educational attainment	Dichotomous variables indicating whether the individual's mother graduated from high school, attended some college, or obtained a bachelor's degree or more advanced degree; the omitted category consists of mothers who did not finish high school
	Maternal age at the time of the child's birth	Continuous variable indicating the age of the mother (in years) at the time of the child's birth
	Maternal age at first birth	Continuous variable indicating the age of the mother (in years) at the time of her first child's birth
	Marital status of the child's parents at the time of birth	Dichotomous variable indicating whether the child's mother was married when the child was born; the omitted category consists of children whose mothers were not married, even if cohabitating, at the time of their birth
	Family income at birth	Continuous variable indicating the log-transformed measure of the family's income as a percentage of the federal poverty level in the year the child was born
	Low birth weight	Dichotomous variable indicating whether a child weighed 5.5 pounds or less when he or she was born; the omitted category consists of children who weighed more than 5.5 pounds at birth
	Mother's AFQT score	Age-normed percentile score of the child's mother on the AFQT, a general achievement test taken when the mothers were between ages 16 and 23
	Parenting: Cognitive stimulation	Standardized score on the HOME Inventory Cognitive Stimulation scale, measured when the child is less than 2 years old
	Parenting: Emotional support	Standardized score on the HOME Inventory Emotional Support scale, measured when the child is less than 2 years old
	Early verbal ability	Age-standardized score of the child on the PPVT, measured when the child is age 3 or 4

Stage	Variable	Description
Early childhood (age 5)	Math	Age-standardized scores from the math section of the PIAT
	Reading	Age-standardized scores from the reading recognition section of the PIAT
	Antisocial behavior	Age-standardized antisocial behavior subscale from the Behavior Problems Index (BPI); scores are reverse-coded so higher is better
	Hyperactivity	Age-standardized hyperactivity subscale from the BPI; scores are reverse-coded so higher is better
Middle childhood (age 11)	Math	Age-standardized scores from the math section of the PIAT
	Reading	Age-standardized scores from the reading recognition section of the PIAT
	Antisocial behavior	Age-standardized antisocial behavior subscale from the Behavior Problems Index (BPI). Scores are reverse-coded so higher is better
	Hyperactivity	Age-standardized hyperactivity subscale from the BPI; scores are reverse-coded so higher is better
Adolescence (ages 13 to 19)	High school graduation status	Dichotomous variable indicating whether the individual received a high school diploma by age 19; GED earners are not counted as high school graduates
	Grade point average	Continuous variable indicating average grade in the last year of high school; ranges from 0.0 to 4.0
	Criminal conviction	Dichotomous variable indicating whether the individual was convicted of any charges other than minor traffic violations by age 19
	Teen parent	Dichotomous variable indicating whether the individual reported having a child by age 19
	Lives independently from parents	Dichotomous variable indicating whether the individual was living independently from his or her parents at age 19
	Math	Age-standardized score on a test measuring mathematical ability: math section of the PIAT at age 13 or 14 in the CNLSY and arithmetic reasoning section of the ASVAB, taken between ages 15 and 23, in the NLSY79
	Reading	Age-standardized score on a test measuring verbal ability: reading recognition section of the PIAT at age 13 or 14 in the CNLSY and word knowledge section in the ASVAB, taken between ages 15 and 23, in the NLSY79
	Family income	Continuous variable indicating the log-transformed measure of the family's income during early adolescence (ideally measured at age 13, 14, 15, or 16; income is in constant 2010 dollars, adjusted using the CPI-U-RS
	Marijuana use	Dichotomous variable indicating whether the individual reports having ever used marijuana (CNLSY) or having used marijuana in the past year (NLSY79)
	Other drug use	Dichotomous variable indicating whether the individual reports having ever used drugs other than marijuana or amphetamines (CNLSY) or having used drugs other than marijuana in the past year (NLSY79)
	Early sex	Dichotomous variable indicating whether the individual reports having had sexual intercourse before age 15

Stage	Variable	Description
	Suspension	Dichotomous variable indicating whether the individual was ever suspended from school
	Fighting	Dichotomous variable indicating whether the individual reported getting in a fight at school or work in the past year
	Hitting	Dichotomous variable indicating whether the individual reported hitting or seriously threatening to hit someone in the past year
	Damaging property	Dichotomous variable indicating whether the individual reported intentionally damaging the property of others in the past year
	Self-esteem index	Age-standardized item response theory score on the Rosenberg Self-Esteem Scale
	Religious service attendance	Variable indicating frequency of religious service attendance on a scale of 0 (none) to 5 (more than once a week)
	Gender role attitudes	Continuous variable indicating the mean of the individual's answers to five questions about how they view women
	Participation in school clubs	Dichotomous variable indicating whether the individual participated in clubs in high school, such as band, choir, or sports
Transition to adulthood (age 29)	Family income	Continuous variable indicating the log-transformed measure of the family's income during the year the individual was 29 years old; income is in constant 2010 dollars, adjusted using the CPI-U-RS
	Family income to needs	Continuous variable indicating the log-transformed measure of the family's income as a percentage of the federal poverty level during the year the individual was 29 years old
	College completion	Dichotomous variable indicating whether the individual obtained a four-year degree or more advanced degree
	Lives independently from parents	Dichotomous variable indicating whether the individual was living independently from his or her parents at age 29
Adulthood (age 40)	Family income	Continuous variable indicating the log-transformed measure of the family's income during the year the individual was 40 years old; income is in constant 2010 dollars, adjusted using the CPI-U-RS
	Family income to needs	Continuous variable indicating the log-transformed measure of the family's income as a percentage of the federal poverty level during the year the individual was 40 years old

Notes: AFTQ=Armed Forces Qualifying Test; ASVAB=Armed Services Vocational Aptitude Battery; BPI=Behavior Problems Index; CNLSY= Children of National Longitudinal Survey of Youth 1979; CPI-U-RS= Consumer Price Index Research Series Using Current Methods; NLSY79=National Longitudinal Survey of Youth 1979; PIAT=Peabody Individual Achievement Test; PPVT=Peabody Picture Vocabulary Test.

TABLE B2

Life Stages and Corresponding Outcomes for the NLSY97 Social Genome Model

Stage	Variable	Description
Adolescence (age 19)	High school graduation status	Dichotomous variable indicating whether the individual received a high school diploma by age 19; GED earners are not counted as high school graduates
	Grade point average	Continuous variable indicating average grade in the last year of high school; ranges from 0 to 4
	Criminal conviction	Dichotomous variable indicating whether the individual was convicted of any charges other than minor traffic violations by age 19
	Teen parent	Dichotomous variable indicating whether the individual reported having a child by age 19
	Family income	Continuous variable indicating the log-transformed measure of the family's income at age 19; income is in 2010 constant dollars, adjusted using the CPI-U-RS
	Marijuana use	Dichotomous variable indicating whether the individual reports having used marijuana in the past year
	Other drug use	Dichotomous variable indicating whether the individual reports having used drugs other than marijuana in the past year
	Self-esteem index	Standardized measure of the respondent’s level of self-esteem
	Mental health scale	Standardized mental health scale
	Days per week do something religious	Interval scale variable for the number of days from 0 to 7
	General health	Interval scale from 0 to 4 indicating self-reported health (higher is poorer health)
Early transition to adulthood (age 25)	Family income	Continuous variable indicating the log-transformed measure of the family's income during the year the individual was 25 years old; income is in 2010 constant dollars, adjusted using the CPI-U-RS
	Family income to needs	Continuous variable indicating the log-transformed measure of the family's income as a percentage of the federal poverty level during the year the individual was 25 years old
	College completion	Dichotomous variable indicating whether the individual obtained a four-year degree or higher
	Lives independently from parents	Dichotomous variable indicating whether the individual was living independently from his or her parents at age 25
	Parenthood status	Dichotomous variables indicating whether the individual is a single parent, a cohabiting parent, a married parent, or not a parent
	Criminal conviction	Dichotomous variable indicating whether the individual was convicted of any charges other than minor traffic violations from ages 20 to 24
	General health	Interval scale from 0 to 4 indicating self-reported health (higher is poorer health)
	Down/depressed	Interval scale from 0 to 6 indicating how often the respondent feels down or depressed (higher is less often)

Stage	Variable	Description
Transition to adulthood (age 29)	Family income	Log-transformed measure indicating the family's income during the year the individual was 29 years old; income is in 2010 constant dollars, adjusted using the CPI-U-RS
	Family income to needs	Log-transformed measure indicating the family's income as a percentage of the federal poverty level during the year the individual was 29 years old
	College completion	Dichotomous variable indicating whether the individual obtained a four-year degree or higher
	Lives independently from parents	Dichotomous variable indicating whether the individual was living independently from his or her parents at age 29
	Parenthood status	Dichotomous variables indicating whether the individual is a single parent, a cohabiting parent, a married parent, or not a parent
	Personal income from wages/salary	Log-transformed measure of the respondent's income during the year the individual was 29 years old ; income is in constant 2010 dollars, adjusted using the CPI-U-RS
	General health	Interval scale from 0 to 4 indicating self-reported health (higher is poorer health)
	Down/depressed	Interval scale from 0 to 6 indicating how often the respondent feels down or depressed (higher is less often)

Note: CPI-U-RS= Consumer Price Index Research Series Using Current Methods

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