

Research Brief



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BROOKINGS

“What if” you earned a diploma and delayed parenthood?

INTERGENERATIONAL
SIMULATIONS OF
DELAYED CHILDBEARING
AND INCREASED
EDUCATION

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OVERVIEW

Teen childbearing is associated with negative outcomes for teen parents, their children, and society. Teen mothers are more likely to be poor as adults, and are more likely to rely on public assistance, compared with women who delay childbearing.¹ Children born to young mothers have poorer educational, behavioral, and health outcomes throughout their lives, compared with children born to older parents, in part because of lower parental education and relationship stability.²

Is it the case, as some research suggests, that delaying childbearing or improving educational outcomes among young parents can help reduce intergenerational cycles of early childbearing and poverty?³ And if so, how much of an improvement can be attributed to one strategy or the other? To answer these and related questions, we employed The Social Genome Model to provide a better understanding of how delaying childbearing and improving the educational attainment of teen mothers in one generation can be linked to the improved economic well-being of their children. The Social Genome Model, originally developed at the Brookings Institution and based at the Urban Institute, is a joint venture of the Brookings Institution, Child Trends, and the Urban Institute. This brief specifically reports results from “What if” simulations, in which teen mothers’ age at their first birth was increased by two or five years and in which the mothers earn a high school diploma. The implications of these changes on the life of the mothers’ children are estimated through childhood and up to age 29.

KEY FINDINGS AND IMPLICATIONS

- Delaying births to teenagers increases the average family income of their offspring – and the longer a teen birth is delayed, the larger the average family income of the offspring.
- Earning a high school diploma raises the average family income of teen mothers’ offspring even more.
- The largest gain in offspring’s income at age 29 results from delaying a first birth and completing high school.
- These findings highlight the importance of identifying intervention approaches that delay childbearing and improve educational attainment among young parents.

Each of these findings is discussed in greater detail below.

BACKGROUND

Experimental evidence regarding the effectiveness of social interventions is becoming a critical input into policy and program decision-making. However, if the effect of a program serving one generation on the next generation is the question to be assessed, it takes decades for experiments to be conducted and outcomes to be observed. For example, will a delay in the timing of a first birth from the teen years to early adulthood affect the outcomes for the children that are eventually born?

Microsimulation offers an approach to estimate these effects, based on carefully constructed models, without waiting decades to get a sense of the outcomes. To illustrate the utility of this approach, we present here initial simulations from a Brookings/Child Trends project to model children's development from birth into adulthood. Data from the 1997 National Longitudinal Survey of Youth (NLSY97) were used to model children's progression from birth through school and into early adulthood. The model incorporates varied factors that influence success, including family background, the child's educational success, test scores, problem behaviors, substance use, religious attendance, the timing of the first birth, college attendance, criminal conviction, and family income at ages 25 and 29 (see the methods box at the end of this brief for more detail).

Compared to a baseline model that follows the NLSY97 cohort over time (Model A, shown in Table 1 and Figure 1), we have conducted a series of simulations to provide estimates of how changing the mother's fertility and education would alter the outcomes of their offspring at age 29. The models are as follows:

- Model B: Teen mothersⁱ age at first and focal birth were delayed by two years, while assuming their high school graduation status and other personal characteristics remained the same.
- Model C: Teen mothers' age at first and focal birth were delayed by five years while assuming their high school graduation status and other characteristics remained the same.
- Model D: Teen mothers' age at first and focal birth were unchanged, but all teen mothers completed high school.
- Model E: Teen mothers' age at first and focal birth were delayed by two years and all teen mothers have a high school diploma.

Each model estimated the developmental trajectory of the teen mothers' offspring through adolescence and early adulthood up to age 29. This brief is interested in the combination of delaying childbearing and increasing educational attainment and provides Model E as one example, although many other permutations are possible (other results are available upon request).

Results from Intergenerational Simulations of Delayed Childbearing and Increased Education

The simulation results, described in Table 1, represent the average characteristics of the children of teen mothers when the children reach age 29, before and after each simulation. They yielded the following findings:

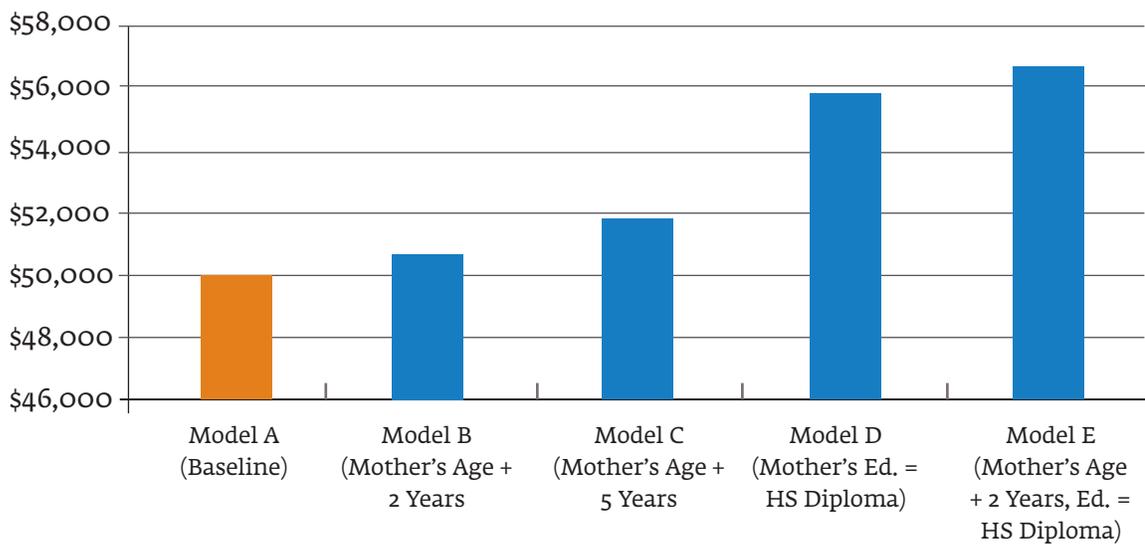
Delaying births to teenagers increases the average family income of their offspring - and the longer a teen birth is delayed, the larger the average family income of the offspring. The simulations indicate that delaying first and focal births to teenagers by two years increases the average annual family income of their offspring at age 29 by \$688 (to \$50,645) in Model B, while delaying first and focal births to teens by five years increases their offspring's average annual family income at age 29 by \$1,833 (to \$51,789) in Model C (see Figure 1).

i Teen mothers are those whose first birth was at age 20 or younger

Earning a high school diploma raised the average family income of teen mothers’ offspring even more. Increasing the educational attainment of teen mothers who had not received a high school diploma by “assigning” them a high school diploma is found to raise all teen mothers’ offspring’s average annual family income at age 29 by \$5,896 (to \$55,852) in Model D.

The largest gain in offspring’s income at age 29 resulted from delaying a first birth by two years and completing high school. The combination of delaying first and subsequent births by two years and providing all teen mothers with at least a high school education is linked to a \$6,660 increase (to \$56,616) in the offspring’s annual family income at age 29 in Model E. Note that the resulting increase in the offspring’s family income based on the combination of changes (both increasing age at first birth and education in Model E) is greater than the sum of the income effects for both changes (Models C and D).

The Average Family Income (2011\$) of the Offspring of Teen Mothers, when Offspring are 29 Years Old



Beyond family income, a number of other outcomes for the offspring during their twenties were estimated. These analyses suggest, for example, that the proportion of offspring attaining a college degree by age 29 would increase by:

- 2 percentage points in Model B (two year increase in maternal age)
- 5 percentage points in Model C (five year increase in maternal age)
- 2 percentage points in Model D (high school diploma)
- 4 percentage points in Model E (two year increase in age and high school diploma).

When teen mothers’ births are delayed and their education is increased, their offspring are:

- Less likely to be a parent by age 29;
- Slightly less likely to report symptoms of depression, and;
- Less likely to describe themselves as being in poor health (see Table 1).

DISCUSSION

The simulation models show how intervention approaches to delay childbearing and increase educational attainment among teen mothers can improve the financial well-being of their children as they enter adulthood. These analyses highlight especially strong links between increasing maternal education among teen mothers and improving well-being in the next generation. Specifically, the models found that if the 44% of teen mothers who did not complete high school instead earned a diploma, one result would be a \$5,896 increase in the average income among ALL children of teen mothers, an increase of nearly 12%.

Although these findings are dramatic, it must be recognized that few rigorously evaluated programs have documented increases in high school graduation rates among youth in general,⁴ much less among the most at-risk youth, including teen mothers. And programs targeted to young parents have generally focused on increases in GED receipt rather than high school diploma receipt. However, the employment and income benefits of receiving a GED are not nearly as dramatic as the benefits of a high school diploma.^{5,6}

Our models also highlighted links between delaying childbearing in one generation and increased financial wellbeing in the next generation, although the income increases for these simulations weren't as large as for the models that increased maternal education (ranging from a \$688 increase associated with a 2-year delay in childbearing to a \$1,833 increase associated with a 5-year delay). The smaller size of these associations may be due, in part, to the fact that these simulations held maternal education constant. However, other research finds that delays in childbearing are often accompanied by increases in educational attainment, as well as by greater family stability.⁷ In the real world, increased education may in fact be a key mechanism through which delays in childbearing serve to raise mothers' earnings, and these indirect influences of mothers' age on their children's income in young adulthood would not be reflected in simulations that only increase mother's age at first birth. In fact, early births and educational attainment are often jointly determined, meaning that greater educational attainment is also linked to delayed childbearing.⁸ Moreover, it must be noted that despite the promising benefits of delaying childbearing, programs designed to prevent teen pregnancy have not been found to delay first births by two years, much less by five years.⁹

There are also some important limitations to these simulations that should be noted. All of our estimates take into account a broad array of confounding factors. Nevertheless, we acknowledge that these models cannot account for all of the factors that might influence teen mothers' offspring's development over the years of childhood and the transition to adulthood. Also, we recognize that no intervention to date has succeeded in both delaying first births by several years and also achieving high school graduation for all teen mothers. Thus, the simulations presented in this brief are truly "what if" scenarios. Nevertheless, they enable us to understand the value of accomplishing these objectives for parents and for their children. The simulation findings suggest what *could* be accomplished and thus highlight the need to identify, develop, and evaluate intervention approaches that delay childbearing and improve educational attainment among young parents. These simulations also provide a sense of the relative or cumulative implications of varied types of interventions and/or combined interventions, such as community-level initiatives to delay first births and increasing high school completion, such as are envisioned in Promise Neighborhoods and programs such as Evidence 2 Success.

Since there has been a substantial decline in the teen birth rate, it may be tempting to ignore teen childbearing. However the teen birth rate in the United States remains much higher than other developed countries and some subgroups, such as Latinos, have persistently high (if declining) teen birth rates.¹⁰ The intergenerational links between teen childbearing and financial well-being highlight the need to continue policy and program efforts to improve the well-being of young parents, particularly for these high-risk sub-populations.

Table 1: Results from Four Simulations in which the Target Population is Children of Teen Mothers

Measure	Model A: Baseline		Model B: Teen Mothers' Age At First and Focal Birth Increased by 2 Years, holding high school graduation constant		Model C: Teen Mothers' Age At First and Focal Birth Increased by 5 Years, holding high school graduation constant		Model D: Teen Mothers Without a High School Diploma (HSD) Given an HSD, holding mother's age at birth constant		Model E: Teen Mothers' Age At First and Focal Birth Increased by 2 Years AND Those without an HSD Given an HSD	
	Proportion Of, or Average Among, Target Population, Prior to Simulation	Change Pre- to Post-Simulation	Proportion or Average, Post Simulation	Change Pre- to Post-Simulation	Proportion or Average, Post Simulation	Change Pre- to Post-Simulation	Proportion or Average, Post Simulation	Change Pre- to Post-Simulation	Proportion or Average, Post Simulation	Change Pre- to Post-Simulation
Outcomes Among Offspring of Teen Mothers at Transition to Adulthood (Age 29)										
Has at least a BA	0.15	0.02	0.17	0.02	0.21	0.05	0.17	0.02	0.19	0.04
Is a Single Parent	0.24	-0.01	0.23	-0.01	0.22	-0.02	0.22	-0.02	0.21	-0.03
Is a Cohabiting Parent	0.14	0.00	0.14	0.00	0.13	-0.02	0.13	-0.01	0.13	-0.01
Is a Married Parent	0.30	-0.01	0.29	-0.01	0.27	-0.03	0.29	-0.01	0.28	-0.02
Is Living Independently	0.87	0.00	0.87	0.00	0.86	-0.01	0.88	0.01	0.88	0.01
Down/ Depressed Index ^a (Higher score = less frequently)	4.92	0.01	4.93	0.01	4.93	0.01	4.99	0.07	5.00	0.07
Self-Rated Health ^b (Higher score = poorer health)	1.44	-0.03	1.41	-0.03	1.35	-0.09	1.39	-0.05	1.35	-0.09
Family Income ^c	\$49,956	688	50,645	688	51,789	1,833	55,852	5,896	56,616	6,660
Family Income to Needs ^d	2.74	0.06	2.80	0.06	2.91	0.17	3.05	0.30	3.12	0.37
Personal Earnings ^e	\$24,852	428	25,820	428	25,947	1,095	26,728	1,875	27,176	2,324

^a The Down/Depressed Index is the sum of a respondent's rating of how often they are down and how often they are depressed, where 0 is All the Time and 3 is Never (combined range is 0 to 6)

^b Self-Rated Health Index is the respondent's rating of their own health, where 0 is Excellent and 4 is Poor.

^c Family Income is the income from all sources of the respondent's family or household, in 2011 dollars.

^d Family Income to Needs is the ratio of the family income to the federal poverty level, such that a value of 1 indicates family income at poverty level.

^e Personal Earnings is the respondent's income from all wages and/or salary in 2011 dollars.

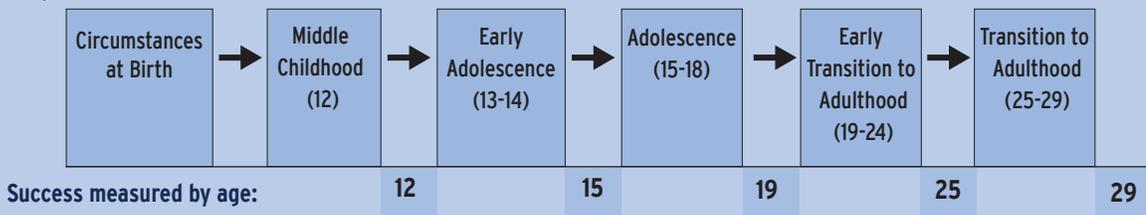
Methods

The Brookings/Child Trends Social Genome Model 1997 (SGM97) is an adaptation and update of the Brookings Social Genome Model (see Winship & Owen 2013)¹¹ using NLSY97 data. The NLSY97 is a representative sample of 8,984 youth aged 12 to 16 years in 1997. The youth have been interviewed annually, most recently in 2011, when the sample was approximately 26 to 30 years old.

The SGM97 predicts outcomes for five life stages covering ages 12 through 29, using a series of recursive equations. Figure 2 below outlines these life stages and the ages at which the relevant outcomes for that stage are measured.

Figure 2: Social Genome Model 97 - Age Stages

Stage:



Because not every respondent in the NLSY sample was surveyed at every age covered by the SGM life stages, we impute missing values in order to create a complete dataset of 8,984 individuals with no missing values for any of the variables in our models. We use the same imputation methods employed by Brookings in their SGM (see Winship & Owen 2013 for more detail).¹¹

The outcomes at each stage of life are estimated individually using all variables from previous life stages, so that the equation estimated for each outcome in each stage is:

$$\text{Outcome} = \beta_0 + \beta_1 \text{Circumstances at Birth} + \beta_2 \text{Previous Stage Outcomes} + \epsilon$$

Where β_1 and β_2 are vectors of coefficients, Circumstances at Birth is a set of variables describing an individual’s demographic and family characteristics (such as gender, race/ethnicity, mother’s highest level of education, and mother’s age at first birth), and Previous Stage Outcomes is the set of outcomes from prior life stages, and ϵ is the error term.

Simulations such as the ones presented in this brief are estimated through a multi-step process. First, we identify a target population for the simulation – in the case of this brief, the target population is the children of teen mothers (respondents whose mother’s age at first birth was less than 20). We estimate coefficients using linear regression and linear probability models as described above, which are then used to predict each outcome for individuals in the target population to create a baseline (the “pre” values in Table 1). For continuous outcomes, the residual and the predicted value are added together so that the baseline matches as closely as possible the actual values in the dataset. For binary variables, individuals are randomly assigned a number from 0 to 1; if the random number is greater than or equal to an individual’s predicted probability on a given variable, the individual is assigned a value of 0, indicating that the particular outcome did not occur (e.g., the individual did not get a high school diploma by age 19).

Methods (cont.)

From this synthetic baseline “state of the world,” we estimate what would happen if we made a specific change – referred to as the intervention – among the target population. In the case of the simulations in this brief, the intervention was either increasing mother’s age at first and focal birth by a set number of years, changing maternal education from less than a high school diploma to a high school diploma, or both. After the target population’s actual values have been altered by the intervention, the estimated coefficients are applied to produce “post-intervention” estimates. These estimates are only produced for the life stages that follow the stage in which the intervention takes place, for example, if an intervention takes place in Middle Childhood, new estimates are produced for outcomes in Early Adolescence and beyond, but Circumstances at Birth are unchanged.

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