

Turning Vicious Cycles Into Virtuous Ones: the Potential for Schools to Improve the Life Course

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abstract

Adolescence is a critical transition period that sets the stage for adulthood and future health outcomes. Marked by key developmental milestones in brain maturation, increasing independence from parents, and greater connections to peers, adolescence is also a time of heightened risk for behavioral health problems, including substance use, violence, delinquency, and mental health issues. High school completion is a significant life course event and a powerful social determinant of health and health disparities. Jessor's Theory of Problem Behavior suggests that adolescent health behaviors and mental health problems are closely tied to poor educational outcomes and peer network formation in a reinforcing feedback loop, or vicious cycle, often leading to school failure, school disengagement, and drop-out. Schools are a novel platform through which vicious cycles can be disrupted and replaced with virtuous ones, simultaneously improving education and health. This article describes the potential for schools to transform health trajectories through interventions creating positive and supportive school climates. In addition, new models such as the Whole School Whole Community Whole Child Model promote whole child well-being, including cognitive, social, emotional, psychological, and physical development. Full-service community schools can serve as a hub coordinating and integrating all available resources to better respond to the needs of children and families. Present in every neighborhood, schools are a way to reach every school-age child and improve their health trajectories, providing an important platform for life course intervention research.



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A central idea to Life Course Health Development (LCHD) is the idea of timing; that certain transition periods exist during which biological, social, behavioral, and other factors are particularly influential on health and the acquisition of capabilities.¹ Much of the focus of life course research has been on early childhood because of the rapid changes that occur during that time. However, important transitions arise throughout the life span. In this article, we discuss the importance of adolescence and the risks and opportunities that this transition period presents for later adult health. We also discuss the effect that education and school environments have on health trajectories. Current thinking about LCHD asserts that social and cultural factors create a “social scaffolding” that can support and promote health development.¹ During adolescence, teachers, coaches, school counselors, and peers are often highly influential. Harnessing these influences could be an important way to reengineer the social scaffolding during the vulnerable period of adolescence.

Perhaps one aspect not fully appreciated in current LCHD models is the impact of political and sociological timing. Currently in the United States, health care systems have increasingly recognized the importance of social determinants on health. Although these ideas are not new, health care systems are more receptive to addressing the social needs of patients, in part because of the Affordable Care Act, which incentivizes value-based care and population health improvements.² Concurrently, primary and secondary public schools in the United States have had a similar transition. In 2001, with the passage of the No Child Left Behind Act, school accountability and benchmarking

were central to this policy and “success” was largely measured by standardized test results. The narrow focus of this policy in defining school success on the basis of acquisition of cognitive skills led to push-back and a subsequent recognition that noncognitive skills, often referred to as “social-emotional learning,” are also important. The Every Student Succeeds Act, passed in 2015, allowed schools to expand the definitions of school success beyond test scores and permitted states to create more holistic measures of child development.³ Although there remains great debate on school accountability and how to measure success, schools have increasingly embraced the need to address child health and well-being. In short, the US health care and education systems have taken a step closer to recognizing that health and education are intertwined and that success in one perhaps cannot be achieved without addressing the other. Although this step might be arguably small, it is a step in the right direction, and this article discusses the opportunity for a societal transition to improve life course trajectories through schools.

THE IMPORTANCE OF ADOLESCENCE

Adolescence is a critical transition period that sets the stage for adulthood and future health outcomes. It is marked by key developmental milestones and brain maturation in regions that influence cognitive and decision-making skills and executive functioning. Adolescents seek greater independence from their parents, increasing their connections to peers and looking beyond family members for support. As part of this separation from family, they continue to formulate their self-concept and social identity, which is intertwined with the growing importance and influence of peers.

As teens broaden their social networks and look to peers for social acceptance, social-emotional capabilities develop and become increasingly salient to their well-being.^{4,5} These social-emotional capabilities are related to self (eg, confidence, esteem, self-concept, conscientiousness, control of emotions), skills related to social relationships (eg, empathy, cooperation, social awareness, communication, leadership), and skills related to tasks (eg, patience, resiliency, growth mindset, persistence, optimism, creativity).⁶

During this transition to adulthood, adolescents are also exposed to heightened risk from various behavioral health problems, including substance use, violence, delinquency, and mental health issues. Stress increases for a variety of reasons related to growing academic pressures, relationships with peers, and family conflict as teens strive for greater independence. Because of this psychosocial stress, as well as biological changes involving cognitive maturation and sex hormones, the prevalence of depression and anxiety also increases during these years.⁷ For example, the annual prevalence of depression increases from <1% during childhood to 4% to 5% during adolescence.⁷⁻⁹ Substance use increases as teens begin experimenting with new behaviors, exhibit independence, and look for acceptance from peers. Some teens may use drugs and alcohol to cope with stress. Greater engagement with risky peers reinforces risky behaviors and may increase risk for conflict, violence, and exposure to the criminal justice system. The long-term effects of these adolescent problems can be profound. For example, three-quarters of adults with depression were diagnosed during adolescence or earlier.¹⁰

Finally, one of the most significant life course milestones during adolescence is the completion of secondary education. High school completion is a powerful social determinant of health and health disparities throughout the life course.^{11,12} Observational studies have found that students who complete their education without a high school diploma have worse health outcomes in adulthood across a wide spectrum of acute and chronic diseases, such as heart disease, cancer, obesity, and HIV infection.^{13,14} Greater investments in education and more school rigor are linked to better health, particularly among low-income and minority populations,^{15,16} and experimental and quasi-experimental studies suggest the impact of education on health is causal.^{17–20} Obtaining a high school diploma is the gateway to higher education, employment opportunities, and socioeconomic success. Thus, poor educational outcomes are a precursor of other key social determinants of adult health, including under- and unemployment, incarceration, poverty, housing instability, family instability, and limited access to health care,^{13,21,22} further increasing the risk of poor health in adulthood.

THE VICIOUS CYCLE OF POOR ACADEMIC PERFORMANCE AND BEHAVIORAL HEALTH PROBLEMS

Three decades ago, in his Theory of Problem Behavior, Richard Jessor theorized that many of the developmental, behavioral, and academic milestones of adolescence are intertwined. He posited that adolescent health behaviors and mental health problems are closely tied to poor educational outcomes and peer network formation in a reinforcing feedback loop often leading to school disengagement, school failure, and incompleteness of high school (Fig 1).^{23,24} Friendship networks coalesce around teens

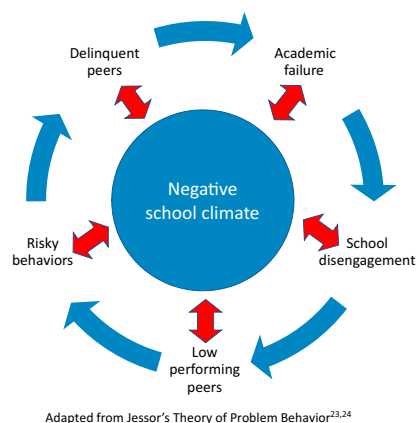


FIGURE 1 Vicious cycle of academic failure and risky behaviors. (Adapted from Jessor R. Problem-behavior theory, psychosocial development and adolescent problem drinking. *Br J Addict*. 1987;82(4):331–342 and Jessor R. Risk behavior in adolescence: a psychosocial framework for understanding and action. *J Adolesc Health*. 1991;12(8):597–605.)

with similar interests and behaviors. When applied to poor-performing, disengaged, and misbehaving students in schools, the result has been described as “deviancy clustering.” This concept may capture the complexity of issues facing students but may also fail to recognize the agency of students who disengage or violate norms because their schools are not structured to support their engagement. For example, it has been proposed that schools that track students into classes on the basis of school performance may be creating environments that perpetuate inequities.²⁵ Academic policies and other school factors (often referred to as “school climate”) such as teacher support and school safety are thought to shape adolescent academic and behavioral outcomes.²⁶

Adolescents who do not experience school success may develop a poor self-concept that propels disruptive behavior. Furthermore, executive function is a critical component of

brain function that primarily develops during the teenage years²⁷ and is impaired by substance use.²⁸ Substance use, comorbid mental health problems, and poor executive functioning in turn negatively influence academic engagement and achievement.²⁹ Poor academic achievement further drives poor self-concept, deviancy clustering, and more delinquent behaviors. This vicious cycle all takes place in school settings where peers adopt behaviors from each other via social influence. Jessor’s theory suggests that this vicious cycle can lead to an overall negative school climate, which then further contributes to both academic failure and delinquency.

The life course implications of entering the vicious cycle are enormous given the importance of educational, developmental, and behavioral health capabilities that are often acquired during and essential to adolescence.^{30,31} For example, puberty and sex hormone changes increase the risk for depression.⁷ Substance use often complicates depression,^{32,33} impairs cognitive capabilities, including verbal and working memory, visual–spatial functioning, and psychomotor speed; and has been linked to changes in brain structure, such as declines in frontal and temporal gray matter volume.^{28,34} Executive functioning, decision-making, and emotional control have not fully matured, leading teens to make poor decisions that are largely influenced by a need to fit in among their peers who are also not fully mature. Setbacks in school can cascade into larger problems that reverberate through the transition to college and adulthood. Substance use and engagement in other risky behaviors can lead to school disciplinary action, such as suspension and expulsion, which can then deprive teens of the support of

teachers and staff when they need it most. Since teens are also developing their sense of identity, self-concept, and worth, negative feedback from peers and adults can be particularly devastating, especially among those who have not yet developed coping strategies and resiliency skills. Recovering from this vicious cycle during the transition to adulthood is very difficult, especially as the adult support network that is present in childhood contracts as the teen strives to be more independent.

VIRTUOUS CYCLES AND THE PROMISE OF SCHOOLS AS A PLATFORM FOR IMPROVING LIFE TRAJECTORIES

In short, education and health outcomes (including cognitive development, mental health, social-emotional outcomes) are closely linked, which creates great risk for adolescents who enter a vicious cycle of poor school performance and risky health behaviors. But by disrupting this vicious cycle, it can be converted into a virtuous cycle whereby improvements in education lead to better health and vice versa (Fig 2). Within the school environment, just as poor performing peers (academically and behaviorally) reinforce each other's academic and adolescent behaviors, academically

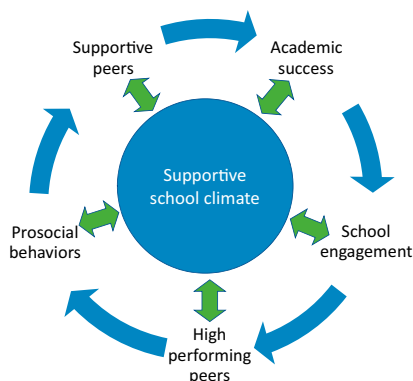


FIGURE 2
Virtuous cycle of academic success and positive behaviors.

engaged and prosocial peers can also reinforce positive and adaptive adjustment during this vulnerable period of heightened sensitivity to social influence.³⁵ Consequently, positive school environments can create the social scaffolding that supports and promotes the acquisition of essential cognitive, social, emotional, and behavioral capabilities that are important during adolescence and later adult life.

Jessor's theory may be limited in suggesting that student behaviors drive school climate, rather school climate can also drive student behavior. Teachers, staff, school policies, pedagogical practices, and structure can create a supportive environment, one in which students are empowered, connected, and successful. This supportive environment creates normative behaviors and attitudes that further promote academic engagement, support of others, and prosocial behaviors. If so, schools could be a transformative platform for improving life trajectories.

EVIDENCE THAT VIRTUOUS CYCLES CAN BE ACHIEVED THROUGH SCHOOLS

Early education intervention studies, including the Carolina Abecedarian and Perry Preschool Projects, suggest that starting children on the right educational path from the beginning is remarkably powerful and protective over the life course.³⁶⁻⁴¹ These randomized trials demonstrated that preschool programs can improve the life course trajectory across multiple domains, including health (blood pressure, obesity, cholesterol and cortisol levels, exercise, substance use, diabetes, and executive functioning), employment, income, and incarceration.

Although numerous observational studies have found very strong

associations between health and education,^{14,42} the effect of secondary education on health is less well documented. Causal evidence comes from a few charter school studies that used admissions lotteries to conduct natural experiments.^{17-19,43} These studies sampled teens who lived in low-income neighborhoods and applied to high-performing charter schools (identification of high-performing schools was on the basis of standardized test results). Comparing students who "won" the lottery with those who "lost" the lottery, the charter school studies demonstrated that exposure to high-performing schools not only increased the likelihood of academic success, but also reduced substance use, delinquent behaviors, and incarceration. Although these studies may not be generalizable to all families and adolescents living in low-income neighborhoods of color, they provide a more rigorous study design in which to understand the causal impact of education and school environments on academic and behavioral health. Specifically, these natural experimental studies avoid potential confounding because of selection bias that is likely to exist in observational studies. For example, well-behaving, more motivated students are likely to seek out more rigorous, higher-performing schools, and wealthier families have greater access to supportive resources and better schools.

There is further evidence that interventions purely focused on academic behavior have spillover effects on health. Bergman devised a simple intervention to encourage middle and high school students to complete homework by notifying parents by text message or e-mail if their child was behind on their homework, only providing the details of the missing assignment. In

just 6 months, grades and standardized test scores significantly and substantially improved.⁴⁴ The impact of this intervention on educational outcomes has since been confirmed in other studies, including schools in several other US cities and 4 other countries.⁴⁵⁻⁴⁷

The intervention was also replicated in 4 middle schools and found to reduce alcohol and marijuana initiation by almost 50%.⁴⁸ In another set of studies, Van Ryzin and colleagues implemented cooperative learning into school pedagogy and studied its effects. By having students engage in group-based learning, they found academic outcomes improved, along with reductions in alcohol and tobacco use, and this effect was mainly mediated by peer and friendship networks.⁴⁹⁻⁵¹ These controlled randomized trials provide the strongest evidence in support of Jessor's Theory of Problem Behavior and the capacity to create virtuous cycles in schools that simultaneously improve both education and health.

SCHOOLS HAVE THE POTENTIAL TO TRANSFORM HEALTH TRAJECTORIES

The limitations of our health care and public health systems were starkly visible this last year during the coronavirus disease 2019 pandemic, exposing what we already knew: biomedical discovery by itself is not enough to protect or improve population health. The changes that are needed are not just limited to improving health care delivery and making it more equitable. They must address the root causes of health and health disparities. Transformative changes are needed to effectively and significantly improve the life course starting from birth for everyone, especially the most vulnerable segments of our society.

What does it mean to be transformative? Truly

transformative interventions need to be more than effective, they also need to be scalable, targeted, timely, transmissible, inheritable, and multilevel. Although having any 1 of these characteristics might be enough to make an intervention transformative, employing schools as a platform to improve education and health outcomes has all these attributes. We assert that when schools are structured to improve both education and health outcomes, our system of public education offers the best hope for social transformation and improvements in the life course.

Scalable

The financial and human capital costs of implementation of many health interventions are common critical barriers to dissemination. Scalability increases as the marginal cost of treating an additional person reaches 0, essentially becoming self-sustaining. Approaching schools as a "systems change" has a fixed cost that would not require perpetual public health investments of time or money to reach large numbers of individuals on a continuous basis. Investing in high-quality schools as a health intervention continues to benefit future cohorts of students. Furthermore, converting the vicious cycle of poor school performance and poor behavioral health among teens into a virtuous cycle of education achievement, engagement, and prosocial behaviors could be self-sustaining and self-reinforcing.

Targeted

In health care systems, patients in greatest need are often the hardest to reach. In contrast, schools provide teachers and staff access to students daily during the academic year and thus much greater potential to influence teens than health care professionals. Schools have access to all adolescents, including those who are vulnerable

to academic and behavioral setbacks. Public schools are particularly well situated to reach minority children from low-income families.

Timely

Because schools have daily access to teens, teachers, and staff can potentially monitor for early markers of health problems and engage parents and health care providers for help before these problems become more difficult to address. For example, school absence is sometimes the first signs of depression,⁵² and thus chronic absenteeism could trigger a screen by a school psychologist or counselor.

Transmissible

Although it is commonly recognized that some diseases are communicable, health behaviors (good and bad) are also transmissible. For example, individuals are more likely to lose weight or quit smoking when their friends and family members do so.^{53,54} Thus, a "behavioral vaccine" has been proposed as a potential transformative way to change behavior at a population level, whereby good behaviors transmitted to enough persons within a social network has the potential to inoculate others in the network.⁵⁵ Teens are particularly susceptible to the influence of peer networks.^{56,57} Focusing on schools has the potential to provide "herd immunity" if normative behavior in a school community can be shifted toward academic engagement and prosocial behaviors.

Inheritable

Interventions would have greater impact if protecting patients also protects their children. Poverty and its negative effects on health are inheritable, not genetically, but in the sense that poverty and its effects

are passed between generations.^{58,59} Studies have shown that young adults who are set on a better life course trajectory more often convey benefits to their children.^{58,60,61} By improving education and health outcomes among teens before they become adults and start a family, schools could greatly improve later adult health and socioeconomic status, transmitting those benefits to their children.

Multilevel

The causes of health and health disparities are complex and thus solutions are more likely to be transformative if they impact multiple levels. At the student level, positive school climates promote well-being, academic success, and reduce risky and delinquent behaviors.²⁶ At the peer network level, schools could cultivate social inclusion and connectedness, reduce bullying, and counteract pressure by peers to engage in delinquent and disruptive behaviors.⁶² At the family level, successful schools could increase parental involvement and self-efficacy, which are significant protective factors.⁶³⁻⁶⁶ Schools could also serve as entry points for reaching families, including recent immigrants and refugees,⁶⁷ and deliver interventions aimed at improving family outcomes.⁶⁸ Systems change at the school level, not just placement of interventions targeting youth located in schools, has the potential to improve the whole school environment and influence the entire social network of adolescents. At the community level, schools can play a unique role in creating and nurturing healthy neighborhoods, becoming catalysts for placed-based development and change.⁶⁹

TRANSFORMATIVE SCHOOLS

To create schools as a transformative platform for improving health, it is first

necessary to recognize the critical impact that education and school environments have on adolescents and the role they play in helping teens acquire the developmental and behavioral capacities they need to achieve a healthier life course. The Centers for Disease Control and Prevention (CDC) has proposed an important model for how schools should be redesigned: the Whole School, Whole Community, Whole Child Model (Fig 3).⁷⁰⁻⁷² Schools have traditionally focused primarily on the cognitive development of children and the acquisition of specific academic skills centered on traditional academic outcomes, including grades and test scores. The CDC has promoted the concept that whole child well-being includes not only cognitive development, but also social, emotional, psychological, and physical development. Recognizing the growing literature that schools have an important influence on all these components, the whole child model suggests schools should be explicitly designed around achieving a broader set of developmental goals for children, which is key to improving population health outcomes.

An important element of the CDC model acknowledges the importance of “whole community.” Many community resources are available to children and adolescents to support their well-being and growth. These resources are not limited to physicians and mental health professionals in health care systems, but also include parents, teachers, school counselors, and coaches, constituting a network of supportive adults and services. They could even include businesses, the justice system, and other community and religious organizations. Although current health care guidelines recommend physicians screen for behavioral health problems, only one-third of adolescents have a

well-child visit in a given year.⁷³ Furthermore, teens often become less communicative with parents as they strive to be more independent, and thus less likely to disclose problems around mental health, substance use, and academic problems.⁷⁴ Consequently, reliance on traditional health care settings to screen for adolescent health problems often means these problems are recognized too little and too late. However, early signs of behavioral health problems often manifest as poor school performance, disruptive behaviors, and poor attendance.^{52,75} Thus, schools and teachers are much better positioned to identify adolescent problems early before teens get caught too far in the vicious cycle and refer for further care and support. For vulnerable youth, including those who have suffered trauma or have fewer resources at home, schools may be the main source of support and services.

Unfortunately, the family, school, community, and health system that should form a network of supportive adults and services around adolescents are often fragmented and disconnected, making it difficult to identify and address students' needs. In recent years, health care systems have increasingly recognized the importance of social determinants of health, including education.⁷⁶ At the same time, schools and educators have also realized the importance of addressing health and social-emotional problems. Despite this recognition that health and education outcomes are intertwined, there are limited mechanisms to share relevant information and coordinate the network of supportive adults and services surrounding children and adolescents. Even within schools, adolescent students rotate through

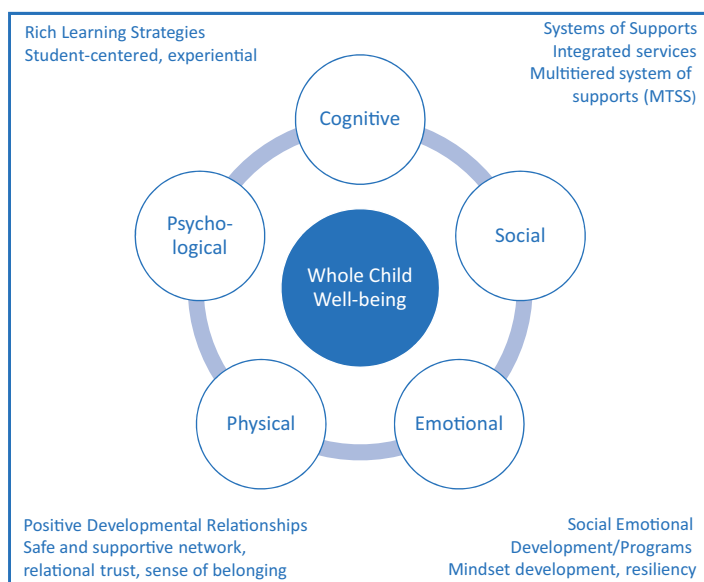


FIGURE 3 Whole School, Whole Community, Whole Child Model. (Adapted from Darling-Hammond et al and Cantor et al.)

multiple teachers and classrooms each day and few systems provide a child-centered, holistic view of overall function and well-being. Even fewer systems allow for care coordination and closed loop communication to ensure that students receive the needed support services and that the desired improvement occurs. Given the daily exposure of children to schools, teachers, and other school-related adults can play a central role in monitoring child well-being and identifying when more supports and services are needed. At the same time, we need to overcome the barriers to sharing information about youth so that health care and education systems can expand beyond their silos and coordinate their efforts to improve child well-being and promote positive health and resiliency.

THE FULL-SERVICE COMMUNITY SCHOOL

The CDC's Whole School, Whole Community, Whole Child Model is similar to the approach taken by the US Department of Education to

advance full-service community schools, which are defined by 4 pillars: (1) integrated student supports, (2) expanded learning time and opportunities, (3) family and community engagement, and (4) collaborative leadership and practice.⁷⁷ These mutually reinforcing pillars have been shown to positively impact student and school outcomes, particularly in communities facing concentrated poverty.^{77-79,80} When schools serve as the hub to coordinate all available resources (eg, education, health, social work, housing, food), they are able to better support and respond to the needs of children and families in the neighborhood. Community schools integrate these resources with the help of coordinators, counselors, teachers, and other professionals.⁸¹ A recent Rand study of community schools in New York City found that they significantly improve academic outcomes, including attendance and standardized test scores, graduation rates, and reduced disciplinary incidents on campus.⁷⁹ There is some evidence that mental health

outcomes were also improved, particularly in those community schools with greater integration of mental health services.

Although there is a renewed interest in community schools, they are not new. As a reform, community schools date back more than a century to the Settlement House Movement led by Jane Addams and the democratic education ideals of John Dewey. The movement was strengthened in the civil rights era and formalized in policies that support community school development, such as the Community Schools Act of 1974. There are currently an estimated 8000 to 10 000 community schools, between 6% and 8% of the nation's schools, and the numbers are increasing given the influx of state and federal support, such as the Full-Service Community School Expansion Act of 2021.⁸² The global pandemic has hastened the need for the wrap-around supports provided through community schools, and the racial justice uprisings have underscored the value of pedagogy that builds on the local assets of communities of color.

The most prevalent critique of community schools comes from advocates for desegregation. Neighborhood community schools have been criticized as engines of racial and economic segregation, with desegregation advocates arguing instead for schools of choice, such as magnets and permit programs or redistricting strategies, to disrupt patterns of racial isolation.⁸³ Indeed, neighborhood community schools are defined by the demographics of their student body, demographics that mirror broader patterns of residential segregation. There is ample evidence, however, that community schools can serve as a strategy to strengthen communities and rebuild or reimagine historic neighborhood

schools, those under threat of school closures, as pillars of their communities. By broadening the responsibility for student well-being beyond traditional educational entities to the interconnected systems that serve young people and their families, community schools aim to disrupt the deep and enduring social and racial inequalities suffered by our most marginalized communities.

CONCLUSIONS

Present in every neighborhood, schools are a way to reach every school-age child and improve their health trajectory. This opportunity could be particularly impactful for adolescents, who are not only at a critical and vulnerable juncture in life, but are often difficult to reach. Despite the dangers posed by the vicious cycle of academic failure and adolescent health problems, there is the promise that we can leverage the mechanisms of adolescent development and create virtuous cycles. If so, then the right investments in schools could potentially transform health trajectories positively in a scalable way. Our society has already invested substantially in schools. Similar to international comparisons of health care expenditures, the United States spends relatively more on education per pupil compared with other countries.⁸⁴ Yet many schools struggle to provide the developmental capabilities that children need because of the challenges of poverty and inequities in society. Despite the many barriers to improving our educational system, we would argue that finding solutions should be a priority as a life course intervention. We believe there is enormous opportunity to maximize the utility of educational investments and to better coordinate the network of supportive adults and services to ensure adolescents successfully achieve provide youth the cognitive,

behavioral, social, and other developmental capabilities that are essential for health over the life course.

ABBREVIATIONS

CDC: Centers for Disease Control and Prevention
 LCHD: Life Course Health Development

REFERENCES

- Halfon N, Larson K, Lu M, Tullis E, Russ S. Lifecourse health development: past, present and future. *Matern Child Health J*. 2014;18(2):344–365
- Solomon L, Kanter MH. Health care steps up to social determinants of health: current context. *Perm J*. 2018;22:18–139
- Larocca R, Krachman SB. Transforming Education. Expanding the definition of student success under ESSA: opportunities to advance social-emotional mindsets, skills, and habits for today's students. Available at: <http://files.eric.ed.gov/fulltext/ED605420.pdf>. Accessed June 30, 2021
- Oberle E, Schonert-Reichl KA, Thomson KC. Understanding the link between social and emotional well-being and peer relations in early adolescence: gender-specific predictors of peer acceptance. *J Youth Adolesc*. 2010;39(11):1330–1342
- Meuwese R, Braams BR, Güroğlu B. What lies beneath peer acceptance in adolescence? Exploring the role of Nucleus Accumbens responsivity to self-serving and vicarious rewards. *Dev Cogn Neurosci*. 2018;34:124–129
- Schoon I. Towards an integrative taxonomy of social-emotional competences. *Front Psychol*. 2021;12:515313
- Thapar A, Collishaw S, Pine DS, Thapar AK. Depression in adolescence. *Lancet*. 2012;379(9820):1056–1067
- Avenevoli S, Swendsen J, He J-P, Burstein M, Merikangas KR. Major depression in the national comorbidity survey-adolescent supplement: prevalence, correlates, and treatment. *J Am Acad Child Adolesc Psychiatry*. 2015;54(1):37–44.e2
- Lewinsohn PM, Rohde P, Klein DN, Seeley JR. Natural course of adolescent major depressive disorder: I. Continuity into young adulthood. *J Am Acad Child Adolesc Psychiatry*. 1999;38(1):56–63
- Kim-Cohen J, Caspi A, Moffitt TE, Harrington H, Milne BJ, Poulton R. Prior juvenile diagnoses in adults with mental disorder: developmental follow-back of a prospective-longitudinal cohort. *Arch Gen Psychiatry*. 2003;60(7):709–717
- Sasson I, Hayward MD. Association between educational attainment and causes of death among White and Black US adults, 2010–2017. *JAMA*. 2019;322(8):756–763
- Walsemann KM, Geronimus AT, Gee GC. Accumulating disadvantage over the life course: evidence from a longitudinal study investigating the relationship between educational advantage in youth and health in middle age. *Res Aging*. 2008;30(2):169–199
- Cutler DM, Lleras-Muney A. Education and health: evaluating theories and evidence. NBER Working Paper No. 12352. Available at: <https://www.nber.org/papers/w12352>. Accessed October 29, 2021
- Wong MD, Shapiro MF, Boscardin WJ, Ettner SL. Contribution of major diseases to disparities in mortality. *N Engl J Med*. 2002;347(20):1585–1592
- Frisvold D, Golberstein E. School quality and the education-health relationship: evidence from blacks in segregated schools. *J Health Econ*. 2011;30(6):1232–1245
- Hao Z, Cowan BW. The effects of graduation requirements on risky health behaviors of high school students. *Am J Health Econ*. 2019;5(1):97–125
- Dudovitz RN, Chung PJ, Reber S, et al. Assessment of exposure to high-performing schools and risk of adolescent substance use: a natural experiment. *JAMA Pediatr*. 2018;172(12):1135–1144
- Wong MD, Collier KM, Dudovitz RN, et al. Successful schools and risky behaviors among low-income adolescents. *Pediatrics*. 2014;134(2):e389–e396
- Dobbie W, Fryer RG. The Medium-Term Impacts of High-Achieving Charter Schools. *Journal of Political Economy*. 2015;123(5):985–1037
- Galama TJ, Lleras-Muney A, van Kippersluis H. The effect of education on health and mortality: a review of

- experimental and quasi-experimental evidence. Available at: www.nber.org/papers/w24225.pdf. Accessed June 3, 2021
21. Wiesner M, Vondracek FW, Capaldi DM, Porfeli E. Childhood and adolescent predictors of early adult career pathways. *J Vocat Behav.* 2003;63(3):305–328
 22. French MT, Homer JF, Popovici I, Robins P. What you do in high school matters: the effects of high school GPA on educational attainment and labor market earnings in adulthood. *East Econ J.* 2015;41(3):370–386
 23. Jessor R. Problem-behavior theory, psychosocial development, and adolescent problem drinking. *Br J Addict.* 1987;82(4):331–342
 24. Jessor R. Risk behavior in adolescence: a psychosocial framework for understanding and action. *J Adolesc Health.* 1991;12(8):597–605
 25. Oakes J. *Keeping track: How schools structure inequality.* New Haven, CT: Yale University Press; 2005
 26. Thapa A, Cohen J, Guffey S, Higgins-D'Alessandro A. A review of school climate research. *Rev Educ Res.* 2013;83(3):357–385
 27. Blakemore SJ, Choudhury S. Development of the adolescent brain: implications for executive function and social cognition. *J Child Psychol Psychiatry.* 2006;47(3–4):296–312
 28. Squeglia LM, Gray KM. Alcohol and drug use and the developing brain. *Curr Psychiatry Rep.* 2016;18(5):46
 29. Casey BJ, Jones RM. Neurobiology of the adolescent brain and behavior: implications for substance use disorders. *J Am Acad Child Adolesc Psychiatry.* 2010;49(12):1189–1201, quiz 1285
 30. Kann L, McManus T, Harris WA, et al. Youth risk behavior surveillance – United States, 2015. *MMWR Surveill Summ.* 2016;65(6):1–174
 31. Merikangas KR, He JP, Burstein M, et al. Lifetime prevalence of mental disorders in U.S. adolescents: results from the National Comorbidity Survey Replication–Adolescent Supplement (NCS-A). *J Am Acad Child Adolesc Psychiatry.* 2010;49(10):980–989
 32. Marmorstein NR. Longitudinal associations between alcohol problems and depressive symptoms: early adolescence through early adulthood. *Alcohol Clin Exp Res.* 2009;33(1):49–59
 33. Marmorstein NR. Longitudinal associations between depressive symptoms and alcohol problems: The influence of comorbid delinquent behavior. *Addict Behav.* 2010;35(6):564–571
 34. Windle M, Gray JC, Lei KM, et al. Age sensitive associations of adolescent substance use with amygdalar, ventral striatum, and frontal volumes in young adulthood. *Drug Alcohol Depend.* 2018;186:94–101
 35. Telzer EH, van Hoorn J, Rogers CR, Do KT. Social influence on positive youth development: a developmental neuroscience perspective. *Adv Child Dev Behav.* 2018;54:215–258
 36. Schweinhart LJ, Berrueta-Clement JR, Barnett WS, Epstein AS, Weikart DP. Effects of the Perry Preschool Program on youths through age 19: a summary. *Top Early Child Spec Educ.* 1985;5(2):26–35
 37. Schweinhart LJ, Montie J, Xiang Z, Barnett WS. *Lifetime Effects: the High/Scope Perry Preschool Study Through Age 40.* Ypsilanti, MI: HighScope Press; 2005
 38. Heckman JJ, Karapakula G. National Bureau of Economic Research. The Perry preschoolers at late midlife: a study in design-specific inference. Available at: www.nber.org/papers/w25888. Accessed May 5, 2021
 39. Campbell F, Conti G, Heckman JJ, et al. Early childhood investments substantially boost adult health. *Science.* 2014;343(6178):1478–1485
 40. Muennig P, Robertson D, Johnson G, Campbell F, Pungello EP, Neidell M. The effect of an early education program on adult health: the Carolina Abecedarian Project randomized controlled trial. *Am J Public Health.* 2011;101(3):512–516
 41. Conti G, Heckman J, Pinto R. The effects of two influential early childhood interventions on health and healthy behaviour. *Econ J.* 2016;126(596):F28–F65
 42. Cutler DM, Lleras-Muney A. Understanding differences in health behaviors by education. *J Health Econ.* 2010;29(1):1–28
 43. Dobbie W, Fryer RG. Are high-quality schools enough to increase achievement among the poor? Evidence from the Harlem children's zone. *Am Econ J Appl Econ.* 2011;3(3):158–187
 44. Bergman P. Parent–child information frictions and human capital investment: evidence from a field experiment. *J Polit Econ.* 2021;129(1):286–322
 45. Bergman P, Chan EW. Leveraging parents through low-cost technology: the impact of high-frequency information on student achievement. *J Human Resources.* 2019;56(1):125
 46. Kraft MA, Rogers T. The underutilized potential of teacher-to-parent communication: Evidence from a field experiment. *Econ Educ Rev.* 2015;47:49–6
 47. Berlinski S, Busso M, Dinkelman T, Martinez C. Reducing parent–school information gaps and improving education outcomes: evidence from high frequency text messaging in Chile. Available at: https://www.povertyactionlab.org/sites/default/files/publications/726_20Reducing-Parent-School-information-gap_BBDM-Dec2016.pdf. Accessed October 29, 2021
 48. Bergman P, Dudovitz RN, Dosanjh KK, Wong MD. Engaging parents to prevent adolescent substance use: a randomized controlled trial. *Am J Public Health.* 2019;109(10):1455–1461
 49. Van Ryzin MJ, Roseth CJ. Enlisting peer cooperation in the service of alcohol use prevention in middle school. *Child Dev.* 2018;89(6):e459–e467
 50. Van Ryzin MJ, Roseth CJ. Peer influence processes as mediators of effects of a middle school substance use prevention program. *Addict Behav.* 2018;85:180–185
 51. Van Ryzin MJ, Roseth CJ. The power of peer influence to address student behavioral problems. *Phi Delta Kappan.* 2018;99(8):62–66
 52. Gase LN, Kuo T, Collier K, Guerrero LR, Wong MD. Assessing the connection between health and education: identifying potential leverage points for public health to improve school attendance. *Am J Public Health.* 2014;104(9):e47–e54
 53. Christakis NA, Fowler JH. The collective dynamics of smoking in a large social network. *N Engl J Med.* 2008;358(21):2249–2258
 54. Christakis NA, Fowler JH. The spread of obesity in a large social network over 32 years. *N Engl J Med.* 2007;357(4):370–379

55. Embry DD. The Good Behavior Game: a best practice candidate as a universal behavioral vaccine. *Clin Child Fam Psychol Rev*. 2002;5(4):273–297
56. Pollard MS, Tucker JS, Green HD, Kennedy D, Go M-H. Friendship networks and trajectories of adolescent tobacco use. *Addict Behav*. 2010;35(7):678–685
57. Wong MD, Strom D, Guerrero LR, et al. The role of social–emotional and social network factors in the relationship between academic achievement and risky behaviors. *Acad Pediatr*. 2017;17(6):633–641
58. Heckman JJ, Karapakula G. Intergenerational and intragenerational externalities of the Perry Preschool Project. Working Papers 2019-033, Human Capital and Economic Opportunity Working Group. 2019
59. Card D, Domnisoru C, Taylor L. The intergenerational transmission of human capital: evidence from the golden age of upward mobility. Available at: www.nber.org/papers/w25000. Accessed May 7, 2021
60. Chetty R, Hendren N, Katz LF. The effects of exposure to better neighborhoods on children: new evidence from the moving to opportunity experiment. *Am Econ Rev*. 2016;106(4):855–902
61. Chetty R, Hendren N. The impacts of neighborhoods on intergenerational mobility II: county-level estimates. Available at: www.nber.org/papers/w23002. Accessed October 29, 2021
62. Eisenberg ME, Neumark-Sztainer D, Perry CL. Peer harassment, school connectedness, and academic achievement. *J Sch Health*. 2003;73(8):311–316
63. Shakya HB, Christakis NA, Fowler JH. Parental influence on substance use in adolescent social networks. *Arch Pediatr Adolesc Med*. 2012;166(12):1132–1139
64. DeVore ER, Ginsburg KR. The protective effects of good parenting on adolescents. *Curr Opin Pediatr*. 2005;17(4):460–465
65. Dornbusch SM, Ritter PL, Leiderman PH, Roberts DF, Fraleigh MJ. The relation of parenting style to adolescent school performance. *Child Dev*. 1987;58(5):1244–1257
66. Murphy DA, Brecht M-L, Huang D, Herbeck DM. Trajectories of delinquency from age 14 to 23 in the National Longitudinal Survey of Youth Sample. *Int J Adolesc Youth*. 2012;17(1):47–62
67. McNeely CA, Morland L, Doty SB, et al. How schools can promote healthy development for newly arrived immigrant and refugee adolescents: research priorities. *J Sch Health*. 2017;87(2):121–132
68. Kratochwill TR, McDonald L, Levin JR, Scalia PA, Coover G. Families and schools together: an experimental study of multi-family support groups for children at risk. *J Sch Psychol*. 2009;47(4):245–265
69. Teasley M. School social workers and urban education reform with African American children and youth: realities, advocacy, and strategies for change. *Sch Community J*. 2004;14(2):19–38
70. Lewallen TC, Hunt H, Potts-Datema W, Zaza S, Giles W. The whole school, whole community, whole child model: a new approach for improving educational attainment and healthy development for students. *J Sch Health*. 2015;85(11):729–739
71. Darling-Hammond L, Flook L, Cook-Harvey C, Barron B, Osher D. Implications for educational practice of the science of learning and development. *Appl Dev Sci*. 2019;24(2):97–140
72. Cantor P, Lerner RM, Pittman KJ, Chase PA, Gomperts N. *Whole-Child Development, Learning, and Thriving: A Dynamic Systems Approach*. New York, NY: Cambridge University Press; 2021
73. Rand CM, Goldstein NPN. Patterns of primary care physician visits for US adolescents in 2014: implications for vaccination. *Acad Pediatr*. 2018;18(2S):S72–S78
74. Hamza CA, Willoughby T. Perceived parental monitoring, adolescent disclosure, and adolescent depressive symptoms: a longitudinal examination. *J Youth Adolesc*. 2011;40(7):902–915
75. Bradley BJ, Greene AC. Do health and education agencies in the United States share responsibility for academic achievement and health? A review of 25 years of evidence about the relationship of adolescents' academic achievement and health behaviors. *J Adolesc Health*. 2013;52(5):523–532
76. Figueroa JF, Frakt AB, Jha AK. Addressing social determinants of health: time for a polysocial risk score. *JAMA*. 2020;323(16):1553–1554
77. Oakes J, Maier A, Daniel J. National Education Policy Center. Community schools: an evidence-based strategy for equitable school improvement. Available at: https://learningpolicyinstitute.org/sites/default/files/product-files/Community_Schools_Evidence_Based_Strategy_BRIEF.pdf. Accessed April 13, 2021
78. Horn MB, Freeland J, Butler SM. Brookings Institution. Schools as community hubs: integrating support services to drive educational outcomes. A series of discussion papers on building healthy neighborhoods. Available at: <https://www.brookings.edu/wp-content/uploads/2016/06/Horn-Freeland-Paper-FINAL.pdf>. Accessed September 24, 2021
79. Johnston W, Engberg J, Opper I, Sontag-Padilla L, Xenakis L. *Illustrating the Promise of Community Schools: an Assessment of the Impact of the New York City Community Schools Initiative*. Santa Monica, CA: RAND Corporation; 2020
80. What is a community school? Available at: www.communityschools.org/aboutschools/what_is_a_community_school.aspx. Accessed April 26, 2021
81. Blank MJ, Villareal L. Where it all comes together. *Am Educ*. 2015;39(3):4–9
82. Harper K, Jonas S, Winthrop R. Brookings Institution. Education inequality, community schools, and system transformation: launching the task force on next generation community schools. Available at: <https://www.brookings.edu/blog/education-plus-development/2020/11/10/education-inequality-community-schools-and-system-transformation-launching-the-task-force-on-next-generation-community-schools/>. Accessed September 24, 2021
83. Tefera A, Frankenberg E, Siegel-Hawley G, Chirichigno G. Integrating suburban schools: how to benefit from growing diversity and avoid segregation. Available at: <https://civilrightsproject.ucla.edu/research/k-12-education/integration-and-diversity/integrating-suburban-schools-how-to-benefit-from-growing-diversity-and-avoid-segregation/tefera-suburban-manual-2011.pdf>. Accessed September 24, 2021
84. Irwin V, Zhang J, Wang X, et al. *Report on the Condition of Education 2021 (NCES 2021-144)*. Washington, DC: U.S. Department of Education: National Center for Education Statistics; 2021