A gradient of childhood self-control predicts health, wealth, and public safety

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Policy-makers are considering large-scale programs aimed at self-control to improve citizens' health and wealth and reduce crime. Experimental and economic studies suggest such programs could reap benefits. Yet, is self-control important for the health, wealth, and public safety of the population? Following a cohort of 1,000 children from birth to the age of 32 y, we show that childhood self-control predicts physical health, substance dependence, personal finances, and criminal offending outcomes, following a gradient of self-control. Effects of children's self-control could be disentangled from their intelligence and social class as well as from mistakes they made as adolescents. In another cohort of 500 sibling-pairs, the sibling with lower self-control had poorer outcomes, despite shared family background. Interventions addressing self-control might reduce a panoply of societal costs, save taxpayers money, and promote prosperity.

life course | longitudinal | public policy

The need to delay gratification, control impulses, and modulate emotional expression is the earliest and most ubiquitous demand that societies place on their children, and success at many life tasks depends critically on children's mastery of such self-control. We looked at the lives of 1,000 children. By the age of 10 y, many had mastered self-control but others were failing to achieve this skill. We followed them over 30 y and traced the consequences of their childhood self-control for their health, wealth, and criminal offending.

Interest in self-control unites all the social and behavioral sciences. Self-control is an umbrella construct that bridges concepts and measurements from different disciplines (e.g., impulsivity, conscientiousness, self-regulation, delay of gratification, inattention-hyperactivity, executive function, willpower, intertemporal choice). Neuroscientists study self-control as an executive function subserved by the brain's frontal cortex (1, 2) and have uncovered brain structures and systems involved when research participants exert self-control (3). Behavioral geneticists have shown that self-control is under both genetic and environmental influences (4) and are now searching for genes associated with self-control (5). Psychologists have described how young children develop self-control skills (6, 7) and have traced population patterns of stability and change in self-control across the life course (8). Health researchers report that self-control predicts early mortality (9); psychiatric disorders (10); and unhealthy behaviors, such as overeating, smoking, unsafe sex, drunk driving, and noncompliance with medical regimens (11). Sociologists find that low self-control predicts unemployment (12) and name self-control as a central causal variable in crime theory (13), providing evidence that low self-control characterizes lawbreakers (14, 15).

Economists are now drawing attention to individual differences in self-control as a key consideration for policy-makers who seek to enhance the physical and financial health of the population and reduce the crime rate (16, 17). The current emphasis on self-control skills of conscientiousness, self-discipline, and perseverance arises from the empirical observation that preschool programs that targeted poor children 50 y ago, although failing to achieve their stated goal of lasting improvement in children's intelligence quotient (IQ) scores, somehow produced byproduct reductions in teen pregnancy, school dropout, delinquency, and work absenteeism (18).* To the extent that self-control influences outcomes as disparate as health, wealth, and crime, enhancing it could have broad benefits. Given that self-control is malleable, it could be a prevention target, and the key policy question becomes when to intervene to achieve the best cost–benefit ratio, in childhood or in adolescence (19, 20)? Regardless of its malleability, however, if low self-control is influential, policy-makers might exploit this by enacting so-called "opt-out" schemes that tempt people to eat healthy food, save money, and obey laws by making these the default options that require no effortful self-control. If citizens were obliged to opt out of default health-enhancing programs or payroll-deduction retirement savings schemes, individuals with low self-control should tend to take the easy option and stay in programs, because opting out requires unappealing effort and planning (21, 22). Similarly, the idea behind the crime-reduction policy of "target hardening" is to discourage would-be offenders by making law-breaking require effortful planning (e.g., antitheft devices require more advance planning to steal a car).

In the context of this timely, ubiquitous, and intense policy interest in self-control, we report findings from the Dunedin Multidisciplinary Health and Development Study, a longitudinal study of a complete birth cohort of 1,037 children born in one city in a single year, whom we have followed from birth to the age of 32 y with 96% retention (Fig. 1 and *SI Appendix*). Our study design is observational and correlational; this is in contrast to experimental behavioral-economics studies that ascertain the association between performance on laboratory self-control tasks (e.g., delay of gratification, discounting, intertemporal choice tasks) and behavioral proxy measures of wealth, health, and crime. Such laboratory experiments yield compelling information about self-control, although economists have debated whether behavior in the laboratory faithfully represents real-world behavior (23). The naturalistic Dunedin study complements experimental research on self-control by providing badly needed information about how

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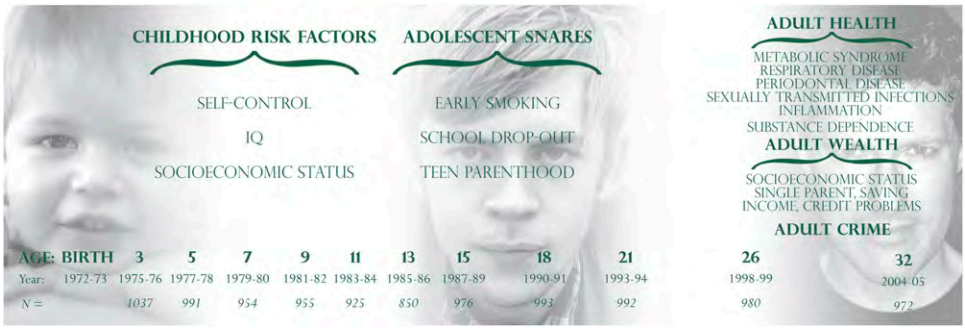

Fig. 1. Design of the Dunedin Multidisciplinary Health and Development Study.

well children's self-control, as it is distributed in the population, predicts real-world outcomes after children reach adulthood. We examined adult health outcomes, such as substance dependence, inflammation, and metabolic abnormalities (e.g., overweight, hypertension, cholesterol), because these are known early-warning signs for costly age-related diseases and premature mortality. We examined wealth outcomes, such as low income, single-parent child rearing, credit problems, and poor saving habits, because these are early warning signs for late-life poverty and financial dependence. We also examined convictions for crime, because crime control poses major costs to government.

The Dunedin study's birth-cohort members with low self-control and poor outcomes have not dropped out of the study. This enabled us to study the full range of self-control and to estimate effect sizes of associations for the general population, information that is requisite for informed policy making. The Dunedin study's design allowed us to address four policy-relevant hypotheses. First, we tested whether children's self-control predicted later health, wealth, and crime similarly at all points along the self-control gradient, from lowest to highest self-control. If self-control's effects follow a gradient, interventions that achieve even small improvements in self-control for individuals could shift the entire distribution of outcomes in a salutary direction and yield large improvements in health, wealth, and crime rate for a nation. Second, although this study did not include an intervention, some Dunedin study members moved up in the self-control rank over the years of the study, and we were able to test the hypothesis that improving self-control is associated with better health, wealth, and public safety. Third, because we assessed whether study members smoked tobacco as adolescents, left secondary school early, or became teen parents, we were able to test the hypothesis that children with low self-control make these mistakes as teenagers that close doors of opportunity and ensnare them in lifestyles harmful to their health and wealth as well as the public's safety. If self-control's influence is mediated through adolescents' mistakes, adolescence could be an ideal window for intervention policy. Fourth, because the Dunedin study assessed self-control as early as the age of 3 y, we were able to test the hypothesis that individual differences in preschoolers' self-control predict outcomes in adulthood. If so, early childhood would also be an intervention window.

Policy-making requires evidence that isolates self-control as the active ingredient affecting health, wealth, and crime, as opposed to other influences on children's futures, such as their intelligence or social class origins. Dunedin study data allowed the requisite statistical controls for IQ and social class. We also exploited another longitudinal study, a birth cohort of siblings, to ask whether the sibling in each pair who had lower self-control subsequently developed worse outcomes, despite both siblings having the same home and family. This design disentangles the individual child's self-control from all other features on which families differ (and which siblings share while growing up).

Results

This research aimed to ascertain whether childhood self-control predicts important adult outcomes along a population gradient. We assessed children's self-control during their first decade of life. Reports by researcher-observers, teachers, parents, and the children themselves gathered across the ages of 3, 5, 7, 9, and 11 y were combined into a single highly reliable composite measure. Mean levels of self-control were higher among girls than boys ($t = 8.39$, $P < 0.001$), but the health, wealth, and public safety implications of childhood self-control were equally evident and similar among boys and girls (*SI Appendix*, Table S1). We therefore combined the genders in all subsequent analyses (but controlled for gender). Dunedin study children with greater self-control were more likely to have been brought up in socioeconomically advantaged families ($r = 0.25$, $P < 0.001$) and had higher IQs ($r = 0.44$, $P < 0.001$), raising the possibility that low self-control could be a proxy for low social class origins or low intelligence. We thus tested whether childhood self-control predicted adults' health, wealth, and crime independent of their social class origins and IQ (the study design and measures are described in *SI Appendix*).

Predicting Health. When the children reached the age of 32 y, we assessed their cardiovascular, respiratory, dental, and sexual health as well as their inflammatory status by carrying out physical examinations and laboratory tests to assess metabolic abnormalities (including overweight), airflow limitation, periodontal disease, sexually transmitted infection, and C-reactive protein level, respectively. We summed these five clinical measures into a simple physical health index for each study member: 43% of study members had none of the biomarkers, 37% had one, and 20% had two or more. Childhood self-control predicted adult health problems (Table 1, model 1), even after accounting for social class origins and IQ (Table 1, model 2). *SI Appendix*, Table S1 shows associations between self-control and each individual health measure.

We also conducted clinical interviews with the study members at the age of 32 y to assess depression and substance dependence (tobacco, alcohol, and cannabis dependence as well as dependence on other street and prescription drugs), following the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV) criteria (24). As adults, children with poor self-control were not at elevated risk for depression. They had elevated risk for substance dependence (Table 1, model 1), however, even after accounting for social class and IQ (Table 1, model 2). This longitudinal link between self-control and substance dependence was verified by people whom study members had nominated as informants who knew them well. As adults, children with poor self-control were rated by their informants as having alcohol and drug problems (Table 1).

Predicting Wealth. Childhood self-control also foreshadowed the study members' financial situations. Although the study members' social class of origin and IQ were strong predictors of their adult socioeconomic status and income, poor self-control offered significant incremental validity in predicting the socioeconomic position they achieved and the income they earned (Table 1). By the age of 32 y, 47% of study members had become parents. Childhood self-control predicted whether or not these study

Table 1. Does poor self-control in childhood lead to poor health, wealth-related problems, and criminal convictions in adulthood?

	Model 1: Baseline bivariate associations			Model 2: Co-occurring childhood risk factors hypothesis		
Adult outcomes and predictors	Coefficient	95% CI/SE	*P*	Coefficient	95% CI/SE	*P*
Health						
Physical health index*						
Low family SES	1.218	1.127–1.316	<0.001	1.154	1.058–1.258	0.001
Low IQ	1.224	1.133–1.323	<0.001	1.092	0.993–1.20	0.069
Low self-control	1.196	1.113–1.285	<0.001	1.111	1.020–1.209	0.016
Recurrent depression†						
Low family SES	1.038	0.876–1.229	0.667	0.955	0.790–1.153	0.629
Low IQ	1.232	1.031–1.470	0.022	1.208	0.978–1.493	0.080
Low self-control	1.187	0.944–1.419	0.059	1.099	0.849–1.352	0.369
Substance dependence index*						
Low family SES	1.343	1.184–1.523	<0.001	1.281	1.116–1.470	<0.001
Low IQ	1.218	1.074–1.382	0.002	1.012	0.870–1.177	0.880
Low self-control	1.299	1.156–1.460	<0.001	1.186	1.038–1.355	0.012
Informant-reported substance problems‡						
Low family SES	0.118	0.033	<0.001	0.076	0.036	0.033
Low IQ	0.081	0.034	0.014	−0.026	0.041	0.507
Low self-control	0.178	0.035	<0.001	0.169	0.039	<0.001
Wealth						
SES‡						
Low family SES	−0.266	0.033	<0.001	−0.124	0.034	<0.001
Low IQ	−0.400	0.033	<0.001	−0.312	0.039	<0.001
Low self-control	−0.263	0.035	<0.001	−0.082	0.038	0.023
Income‡						
Low family SES	−0.214	0.032	<0.001	−0.107	0.034	0.002
Low IQ	−0.291	0.033	<0.001	−0.199	0.039	<0.001
Low self-control	−0.238	0.034	<0.001	−0.112	0.038	0.002
Single-parent child rearing†§						
Low family SES	1.301	1.067–1.586	0.009	1.140	0.909–1.430	0.255
Low IQ	1.395	1.117–1.741	0.003	1.126	0.869–1.458	0.369
Low self-control	1.633	1.304–2.046	<0.001	1.479	1.147–1.908	0.003
Financial planfulness‡						
Low family SES	−0.151	0.032	<0.001	−0.090	0.036	0.011
Low IQ	−0.160	0.034	<0.001	−0.059	0.040	0.124
Low self-control	−0.195	0.034	<0.001	−0.141	0.039	<0.001
Financial struggles‡						
Low family SES	0.095	0.033	0.003	0.077	0.036	0.032
Low IQ	0.029	0.035	0.369	−0.068	0.041	0.078
Low self-control	0.152	0.035	<0.001	0.156	0.039	<0.001
Informant-reported financial problems‡						
Low family SES	0.131	0.033	<0.001	0.035	0.036	0.317
Low IQ	0.192	0.035	<0.001	0.077	0.041	0.045
Low self-control	0.274	0.034	<0.001	0.230	0.039	<0.001
Public safety						
Criminal conviction†						
Low family SES	1.578	1.337–1.863	<0.001	1.373	1.140–1.654	0.001
Low IQ	1.431	1.218–1.680	<0.001	0.967	0.792–1.179	0.737
Low self-control	1.830	1.559–2.148	<0.001	1.714	1.425–2.063	<0.001

Additional details are provided in *SI Appendix*, Table S1. SES, socioeconomic status.
*Incident-rate ratio.
†OR.
‡Standardized ordinary least squares regression coefficient.
§This analysis is restricted to 47% of the study members who have had a child.

members' offspring were being reared in one-parent vs. two-parent households (e.g., the study member was an absent father or single mother), also after accounting for social class and IQ (Table 1).

At the age of 32 y, children with poor self-control were less financially planful. Compared with other 32-y-olds, they were less likely to save and had acquired fewer financial building blocks for the future (e.g., home ownership, investment funds, retirement plans). Children with poor self-control were also struggling financially in adulthood. They reported more money-management difficulties and had accumulated more credit problems (Table 1). Poor self-control in childhood was a stronger predictor of these financial difficulties than study members' social class origins and IQ. This longitudinal link between self-control and self-reported financial problems was verified by informants who knew them well. As adults, children with poor self-control were rated by their informants as poor money managers (Table 1).

Predicting Crime. We obtained records of study members' court convictions at all courts in New Zealand and Australia by searching the central computer systems of the New Zealand Police; 24% of the study members had been convicted of a crime

by the age of 32 y. Children with poor self-control were more likely to be convicted of a criminal offense, even after accounting for social class origins and IQ (Table 1).

Self-Control Gradient. We observed a self-control gradient in which boys and girls with less self-control had worse health, less wealth, and more crime as adults than those with more self-control at every level of the distribution of self-control (Fig. 2). To document further that self-control relates to outcomes all along its gradient, we removed 61 study members who were diagnosed with attention-deficit hyperactivity disorder (a childhood psychiatric disorder of impaired impulse control) and repeated this analysis. The gradient associations in Fig. 2 remained unaltered. In addition, we tested whether self-control effects operate throughout the distribution or are confined to the least self-controlled children. We repeated analyses after removing children in the least self-controlled quintile and continued to observe significant linear associations. The self-control gradient was even apparent when we removed children in the least and most self-controlled quintiles (*SI Appendix*, Table S2).

An interesting question is what would happen if we were able to intervene and improve children's self-control. Would an increase in self-control predict better outcomes? Although the study did not include an experimental intervention, we were able to address this question by studying children who moved up the rank in their self-control from childhood to young adulthood. The childhood measure of self-control was significantly correlated with a personality measurement of self-control administered to our cohort in young adulthood ($r = 0.30$, $P \leq 0.001$), at a moderate magnitude, consistent with expectations (25) (*SI Appendix*). This stability coefficient implies that some children also changed their rank order in self-control. Moreover, those children who became more self-controlled from childhood to young adulthood had better outcomes by the age of 32 y, even after controlling for their initial levels of childhood self-control (*SI Appendix*, Table S3). As a caveat, it is not clear that natural history change of the sort we observed in our longitudinal study is equivalent to intervention-induced change. Nevertheless, these suggestive findings should stimulate consideration of interventions to raise self-control.

Self-Control and Adolescent Mistakes. Data collected at the ages of 13, 15, 18, and 21 y showed that children with poor self-control were more likely to make mistakes as adolescents, resulting in "snares"

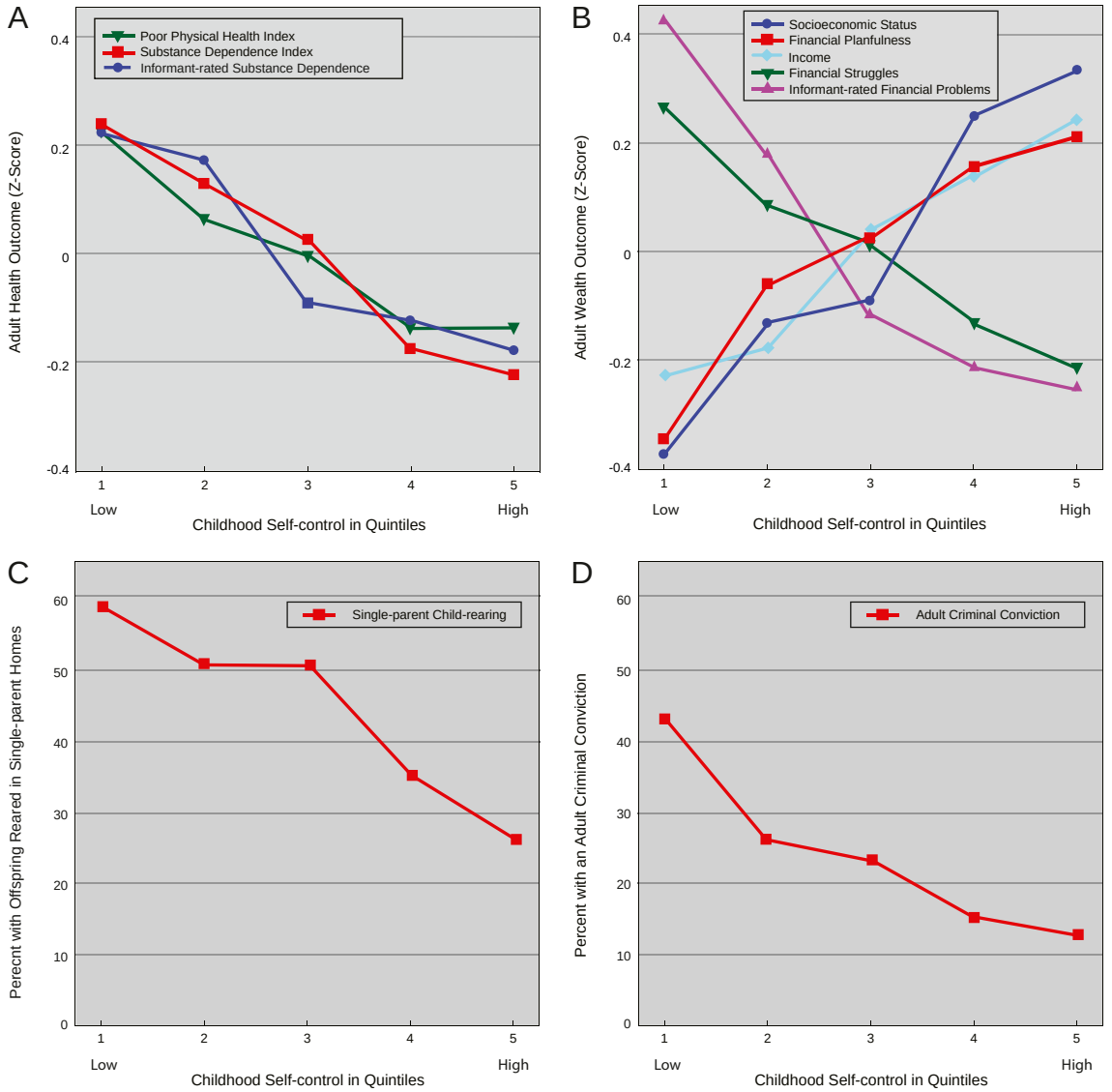

Fig. 2. Self-control gradient. Children with low self-control had poorer health (*A*), more wealth problems (*B*), more single-parent child rearing (*C*), and more criminal convictions (*D*) than those with high self-control.

that trapped them in harmful lifestyles. More children with low self-control began smoking by the age of 15 y [odds ratio (OR) = 1.69, 95% confidence interval (CI): 1.45–1.96], left school early with no educational qualifications (OR = 2.28, 95% CI: 1.92–2.72), and became unplanned teenaged parents (OR = 1.79, 95% CI: 1.40–2.29). The lower their self-control, the more of these snares they encountered (incident rate ratio = 1.48, 95% CI: 1.38–1.59) (*SI Appendix*, Fig. S1). In turn, the more snares they encountered, the more likely they were, as adults, to have poor health, less wealth, and criminal conviction (*SI Appendix*, Table S4). We tested whether snares explained the long-term predictive power of self-control in two ways. First, using statistical controls, we partialled out the portion of the association between childhood self-control and each adult outcome that was accounted for by adolescent snares. The snares attenuated the effect of self-control on health by 32%, substance dependence by 63%, socioeconomic status by 35%, income by 29%, single-parent child rearing by 61%, financial planfulness by 35%, financial struggles by 47%, and crime by 42%. The direct effect of self-control remained statistically significant for nearly every outcome measure, however (*SI Appendix*, Table S4). Second, we tested the association between childhood self-control and the adult outcomes among adolescents who did not encounter any snares, a so-called "utopian" control group (26). Again, prediction from childhood self-control to the adult measures remained significant even among this group of nonsmoking, non–teen-parent, high-school graduates (*SI Appendix*, Table S4).

How Early Can Self-Control Predict Health, Wealth, and Crime? Our composite measure of self-control in the Dunedin study included assessments from the age of 3–11 y. To answer this question, we isolated staff ratings of the children's self-control observed during 90-min data collection sessions at the research unit in the mid-1970s, when they were 3–5 y old (27). This standardized observational measure of preschoolers' self-control significantly predicted health, wealth, and convictions at the age of 32 y, albeit with modest effect sizes (*SI Appendix*, Table S5).

Sibling Comparisons. In the Dunedin study, statistical controls revealed that self-control had its own associations with outcomes, apart from childhood social class and IQ. Each Dunedin study member grew up in a different family, however, and their families varied widely on many features that affect children's outcomes. A compelling quasiexperimental research design that can isolate the influence of self-control is to track and compare siblings. Does the sibling with poorer self-control have worse outcomes than his or her more self-controlled sibling growing up in the same family environment? To apply this design, we turned to a second sample, the Environmental-Risk Longitudinal Twin Study (E-Risk), where we have been tracking a birth cohort of British twins since their birth in 1994 to 1995 with 96% retention (*SI Appendix*). When the E-Risk study twins were 5 y old, research staff rated each child on the same observational measure of self-control originally used with Dunedin study children as preschoolers. Although the E-Risk study children have been followed only up to age of 12 y, their self-control already forecasts many of the adult outcomes we saw in the Dunedin study. We applied sibling fixed-effects models to same-gender dizygotic pairs (n = 509 pairs) because they are no more alike than ordinary siblings (with the added advantages of being the same age and gender). Models showed that the 5-y-old sibling with poorer self-control was significantly more likely to begin smoking as a 12-y-old (a precursor of adult ill health; B = 0.07, SE = 0.003; $P < 0.03$), perform poorly in school (a precursor of adult wealth; B = −0.13, SE = 0.007; $P < 0.001$), and engage in antisocial behaviors (a precursor of adult crime; B = 0.09, SE = 0.007; $P = 0.007$), and these findings remained significant even after controlling for sibling differences in IQ (B = 0.07, SE = 0.003, $P = 0.02$ for smoking; B = −0.07, SE = 0.006, $P = 0.01$ for school performance; and B = 0.09, SE = 0.007, $P = 0.005$ for antisocial behavior).

Comment

Differences between individuals in self-control are present in early childhood and can predict multiple indicators of health, wealth, and crime across 3 decades of life in both genders. Furthermore, it was possible to disentangle the effects of children's self-control from effects of variation in the children's intelligence, social class, and home lives of their families, thereby singling out self-control as a clear target for intervention policy. Joining earlier longitudinal follow-ups (7, 9, 28), our findings imply that innovative policies that put self-control center stage might reduce a panoply of costs that now heavily burden citizens and governments.

Differences between children in self-control predicted their adult outcomes approximately as well as low intelligence and low social class origins, which are known to be extremely difficult to improve through intervention. Effects were marked at the extremes of the self-control gradient. For example, by adulthood, the highest and lowest fifths of the population on measured childhood self-control had respective rates of multiple health problems of 11% vs. 27%, rates of polysubstance dependence of 3% vs. 10%, rates of annual income under NZ $20,000 of 10% vs. 32%, rates of offspring reared in single-parent households of 26% vs. 58%, and crime conviction rates of 13% vs. 43%. This coincidence of low self-control with poor outcomes bolsters the rationale for opt-out programs by demonstrating that the segment of the adult population that is most inclined to avoid the effortful planning necessary to opt out of default programs (i.e., individuals with the lowest self-control) is the same segment of the adult population that accounts for excess costs to society in health care, financial dependency, and crime. Opt-out programs intended to exploit the laziness in all of us may work best for the least conscientious among us.

With respect to timing of programs to enhance self-control, our findings were consistent with "one-two punch" scheduling of interventions during both early childhood and adolescence (29). On the one hand, low self-control's capacity to predict health, wealth, and crime outcomes from childhood to adulthood was, in part, a function of mistakes our research participants made in the interim adolescent period. Adolescents with low self-control made mistakes, such as starting smoking, leaving high school, and having an unplanned baby, that could ensnare them in lifestyles with lasting ill effects. (Our choice of snares was not exhaustive, but we elected to study those that are already high-priority targets of adolescent education policy.) Thus, interventions in adolescence that prevent or ameliorate the consequences of teenagers' mistakes might go far to improve the health, wealth, and public safety of the population. On the other hand, that childhood self-control predicts adolescents' mistakes implies that early childhood intervention could prevent them. Moreover, even among teenagers who managed to finish high school as nonsmokers and nonparents, the level of personal self-control they had achieved as children still explained variation in their health, finances, and crime when they reached their thirties. Early childhood intervention that enhances self-control is likely to bring a greater return on investment than harm reduction programs targeting adolescents alone (30).

With respect to the scope of programs addressing self-control, our findings raise the question of whether early intervention to enhance self-control should take a targeted approach vs. a universal approach. Health, wealth, and crime outcomes followed a gradient across the full distribution of self-control in the population. If correct, the observed gradient implies room for better outcomes even among the segment of the population whose childhood self-control skills were somewhat above average. Universal interventions that benefit everyone often avoid stigmatizing anyone and also attract widespread citizen support. Testing this gradient in other population representative samples is a research priority. It has been shown that self-control can change (31). Programs to enhance children's self-control have been developed and positively evaluated, and the challenge remains to improve them and scale them up for universal dissemination (32–35). Understanding the key ingredients in self-control and how best to enhance them with a good cost–benefit ratio is a research priority.

Two cohorts born in different countries and different eras support the inference that individuals' self-control is a key ingredient in health, wealth, and public safety as well as a sensible policy target. That many Dunedin study members with low self-control had unplanned babies now growing up in low-income single-parent households reveals that one generation's low self-control disadvantages the next generation. Modern history is seeing a marked increase in human longevity, requiring individuals to pay more strategic attention to their health and wealth to avoid disability and poverty in old age (36). Modern history has also seen marked increases in food availability, sedentary occupations, access to harmful addictive substances, ease of divorce, self-management of retirement savings, and imprisonment of law-breakers. These historical shifts are enhancing the value of individual self-control in modern life, not just for well-being but for survival.

Methods

A more detailed report of the study designs, measures, and analyses is available in *SI Appendix*.

Dunedin Study Sample. Participants are members of the Dunedin Multidisciplinary Health and Development Study, which tracks the development of 1,037 individuals born in 1972–1973 in Dunedin, New Zealand.

Childhood Self-Control. Children's self-control during their first decade of life was measured using nine measures of self-control: observational ratings of children's lack of control (3 and 5 y of age) and parent, teacher, and self-reports of impulsive aggression, hyperactivity, lack of persistence, inattention, and impulsivity (5, 7, 9, and 11 y of age). The nine measures were positively and significantly correlated. Based on principal components analysis, the standardized measures were averaged into a single composite score (M = 0, SD = 1), comprising multiple ages and informants, with strong internal reliability $\alpha = 0.86$. *SI Appendix*, Table S6 shows that whether we examined self-control as measured by observers, teachers, parents, or children's self-reports, individual differences in childhood self-control were significantly related to each of the adult health, wealth, and public safety outcomes; that is, the results were not sensitive to the use of any particular source of information about children's self-control and were robust to the data source in measuring self-control.

Adult Outcomes. Health, wealth, and crime outcomes were assessed at age 32 y by physical examinations, blood tests, personal interviews, record searches, and informant reports.

Sample for Sibling-Comparison Analysis. Participants are members of the E-Risk study, which tracks the development of a nationally representative birth cohort of 2,232 twin children born in England and Wales in 1994–1995.

Childhood Self-Control at the Age of 5 Y. After completing the home visit when siblings were 5 y of age, examiners rated each twin on the measure of self-control that was originally used in the Dunedin study when the children in that study were 3 and 5 y of age (27). In this assessment procedure, the examiners evaluated the following behaviors: lability, low frustration tolerance, hostility, roughness, resistance, restlessness, impulsivity, fleeting attention, and lacking persistence. Each behavioral characteristic was defined in explicit terms, and the examiner evaluated whether each characteristic was not at all (0), somewhat (1), or definitely characteristic (2) of the child. The (interrater) reliability was 0.79.

Children's Outcomes at the Age of 12 Y. Children reported about their delinquent behavior and smoking. Children's educational performance was evaluated by their teachers, who rated each child's performance in English and mathematics.

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SUPPLEMENTAL INFORMATION

Self-Control, Health, Wealth, and Public Safety

Dunedin Study Sample

Participants are members of the Dunedin Multidisciplinary Health and Development Study, a longitudinal investigation of health and behavior in a complete birth cohort. Study members (N=1,037; 91% of eligible births; 52% male) were all individuals born between April 1972 and March 1973 in Dunedin, New Zealand, who were eligible for the longitudinal study based on residence in the province at age 3 and who participated in the first follow-up assessment at age 3. The cohort represents the full range of socioeconomic status in the general population of New Zealand's South Island and is primarily white. Assessments have been carried out at ages 3, 5, 7, 9, 11, 13, 15, 18, 21, 26 and 32 years; in 2004-2005 96% of the 1015 Study members still alive were assessed. Formal analyses undertaken reveal that cohort members with missing data do not differ significantly from those with present data on childhood self-control measures or outcomes reported here (1). At each assessment wave, Study members are brought to the Dunedin research unit for a full day of interviews and examinations. These data are supplemented by searches of official records and by questionnaires that are mailed, as developmentally appropriate, to parents, teachers, and peers nominated by the Study members themselves. The Otago Ethics Committee approved each phase of the study.

Childhood Self-control, Social Class, and IQ

Children's self-control during their first decade of life was measured using a multi-occasion/multi-informant strategy. This article reports a composite measure of

overall self-control that we have described in a previous publication (2). Briefly, the nine measures of childhood self-control in the composite include observational ratings of children's lack of control, parent and teacher reports of impulsive aggression, and parent, teacher, and self reports of hyperactivity, lack of persistence, inattention, and impulsivity. At ages 3 and 5, each study child participated in a testing session involving cognitive and motor tasks. The children were tested by examiners who had no knowledge of their behavioral history. Following the testing, each examiner rated the child's lack of control in the testing session (3). At ages 5, 7, 9, and 11, parents and teachers completed the Rutter Child Scale (RCS)(4), which included items indexing impulsive aggression and hyperactivity. At ages 9 and 11, the RCS was supplemented with additional questions about the children's lack of persistence, inattention, and impulsivity (5). At age 11, children were interviewed by a psychiatrist and reported about their symptoms of hyperactivity, inattention, and impulsivity (6).

Measure	Age(s) assessed	Source	Item content
Lack of control	3, 5	Observer	Labile, low frustration tolerance, lack of reserve, resistance, restless, impulsive, requires attention, brief attention to task, lacks persistence in reaching goals
Impulsive aggression	5, 7, 9, 11	Parent, teacher	Flies off handle, fights
Hyperactivity	5, 7, 9, 11	Parent, teacher	Runs and jumps about, cannot settle, has short attention span
Hyperactivity	9, 11 (additional items)	Parent, teacher	"On the go" as if "driven by a motor", difficulty sitting Still
Lack of persistence	9, 11	Parent, teacher	Fails to finish tasks, easily distracted, difficulty sticking to activity
Impulsivity	9, 11	Parent, teacher	Acts before thinking, has difficulty awaiting turn, shifts excessively between activities
Hyperactivity	11	Self	Fidgety, restless
Inattention	11	Self	Difficulty paying attention, trouble sticking to a task
Impulsivity	11	Self	Difficulty waiting turn, talking while others are still talking

The 9 measures of self-control in childhood were all similarly positively and significantly correlated. Based on principal components analysis, the standardized

components were averaged into a single composite score (M=0, SD=1) with excellent internal reliability α = .86 (2); the first component in a principal component analysis accounted for 51% of the variance. (All analyses were repeated with and without "impulsive aggression" in the scale; findings were unaltered.)

The childhood measure of self-control was related to self-control measured in young adulthood, at age 26. Self-control in young adulthood was measured via informant- and self-reports, combined in a single factor: the Conscientiousness scale of the Big Five Personality Inventory (BFI) was mailed to people nominated by each Study member as knowing him/her well (informants included friends, partners, and family members) and the Self-Control scale of the Multidimensional Personality Questionnaire (MPQ) which was completed by the Study members (7). The results showed that children in the low end of the distribution of childhood self-control were rated, in adulthood, as lowest on self-control whereas children in the high end of the distribution of childhood self-control were rated, in adulthood, as highest on self-control. Looking at the sample divided into quintiles on childhood self-control, the means on adult self-control (sample M=0, SD=1) were -.36, -.12, .01, .17, and .24 ($F=18.96$, $P<.001$), r = .30, $P<.001$.

Children's social class origins (i.e., their parents' social class) was measured on a scale that places occupations into one of six categories (1=professional, 6=unskilled laborer) based on education and income associated with that occupation in data from the New Zealand census (8). The higher of either parent's occupation was averaged across the assessments from birth to age 11.

Children's IQ was assessed at ages 7, 9, and 11 years by the Wechsler Intelligence Scale for Children – Revised (WISC-R)(9). IQ scores for the three ages were averaged and standardized.

Adolescent Snares

We assessed three adolescent snares, defined as risky behavioral choices that may mediate the effects of childhood self-control on adult health and wealth outcomes.

Early tobacco use. Study members were interviewed about their tobacco use throughout their adolescence. We defined early tobacco users as those Study members who smoked by age 15 years (32% of Study members).

No educational qualification. 19% of Study members left secondary school early without any qualifications.

Teenaged parenthood. 6% of Study members experienced an unplanned baby born before their 21st birthday.

We summed these three snares for each Study member; 58% of the Study members encountered no snares, 30% had one snare, 10% had 2 snares, and 2% all three snares.

Adult Health Outcomes

Psychiatric and physical examinations (blood drawn always between 4:15-4:45 pm) were conducted at age 32: 92% of the Study members (N=892) provided blood samples. Pregnant women were excluded from the reported analyses.

Physical health was indexed by 5 clinical measures of poor adult health, including clustering of metabolic abnormalities, airflow obstruction (poor respiratory

health), periodontal disease, sexually transmitted infection, and elevated inflammation level.

Clustering of metabolic abnormalities was assessed by measuring (i) overweight, (ii) high blood pressure, (iii) high total cholesterol, (iv) low high-density cholesterol, (v) high glycated hemoglobin, and (vi) poor cardiovascular fitness (VO_2max, maximum oxygen consumption adjusted for body weight was assessed by measuring heart rate in response to a submaximal exercise test on a friction-braked cycle ergometer). As previously described (10), the number of biomarkers on which each Study member was at risk was summed, and Study members who had at least three risk factors were defined as having "clustered" metabolic risk, 17%.

Respiratory function was assessed using a computerized spirometer and body plethysmograph. Measurements of vital capacity were repeated to obtain at least three repeatable values (within 5%) followed by full-forced expiratory maneuvers to record the forced expiratory volume in 1s (FEV_1). The post-bronchodilator FEV_1/FVC ratio is reported as the primary lung function measure because it is the most sensitive measure for assessing airway remodeling in a large cohort (11). Study members with an FEV_1/FVC ratio below .70 were classified as having significant airflow limitation (12), 4%.

Periodontal disease. Examinations were conducted in all 4 quadrants using calibrated dental examiners; three sites (mesiobuccal, buccal, and distolingual) per tooth were examined, and gingival recession (the distance in millimeters from the cementoenamel junction to the gingival margin) and probing depth (the distance from the probe tip to the gingival margin) were recorded using a National Institute of Dental Research probe. Periodontal measurements were not conducted on those reporting a

history of cardiac valvular anomalies or rheumatic fever (15 individuals). The combined attachment loss (CAL) for each site was computed by summing gingival recession and probing depth (third molars were not included). We report the presence of periodontal disease, defined as 2 sites with 4 or more mm of combined attachment loss, 20%.

Sexually transmitted infection. Serology for herpes simplex virus type 2 infection was performed using an indirect enzyme-linked immunosorbent assay (HerpeSelect 2 ELISA IgG; Focus Technologies, Cypress, Calif) (13). Herpes simplex virus type 2 infection was diagnosed using a cutoff value of 3.5, and any equivocal result (from 0.9 to 3.5) was resolved using herpesvirus 2 Western blot analysis, 18%.

Elevation in inflammation was assessed by assaying high-sensitivity C-Reactive Protein (hsCRP, mg/L). High-sensitivity C-reactive protein level is thought to be one of the most reliable measured indicators of vascular inflammation and has been recently endorsed as an adjunct to traditional risk factor screening for cardiovascular risk. hsCRP was measured on a Hitachi 917 analyzer (Roche Diagnostics, GmbH, D-68298, Mannheim, Germany) using a particle enhanced immunoturbidimetric assay. The CDC/AHA definition of high cardiovascular risk (hsCRP >3 mg/L) was adopted to identify our risk group (14), 20%.

Substance dependence. Substance-use disorders during the past year at age 32 were assessed in private structured interviews using the Diagnostic Interview Schedule (15), and diagnosed according to DSM-IV criteria (16). We assessed tobacco dependence, alcohol dependence, cannabis dependence, and dependence on other drugs. Dependence at age 32 signals a substance problem serious enough to outlast early adulthood, a developmental period when large numbers of young people can meet

criteria for substance disorder on a short-term basis. We summed the number of substances on which each Study member was dependent; 73% of the Study members were free of substance dependence, 20% were dependent on one substance, and 7% on two or more substances.

Informant-rated substance problems were measured by mailing a brief questionnaire to people nominated by the Study member as knowing him/her well (informants included friends, partners, and family members). Full details of the Dunedin Study informant rating system are provided elsewhere (17). Information from informants was available for 96% of Study members seen at age 32. Informants rated the study member on two items ("has alcohol problems," "has marijuana or other drug problems" using a 3-point scale (0=not a problem, 1=bit of a problem, 2=yes, a problem). Items were summed for the final score, Mean=0.13, SD=0.30.

Depression. Study members were interviewed by health professionals using the Diagnostic Interview Schedule (15). Depression was diagnosed using the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (16). Study members were classified as depressed if they experienced recurrent episodes of depression in adulthood, from age 18-32 years, 17%.

Adult Wealth Outcomes

Adult socioeconomic index. The New Zealand Socio-Economic Index (NZSEI) (18) is an occupationally derived measure of socio-economic status (SES) developed using data from the 1996 New Zealand Census. Consistent with the International Socio-economic index (19), scores for each of the occupations listed in the New Zealand Standard Classification of Occupations are scaled from 10 (the lowest) to 90 (the

highest). The range in the Dunedin sample is 10 (e.g., launderer) to 89 (e.g., anaesthesiologist). The sample had a mean SES of 41.5 (SD = 16.5).

Income. Following the census (20), Study members were asked to list their sources of income and given the choice of 13 different income categories to report their total pre-tax annual income from all sources. Income averaged $42,694 (SD = 25,817).

Single-parent child-rearing. With the aid of the Life History Calendar (21), we obtained details about whether and when each Study member had children and with whom these children were living.

In private interviews with each Study member, we assessed their financial planfulness and financial struggles.

Financial planfulness was indexed by two scales:

Saving behavior. Study members' attitudes toward saving and saving behaviors were assessed with six questions: "Is saving for the future important to you?", "Do you save money to buy expensive items by putting money away and not touching it?", "Do you make regular savings into a special bank account?", "Do you think that saving money makes people more independent?", "Are you often puzzled by where your money goes?", "Do you think it is important to live within your budget?"(22). Responses (0=no, 1=yes) were summed to form a scale, Mean=4.1, SD=1.3.

Financial building blocks. Study members were asked if they were home owners, had investments such as stocks or business investments, and if they had a retirement plan. We counted the number of building blocks for each Study member, Mean = 1.3, SD = 1.0.

The final “Financial Planfulness” measure was computed by standardizing the Saving Behavior and Financial Building Blocks scales and averaging.

Financial struggles were indexed by two scales:

Money-management difficulties. Study members were asked, “Since you were 26, did you ever find it difficult to meet the cost of”…. “food and other necessities,” “your rent, mortgage, or contribution for keep,” “bills for things like insurance, phone or heating,” “having a night out or presents for the family,” “holidays or travel,” “major repairs to your house or car,” and “do you find yourself living from paycheck to paycheck.” Responses were summed to form a scale, Mean=4.0, SD=4.3.

Credit problems. Study members were asked, “Since you were 26, have you”….. “been turned down for a credit card,” “defaulted on a credit card payment,” “missed a bill, mortgage, or loan payment,” “sold an asset to pay a bill,” “sold any of your belongings to a pawnbroker,” “been declared bankrupt?” We counted the number of credit problems for each Study member, Mean=0.6, SD=0.9.

The final “Financial Struggles” measure was computed by standardizing the Money Management Difficulties and Credit Problems scales and averaging.

Informant-rated financial problems were measured by mailing a brief questionnaire to people nominated by the Study member as knowing him/her well, as described earlier. Informants rated the Study member on two items (“poor money manager,” “lacks enough money to make ends meet”) using a 3-point scale (0=not a problem, 1=bit of a problem, 2=yes, a problem), Mean=0.7, SD=0.9, Range: 0-4.

Crime Outcomes

Criminal convictions between ages 17 and 32 were measured by searching the computerized New Zealand Police database. Computerized records covered all courts in Australia, New Zealand, and surrounding islands. Convictions included *property* (e.g., theft of property of value greater than $500, receipt of stolen property, burglary, breaking and entering, shoplifting, credit car theft), c*ourt-order violations* (e.g., obstructing or resisting police, breaching parole, escaping prison, misleading welfare officer, failing to pay fines, failing to answer summons), *drugs* (e.g., possessing drug paraphernalia, supplying or procuring hard drugs or prescription medications, selling cannabis), *violence* (e.g., aggravated cruelty to animal, common assault, assault with intent to injure with weapon, assault of police officer, robbery, robbery aggravated with firearm, manslaughter, rape, common assault domestic). 24% of the sample had at least one conviction.

Statistical analysis

First, we tested the bivariate associations between childhood self-control and adult outcomes, in the full cohort (with sex as a covariate) as well as for males and females separately. Second, we tested the associations between childhood self-control and adult outcomes controlling for childhood social origins and childhood IQ as covariates (as well as sex), in a regression of the form:

$$A = a + b_1SC + b_2SES + b_3IQ + e,$$

where A is an adult health or wealth measure, SC is childhood self-control, SES is childhood socioeconomic status, IQ is childhood intelligence quotient, and e is an error term. The form of regression varied depending on whether the outcome under consideration represented binary, count, or continuous data. Logistic regression models

were utilized to model odds ratios (OR with 95% confidence intervals) when analyzing binary adult outcomes (i.e., depression, conviction); poisson regressions were used to model incident-rate ratios (IRR with 95% confidence intervals) when analyzing count data that were not overdispersed (i.e., number of health problems); negative binomial regressions were utilized to model incidence-rate ratios (IRR with 95% confidence intervals) when analyzing count data that were overdispersed (e.g., substance dependence); and, ordinary least squares regression models were used to estimate coefficients (B with standard errors) predicting continuously-distributed scales (i.e., socioeconomic status, income, financial planfulness, financial struggles). Third, we tested whether childhood self-control is associated with poor adult outcomes because children with poor self-control make mistakes and bad choices as adolescents (i.e., the snare hypothesis) or whether childhood self-control is independently associated with poor adult outcomes. We tested this by comparing self-control coefficients on adult outcomes (a) before partialling out the effect of adolescent snares; (b) after partialling out the effect of adolescent snares; and (c) by estimating the association between childhood self-control and adult outcomes among the “utopian” group of Study members who did not encounter any adolescent snares.

Sample for sibling-comparison analysis

Participants were members of the Environmental Risk (E-Risk) Longitudinal Twin Study, which tracks the development of a nationally representative birth cohort of 2,232 British children. The sample was drawn from a larger birth register of twins born in England and Wales in 1994-1995 (23). Details about the sample have been reported previously (24). Briefly, the E-risk sample was constructed in 1999-2000, when 1,116

families with same-sex 5-year old twins (93% of those eligible; 49% male) participated in home-visit assessments. Families were recruited to represent the UK population of families with newborns in the 1990s, based on (a) residential location throughout England and Wales and (b) mother's age (i.e., older mothers having twins via assisted reproduction were under-selected and teenage mothers with twins were over-selected). We used this sampling (a) to replace high-risk families who were selectively lost to the register via nonresponse and (b) to ensure sufficient numbers of children growing up in high-risk environments. Follow-up home visits were conducted when the children were aged 7 years (98% participation), 10 years (96% participation), and, most recently, 12 years (96% participation). We applied sibling fixed-effects models to the dizygotic pairs (N= 509 pairs), because they are no more alike than ordinary siblings (with the added advantage of being the same age and sex). Parents gave informed consent and children gave assent. The Joint South London and Maudsley and the Institute of Psychiatry NHS Ethics Committee approved each phase of the study.

Childhood self-control at age 5 years

After completing the age-5 home visit, examiners rated each twin on the measure of self-control that was originally used in the Dunedin Study when the children in that study were age 3 and 5 years (3). In this assessment procedure, the examiners evaluated the following behaviors: lability, low frustration tolerance, hostility, resistance, restlessness, impulsivity, requires attention, fleeting attention, and lacking persistence. Each behavioral characteristic was defined in explicit terms, and the examiner evaluated whether each characteristic was (0) not at all, (1) somewhat, or (2) definitely characteristic of the child. The (inter-rater) reliability was = .79.

Behavioral characteristic	Age assessed	Source	Description
Labile	5	Observer	Instability of emotional responses, overreactivity to external situations and to stimuli.
Low frustration tolerance	5	Observer	Refusal to continue or attempt tasks that appear difficult
Lack of reserve	5	Observer	Assertive, rough, aggressive behavior that is lacking in reserve.
Resistance	5	Observer	Resistance to directions or to demands of the situation and the examiner.
Restlessness	5	Observer	Extreme overactivity, inability to sit still, constantly in motion.
Impulsivity	5	Observer	Explosive, uncontrolled behavior.
Requires attention	5	Observer	Constant need for attention or help.
Fleeting attention	5	Observer	Lack of concentration, brief attention to tasks.
Lacking persistence	5	Observer	Little effort to reach a goal, inability to keep goal or question in mind.

Children's outcomes at age 12 years

Children reported about their delinquent behavior using a self-administered protocol on a laptop computer with headphones, designed to preserve the child's privacy and insure that low reading level did not affect responses. Questions were specifically selected to map onto DSM-IV (16) criteria for conduct disorder (e.g., Have you damaged a parked car? Have you hurt someone just for the fun of it? Have you stolen something while nobody was looking?).

Children reported about smoking in the same computer administered protocol, in response to the question: Have you tried smoking a cigarette? (No = 0, Yes - only once or twice = 1; Yes - more than twice = 2).

Children's educational performance was evaluated by their teachers, who rated each child's performance in English and Math in relation to his or her peers using a seven-point scale, ranging from (1) much less to (7) much more compared with other children in the classroom.

Children's IQ was assessed by the Wechsler Intelligence Scale for Children – IV (25)

Statistical analysis

The sibling fixed effects model captures within-family differences by controlling for unobserved family-level variables (26-28). This is accomplished by differencing estimates across siblings so that the effect of unobserved family-level factors is reduced. More completely, in Equation (1),

$$Y_{ik} = \alpha + \beta SC_{ik} + F_i + \varepsilon_{ik} \quad (1)$$

Y_{ik} represents the outcome of interest (i.e., antisocial behavior, school performance, or smoking) for twin *k* in family *i*, SC represents self-control for twin *k* in family *i*, and the traditional error term is broken into two components:

(a) F_i, represents unmeasured family-level effects for family *i*, and

(b) ε_{ik}, represents error specific to twin *k* in family *i*

Implementing the sibling fixed effects model involves taking averages across siblings and subtracting them from Equation (1). The family fixed effect model then becomes:

$$(Y_{ik} - Y_{.k}) = \beta(SC_{ik} - SC_{.k}) + \gamma(F_i - F_{.k}) + (\varepsilon_{ik} - \varepsilon_{.k}) \quad (2)$$

where $Y_{.k}$, $SC_{.k}$, $F_{.k}$ and $\varepsilon_{.k}$ are sibling averages for Y, SC, F, and ε, respectively. Given that F is constant within a family, $\gamma(F_k - F_{.k})$ equals zero, leaving only the sibling-varying self-control effect (SC_{ik}). β then provides an unbiased estimate of the effect of self-control on Y (i.e., school performance, antisocial behavior, or smoking). We repeated all analyses with sibling differences in IQ as an additional covariate.

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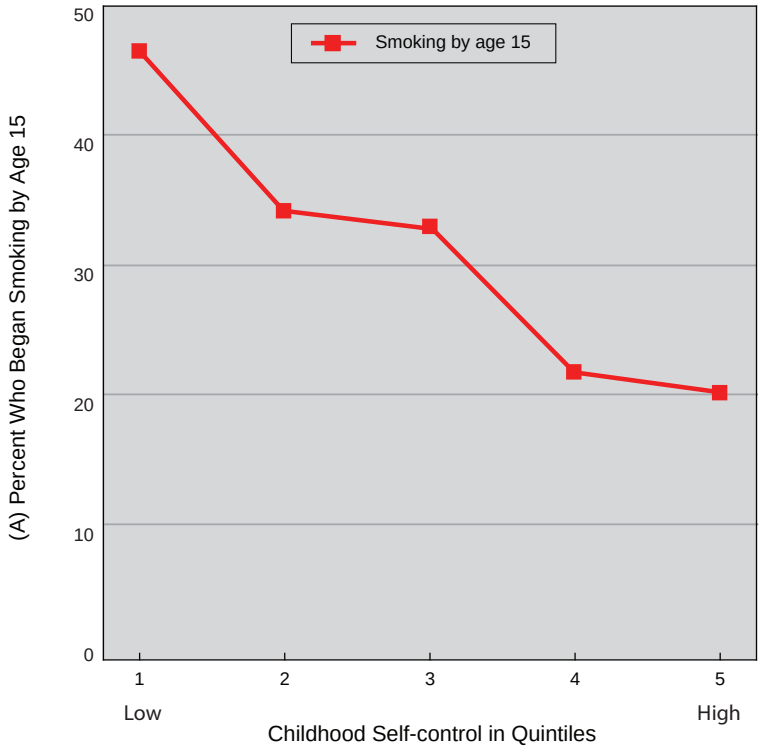
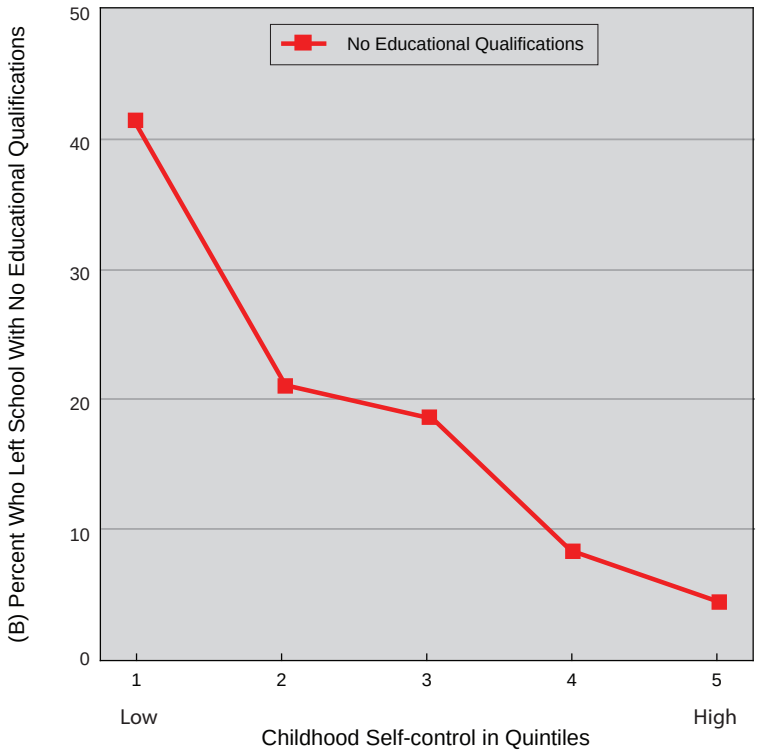
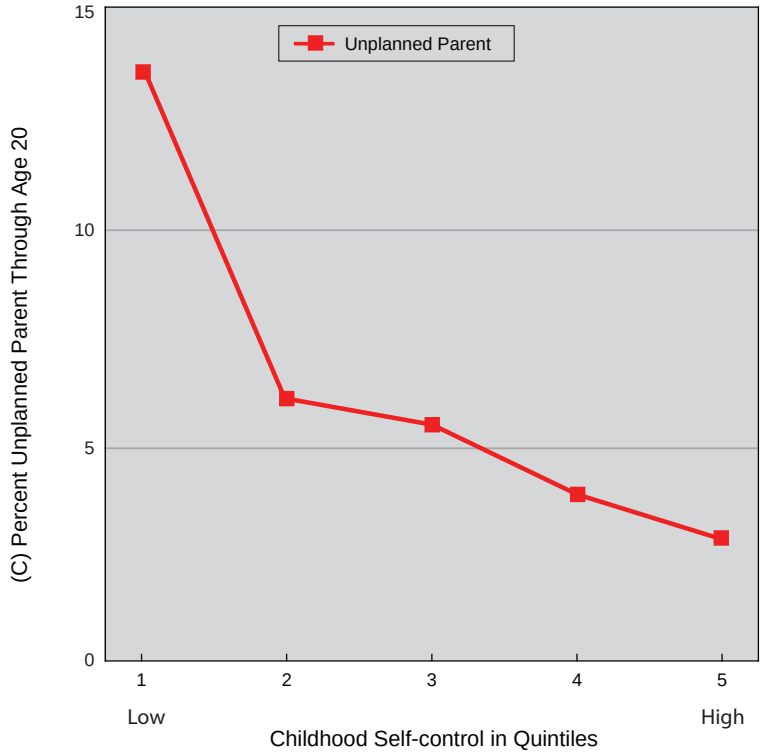
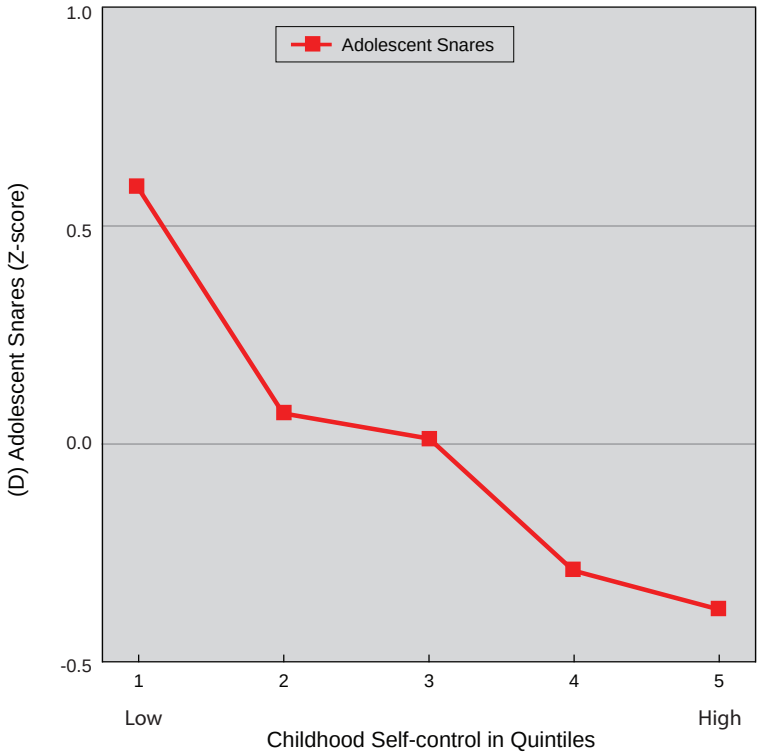
Supplemental Figure 1. Self-control gradient: Children with low self-control were more likely to begin smoking by age 15 (Panel A)**, leave school with no educational qualifications** (Panel B), and **become unplanned parents through age 20 (**Panel C**) than those with high self-control. Panel D shows the self-control gradient for the composite measure of these three adolescent snares.**









Supplemental Table 1. Does poor self-control in childhood lead to poor health, wealth-related problems, and criminal convictions in adulthood? The table shows the association between childhood self-control and each of the outcome variables (shaded) and their components (not shaded), for the full sample (in blue), for females, and for males. The sex differences column shows whether the association between self-control and the outcome differed between females and males. If the test of sex differences in association fell below p<.10, we report the exact p value.

Adult outcomes and predictors:	Full Sample			Sex differences? Yes/No	Females			Males		
Health	Coefficient	95% CI/SE	P		Coefficient	95% CI/SE	P	Coefficient	95% CI/SE	P
Physical Health Index (0 - 5) [a]	1.196	1.113-1.285	<.001	No	1.179	1.047-1.329	.007	1.205	1.101-1.320	<.001
Clustering of metabolic abnormalities [b]	1.332	1.120-1.584	.001	No	1.404	1.037-1.903	.028	1.299	1.052-1.603	.015
Poor respiratory function [b]	1.170	.851-1.608	.335	No	.865	.393-1.904	.719	1.259	.887-1.786	.198
Periodontal disease [b]	1.294	1.100-1.523	.002	No	1.464	1.102-1.946	.009	1.221	1.003-1.488	.047
Sexually transmitted infection [b]	1.194	1.001-1.424	.049	No	1.156	.879-1.521	.298	1.222	.970-1.538	.089
Clinically elevated inflammation levels [b]	1.237	1.039-1.473	.017	No	1.220	.937-1.588	.140	1.250	.991-1.578	.060
Recurrent Depression [b]	1.187	.994-1.419	.059	No	1.222	.945-1.580	.127	1.071	.845-1.359	.570
Substance Dependence Index (0-4) [a]	1.299	1.156-1.460	<.001	No	1.358	1.109-1.663	.003	1.274	1.104-1.407	<.001
Tobacco dependence [b]	1.437	1.228-1.682	<.001	No	1.359	1.044-1.770	.023	1.482	1.217-1.805	<.001
Alcohol dependence [b]	1.116	.888-1.404	.346	No	.932	.547-1.587	.794	1.170	.906-1.510	.228
Marijuana dependence [b]	1.233	.954-1.594	.109	P = .051	2.045	1.185-3.528	.101	1.106	.829-1.477	.492
Dependence on Other Illicit Drugs [b]	1.582	1.189-2.104	.002	No	2.239	1.340-3.741	.002	1.386	.985-1.950	.061
Informant-reported Substance Problems [c]	.178	.035	<.001	No	.108	.045	.020	.208	.050	<.001
Wealth										
Socioeconomic Status [c]	-.263	.035	<.001	No	-.161	.062	.001	-.310	.042	<.001
Income [c]	-.238	.034	<.001	No	-.199	.058	<.001	-.262	.042	<.001
Single-parent Child-rearing [b,d]	1.633	1.304-2.046	<.001	No	1.647	1.175-2.308	.004	1.622	1.199-2.195	.002
Financial Planfulness [c]	-.195	.034	<.001	No	-.178	.056	<.001	-.197	.044	<.001
Saving behaviors [c]	-.139	.035	<.001	No	-.148	.057	.001	-.126	.044	.005
Financial building blocks [c]	-.162	.035	<.001	No	-.118	.056	.010	-.183	.044	<.001
Financial Struggles [c]	.152	.035	<.001	No	.176	.057	<.001	.128	.044	.005
Money management difficulties [c]	.137	.034	<.001	P = .019	.187	.062	<.001	.096	.040	.034
Credit problems [c]	.115	.035	<.001	No	.097	.054	.035	.121	.046	.008
Informant-reported Financial Problems [c]	.274	.034	<.001	No	.280	.053	<.001	.257	.046	<.001
Public Safety										
Criminal Conviction [b]	1.830	1.559-2.148	<.001	No	1.693	1.248-2.297	<.001	1.886	1.558-2.283	<.001

[a] IRR, [b] OR, [c] Standardized OLS regression coefficient, [d] This analysis is restricted to 47% of the Study members who have had a child.

Supplemental Table 2. Does the effect of low self-control operate throughout the self-control distribution or is it driven by the least (and most) self-controlled children?

	Model 1: Full Sample			**Model 2: After removing children in the lowest self-control quintile**			**Model 3: After removing children in the lowest and highest self-control quintiles**		
Adult outcomes and predictors:	Coeff	95% CI/SE	P	Coeff	95% CI/SE	P	Coeff	95% CI/SE	P
A: Health									
Physical Health Index (0-5) [a]									
Low Self-control	1.196	1.113-1.285	<.001	1.215	1.113-1.326	<.001	1.179	1.072-1.297	.001
Substance Dependence Index (0-4) [a]									
Low Self-control	1.299	1.156-1.460	<.001	1.317	1.147-1.514	<.001	1.284	1.102-1.496	.001
Informant-reported Substance Problems [b]									
Low Self-control	.178	.035	<.001	.112	.065	.002	.109	.097	.010
B: Wealth									
Socioeconomic Status [b]									
Low Self-control	-.263	.035	<.001	-.190	.076	<.001	-.148	.105	.001
Income [b]									
Low Self-control	-.238	.034	<.001	-.149	.074	<.001	-.119	.103	.004
Single Parent Child Rearing [c, d]									
Low Self-control	1.633	1.304-2.046	<.001	1.561	1.240-1.964	<.001	1.332	1.036-1.713	.026
Financial Planfulness [b]									
Low Self-control	-.195	.034	<.001	-.118	.071	.001	-.096	.099	.022
Financial Struggles [b]									
Low Self-control	.152	.035	<.001	.131	.070	<.001	.100	.102	.016
Informant-reported Financial Problems [b]									
Low Self-control	.274	.034	<.001	.203	.066	<.001	.202	.095	<.001
C: Public Safety									
Criminal Conviction [c]									
Low Self-control	1.830	1.559-2.148	<.001	1.566	1.292-1.899	<.001	1.373	1.126-1.674	.002

[a] IRR, [b] Standardized OLS regression coefficient, [c] OR, [d] This analysis is restricted to 47% of the Study members who have had a child.

Supplemental Table 3. Does increased self-control from childhood to young adulthood predict better health, more wealth, and less crime by age 32 years? Each child was assigned to one of five quintiles reflecting their childhood self-control score. To answer the question of whether there might be benefits associated from moving a child at a low quintile of self-control in childhood to a higher quintile, we cross-classified children's self-control scores (in quintiles) with their young-adult self-control scores (in quintiles) and constructed a scale ranging from -4 (decreasing self-control) to +4 (increasing self-control). The table shows the association between change in self-control (denoted as Δ self-control) and each of the age-32 outcomes, controlling for initial levels of childhood self-control.

Adult outcomes and predictors:	Coeff	95% CI/SE	P
Health			
Physical Health Index (0-5) [a]			
Low Self-control	1.161	1.081-1.247	<.001
Δ Self-control	.992	.938-1.050	.794
Substance Dependence Index (0-4) [a]			
Low Self-control	1.530	1.365-1.713	<.001
Δ Self-control	.763	.697-.836	<.001
Informant-reported Substance Problems [b]			
Low Self-control	.268	.030	<.001
Δ Self-control	-.213	.024	<.001
Wealth			
Socioeconomic Status [b]			
Low Self-control	-.308	.031	<.001
Δ Self-control	.090	.025	.031
Income [b]			
Low Self-control	-.285	.030	<.001
Δ Self-control	.090	.024	.027
Single Parent Child Rearing [c, d]			
Low Self-control	1.924	1.573-2.353	<.001
Δ Self-control	.686	.587-.802	<.001
Financial Planfulness [b]			
Low Self-control	-.428	.029	<.001
Δ Self-control	.380	.023	<.001
Financial Struggles [b]			
Low Self-control	.343	.030	<.001
Δ Self-control	-.278	.023	<.001
Informant-reported Financial Problems [b]			
Low Self-control	.428	.029	<.001
Δ Self-control	-.284	.023	<.001
Public Safety			
Criminal Conviction [c]			
Low Self-control	2.073	1.758-2.443	<.001
Δ Self-control	.714	.631-.809	<.001

[a] IRR, [b] Standardized OLS regression coefficient, [c] OR, [d] This analysis is restricted to 47% of the Study members who have had a child. Δ self-control = change in self-control rank.

Supplemental Table 4. Does poor self-control in childhood lead to poor health, wealth-realated problems and criminal convictions in adulthood independently of adolescent snares? Adolescent snares include smoking, school-leaving, and unplanned teen parenthood. Model 1 shows the association between childhood self-control and adolescent snares on adult outcomes. Model 2 shows the unique effects of childhood self-control on adult outcomes, controlling for adolescent snares (and of adolescent snares, controlling for childhood self-control). Model 3 shows the effects of childhood self-control on adult outcomes among adolescents who did not encounter any snares, a so-called "utopian" control group.

	Model 1: Independent Effects			**Model 2: Statistical Control**			**Model 3: Utopian Control**		
	Coeff	95% CI/SE	P	Coeff	95% CI/SE	P	Coeff	95% CI/SE	P
Health									
Physical Health Index (0-5) [a]									
Self-Control	1.196	1.113 - 1.285	<.001	1.136	1.049 - 1.230	.002	1.246	1.101 - 1.411	.001
Adolescent Snares	1.262	1.153 - 1.382	<.001	1.188	1.076 - 1.311	.001	--	--	--
Substance Dependence Index (0-4) [a]									
Self-Control	1.299	1.156 - 1.460	<.001	1.089	.962 - 1.232	.179	1.269	.994 - 1.622	.056
Adolescent Snares	1.800	1.576 - 2.055	<.001	1.730	1.497 - 1.999	<.001	--	--	--
Informant-Reported Substance Problems [c]									
Self-Control	.178	.035	<.001	.084	.036	.014	.066	.035	.124
Adolescent Snares	.309	.041	<.001	.281	.044	<.001	--	--	--
Wealth									
Socioeconomic Status [c]									
Self-Control	-.263	.035	<.001	-.175	.037	<.001	-.201	.055	<.001
Adolescent Snares	-.284	.043	<.001	-.224	.046	<.001	--	--	--
Income [c]									
Self-Control	-.238	.034	<.001	-.176	.036	<.001	-.176	.054	<.001
Adolescent Snares	-.221	.042	<.001	-.161	.045	<.001	--	--	--
Single Parent Child Rearing [b, d]									
Self-Control	1.633	1.304 - 2.046	<.001	1.258	.978 - 1.620	.074	1.323	.887 - 1.973	.170
Adolescent Snares	2.290	1.789 - 2.932	<.001	2.113	1.627 - 2.743	<.001	--	--	--
Financial Planfulness [c]									
Self-Control	-.195	.034	<.001	-.132	.037	<.001	-.158	.052	<.001
Adolescent Snares	-.224	.042	<.001	-.178	.044	<.001	--	--	--
Financial Struggles [c]									
Self-Control	.152	.035	<.001	.083	.037	.017	.117	.049	.007
Adolescent Snares	.233	.042	<.001	.205	.044	<.001	--	--	--
Informant-Reported Financial Problems [c]									
Self-Control	.274	.034	<.001	.200	.036	<.001	.174	.045	<.001
Adolescent Snares	.262	.042	<.001	.193	.045	<.001	--	--	--
Public Safety									
Criminal Conviction [b]									
Self-Control	1.830	1.559 - 2.148	<.001	1.457	1.218 - 1.743	<.001	1.701	1.295 - 2.234	<.001
Adolescent Snares	3.507	2.797 - 4.397	<.001	3.057	2.415 - 3.870	<.001	--	--	--

[a] IRR, [b] OR, [c] Standardized OLS regression coefficient, [d] This analysis is restricted to 47% of the Study members who have had a child.

Supplemental Table 5. Does lack of self-control at pre-school ages (3-5 years) lead to poor health, wealth related problems, and criminal convictions in adulthood?

Adult outcomes:	Coeff	95% CI/SE	P
A. Health			
Physical Health Index [a]	1.102	1.059 - 1.147	<.001
Substance Dependence Index [a]	1.103	1.031 - 1.18	.004
Informant-reported Substance Abuse Problems [c]	.103	.020	.001
B. Wealth			
Socioeconomic Status [c]	-.153	.021	<.001
Income [c]	-.135	.020	<.001
Single Parent Child Rearing [b, d]	1.232	1.092 - 1.391	<.001
Financial Planfulness [c]	-.129	.020	<.001
Financial Struggles [c]	.048	.020	.141
Informant-reported Financial Problems [c]	.130	.020	<.001
C. Public Safety			
Criminal Conviction [b]	1.219	1.116 - 1.331	<.001

[a] IRR, [b] OR [c] Standardized OLS regression coefficient, [d] This analysis is restricted to 47% of the Study members who have had a child.

Supplemental Table 6. The composite measure of childhood self control includes information derived from 4 reporting /informant sources: observational ratings of children's lack of self-control at ages 3-5; teacher ratings of children's self control at ages 5,7, 9, and 11; parent reports of children's self control at ages 5,7, 9, and 11; and children's self-reports at age 11 years. This table shows associations between observer (A), teacher (B), parent (C), and children's self (D) reports of self control and each of the adult outcomes. Whether we examined self control as measured by observers, teachers, parents, or children's self reports, individual differences in childhood self control were significantly related to adult health, wealth, and public safety outcomes; that is, the results were not sensitive to the use of any particular source of information about children's self control and were robust to data source in measuring self control.

Adult Outcomes	A. Observer			B. Teacher		
	Coefficient	**95% CI / SE**	**P**	**Coefficient**	**95% CI / SE**	**P**
A. Health Outcomes						
Physical Health Index [a]	1.102	1.059 - 1.147	<.001	1.221	1.127 - 1.322	<.001
Substance Dependence Index [a]	1.103	1.031 - 1.180	0.004	1.274	1.120 - 1.449	<.001
Informant-Rated Substance Abuse Problems [b]	0.103	0.020	0.001	0.178	0.039	<.001
B. Wealth						
Socio-Economic Status [c]	-0.153	0.021	<.001	-0.210	0.040	<.001
Income [c]	-0.135	0.020	<.001	-0.211	0.038	<.001
Single-Parent Child-Rearing [b,d]	1.232	1.092 - 1.391	<.001	1.439	1.127 - 1.837	0.004
Financial Planfulness [c]	-0.129	0.020	<.001	-0.176	0.039	<.001
Financial Struggles [c]	0.048	0.020	0.141	0.153	0.039	<.001
Informant-Rated Financial Problems [c]	0.130	0.020	<.001	0.232	0.039	<.001
C. Public Safety						
Criminal Convictions [b]	1.219	1.116 - 1.331	<.001	1.881	1.575 - 2.246	<.001
Adult Outcomes	C. Parent			D. Child		
	Coefficient	**95% CI / SE**	**P**	**Coefficient**	**95% CI / SE**	**P**
A. Health Outcomes						
Physical Health Index [a]	1.122	1.023 - 1.231	0.015	1.098	0.996 - 1.209	0.060
Substance Dependence Index [a]	1.195	1.031 - 1.385	0.018	1.314	1.127 - 1.532	0.001
Informant-Rated Substance Abuse Problems [b]	0.110	0.042	0.001	0.141	0.043	<.001
B. Wealth						
Socio-Economic Status [c]	-0.191	0.043	<.001	-0.183	0.045	<.001
Income [c]	-0.144	0.042	<.001	-0.165	0.044	<.001
Single-Parent Child-Rearing [b,d]	1.275	0.991 - 1.641	0.059	1.802	1.317 - 2.464	<.001
Financial Planfulness [c]	-0.062	0.042	0.061	-0.192	0.044	<.001
Financial Struggles [c]	0.073	0.042	0.026	0.144	0.044	<.001
Informant-Rated Financial Problems [c]	0.213	0.041	<.001	0.177	0.044	<.001
C. Public Safety						
Criminal Convictions [b]	1.623	1.347 - 1.957	<.001	1.616	1.324 - 1.972	<.001

[a] IRR, [b] OR, [c] Standardized OLS regression coefficient, [d] This analysis is restricted to 47% of the study members who have had a child. Results are sex adjusted.