

The Potential for Youth Sports to Improve Childhood Outcomes

The Council of Economic Advisers
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Executive Summary

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Children’s experiences can have important long-term consequences for their health and wellbeing. One potentially valuable experience is participation in youth sports, which may yield benefits including improved physical health and the development of generalizable skills. In this report, CEA reviews the evidence on access to youth sports and long-term effects of participation. First, we analyze the current state of access to youth sports, noting that girls and children from lower-income families participate at lower rates than those from higher-income families. Second, we review the theoretical mechanisms through which youth sports may improve childhood outcomes, along with some of the evidence on these benefits. Third, we review the literature that addresses concerns about causal inference in the analysis of the relationship between youth sports and outcomes. The estimates from these approaches suggest a positive relationship between participation in youth sports and outcomes. While a full-scale cost-benefit analysis is beyond the scope of this paper, even small investments in this area could have a positive impact. Commonly started and staffed by volunteers, youth sports leagues promote more active lifestyles and facilitate positive mentorship and peer-to-peer relationships that can enhance outcomes later in life.

1. Current State of Youth Sports Participation

Assessing the status of youth participation in the United States reveals notable differences between subgroups. These differences may be factors of interest during future policymaking concerning access to opportunities and resource allocation.

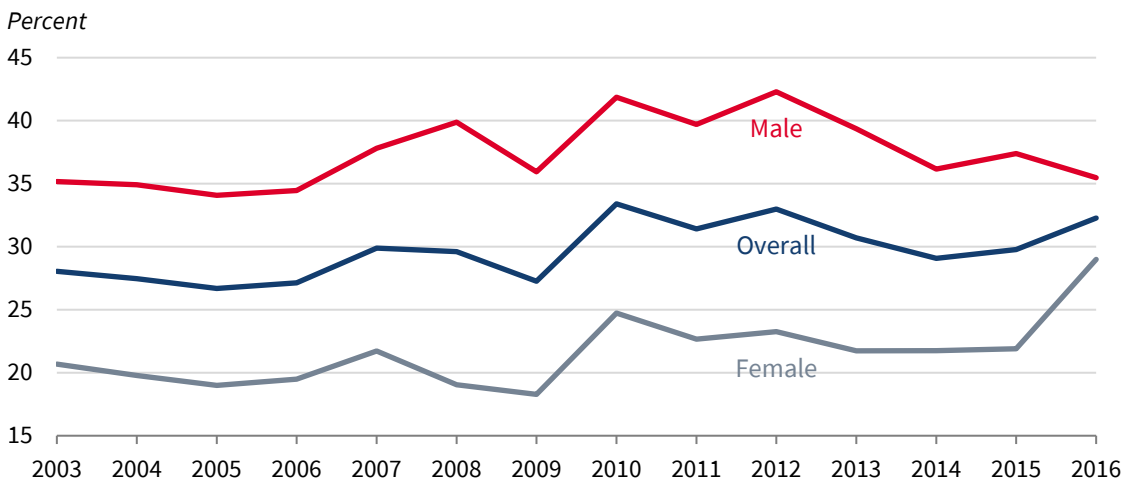
To characterize the current state of sports participation, we rely on two distinct surveys. The first is the American Time Use Survey, which is carried out by the U.S. Census Bureau and asks a nationally representative sample of Americans age 15 and over about how they spend their time on a given day. Respondents log time spent on the activities in which they engage (e.g., sleeping, eating, working, or leisure). Activity classifications are specific, and include not only whether respondents engaged in sporting activities, but exactly what those sports were (e.g., baseball, basketball, volleyball). To study youth participation, we restrict the sample to respondents between the ages of 15 and 19. Data are available from 2003 through 2016, and in some cases we pool multiple years of data to increase sample size and thus increase the precision of estimates.

A second survey, the National Youth Fitness Survey, is carried out by the Centers for Disease Control and Prevention. The advantage of this survey is that it focuses on children between the ages of 3 and 15 who are not surveyed in the American Time Use Survey as a consequence of their age. The National Youth Fitness Survey asks detailed questions about the physical activities and sports in which children engaged during a given week. The survey was conducted only in 2012.

A. Sports participation among youth ages 15–19

We first consider sports participation among youth ages 15–19, based on the American Time Use Survey. It is important to emphasize that participation rates are determined by activities logged on a single day; weekly, monthly or annual participation rates would be higher. Figure 1 shows the share of all youth participating in sports (and related activities) on a given day, as well as shares for female and male participants separately. The share of youth participating in sports has remained relatively stable, increasing from 28 percent in 2003 to 32 percent in 2016. However, average annual female participation is 42 percent lower than male participation: the average female participation rate between 2003 and 2016 is 22 percent, compared to 37 percent for males, although the gap appears to have narrowed in the most recent survey years.

Figure 1. Percent of 15- 19-Year-Olds Who Participated in Sports, Exercise, and Recreation in Past Day, by Gender



Sources: American Time Use Survey; CEA calculations

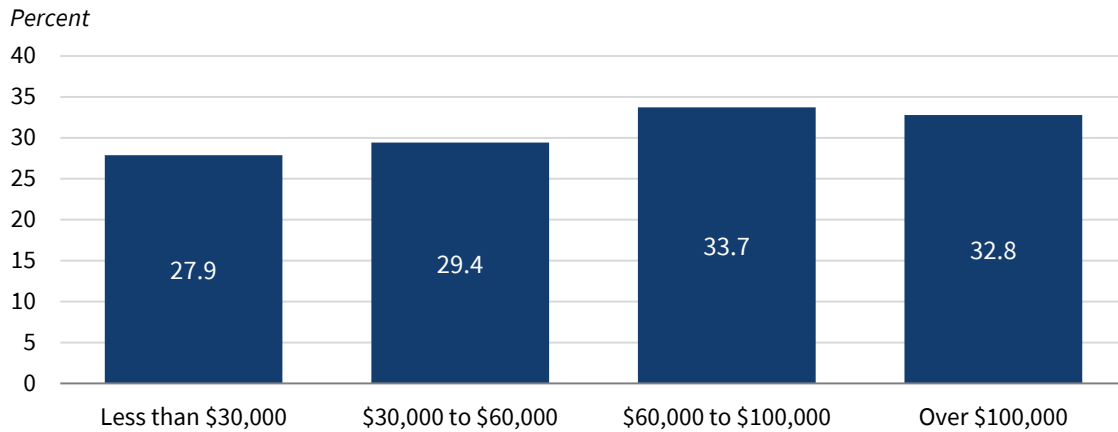
Note: Participation in sports is based on participating for at least one minute in sports, exercise or recreation. We use all activity codes beginning with 1301 in the American Time Use Survey.

Figure 2 shows youth participation rates by family income level between 2012 and 2016. Youth in families with higher incomes have somewhat higher participation rates. Youth with family incomes of under \$30,000 have participation rates of 28 percent, while youth with family incomes of over \$100,000 have participation rates of 33 percent, suggesting that lower-income children experience up to an 18 percent participation gap relative to their higher income peers. Figure 3 shows participation rates by race and ethnicity of the youth. Differences across races and ethnicities are relatively minor, although non-Hispanic white youth have modestly higher rates of participation compared to other groups, with the exception of Hispanic youth who have similar participation rates.

Given the large gap in youth sports participation between girls and boys, we consider the specific sports in which the gender gap is the largest along with overall participation in that sport. Figure 4 shows that girls represent only 36 percent of youth sports participants aged 15 to 19, but the share of female participants varies widely: from baseball (2 percent) to softball (81 percent). Figure 4 also highlights overall youth participation in each sport to indicate its popularity. Participation in the most popular sport—basketball—is dominated by boys; girls constitute only 12 percent of participants. Other popular sports (defined as having greater than 1 percent of all respondents participating in a given day) that have female participant shares of 30 percent and under include football (6 percent), weightlifting (18 percent) and soccer (30 percent). There is only one popular sport in which the female participant share is 70 percent or higher—the use of cardiovascular equipment (71 percent). There are several popular sports in

which the female share falls between 30 percent and 70 percent: working out (35 percent), running (45 percent), water sports (52 percent) and walking (60 percent).

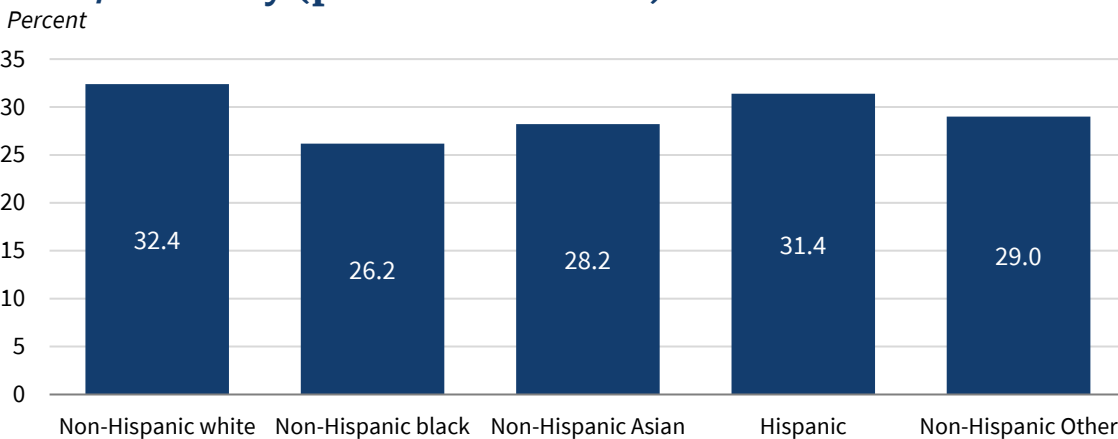
Figure 2. Percent of 15- 19-Year-Olds Participating in Sports, Exercise, and Recreation During Past Day, by Family Income (pooled 2012-2016)



Source: American Time Use Survey; CEA calculations

Note: Participation in sports is based on participating for at least one minute in sports, exercise or recreation. We use all activity codes beginning with 1301 in the American Time Use Survey.

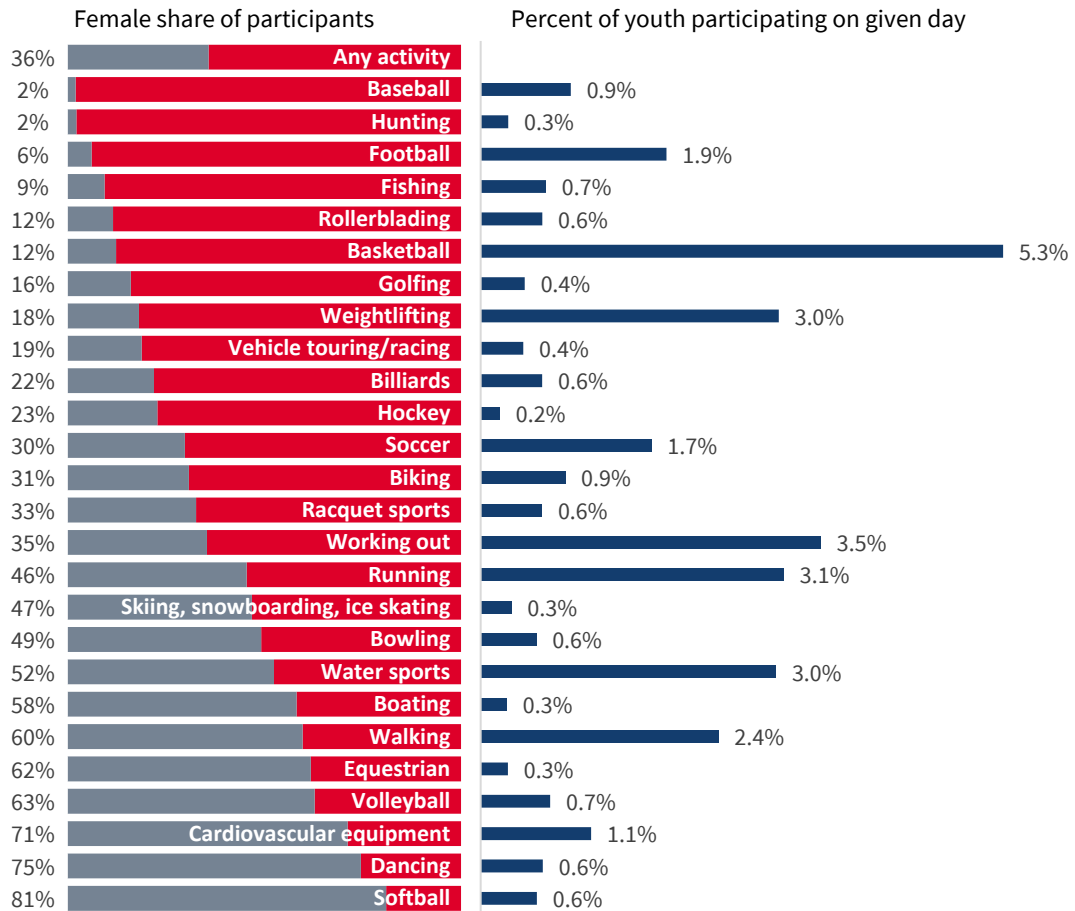
Figure 3. Percent of 15- 19-Year-Olds Participating in Sports, Exercise and Recreation During Past Day, by Race/Ethnicity (pooled 2012-2016)



Source: American Time Use Survey; CEA calculations

Note: Participation in sports is based on participating for at least one minute in sports, exercise or recreation. We use all activity codes beginning with 1301 in the American Time Use Survey.

Figure 4. Gender Sports Participation Gap of 15- 19-Year-Olds, by Sport (pooled 2003-2016)



Source: American Time Use Survey; CEA calculations.

Note: Overall participation in sports is based on participating for at least one minute in sports, exercise or recreation. We use all activity codes beginning with 1301 in the American Time Use Survey. Only sports in which at least 30 survey respondents indicated participation are shown.

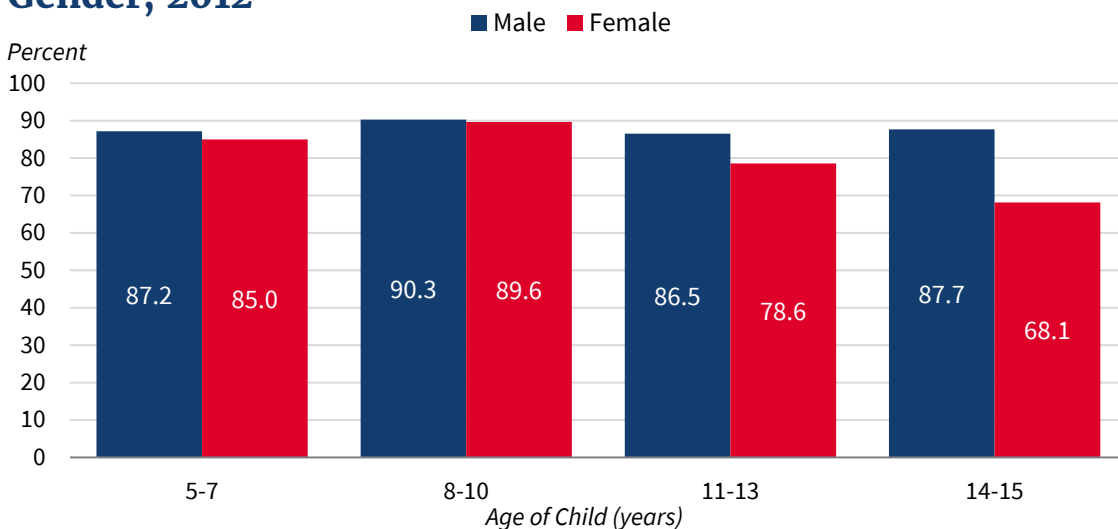
This analysis suggests two potential ways in which the overall rate of female sports participation could substantially rise. First, the female share of participants in popular sports such as basketball could rise. Alternatively, sports dominated by female participants such as dancing, softball or volleyball could expand overall, holding constant the share of female participants. The likelihood of either possibility depends on the factors driving current female shares and overall popularity of each sport, and the extent to which these factors change.

B. Sports participation among children ages 5-15

We next consider sports participation among children ages 5-15, based on the National Youth Fitness Survey. Focusing on the younger age group can help determine when gaps observed

among the older youth population first arise. Figure 5 shows the percent of children participating in physical activity during a given week by age and gender. For children ages 5–10, girls and boys participate at similarly high rates. However, the participation rate of girls between the ages of 11 and 13 is 8 percentage points lower than for boys, and the participation rate for 14 to 15 year old girls is 20 percentage points lower than for boys. This suggests that the gender gap emerges in the pre-teen and early teen years.

Figure 5. Physical Activity During Past Week by Age and Gender, 2012



Source: NHANES National Youth Fitness Survey; CEA calculations

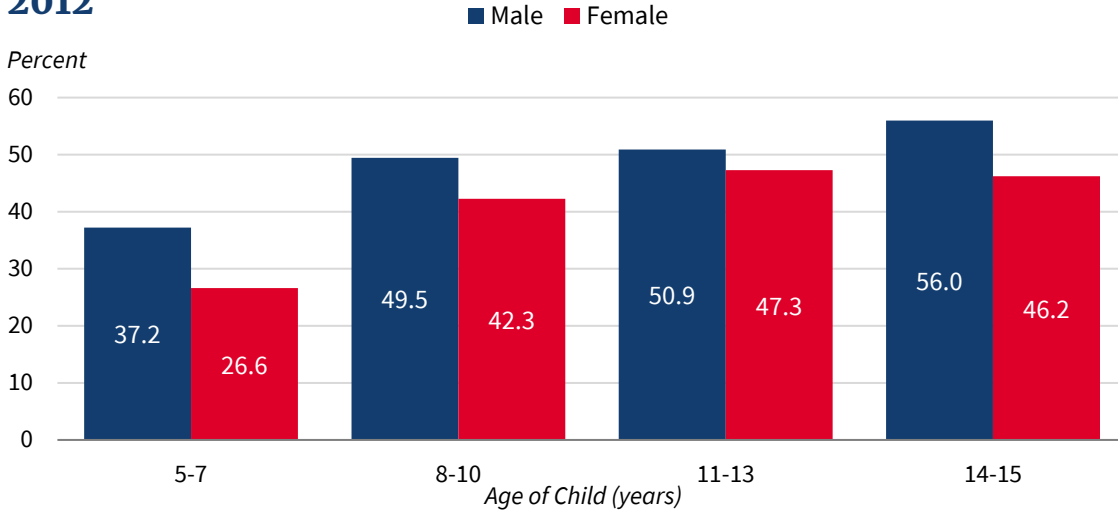
Note: Physical activity includes sports, lessons and other physical activities done in the past seven days.

Figure 6 shows participation rates in school sports (excluding physical education or gym class) by age and gender. Unlike Figure 5 in which a gender gap did not appear until the early teen years, a gender gap for school sports participation is apparent for children as young as 5 to 7 years old, when the participation rate is 37 percent for boys and only 27 percent for girls. Figure 6 suggests a potential mechanism for the pattern observed in Figure 5: lower attachment to school sports programs for girls at younger ages may reduce participation in physical activity more broadly at older ages.

Additionally, youth between the ages of 15 and 19 who had lower family incomes were modestly less likely to participate in sports. Figure 7 shows weekly participation in physical activity and annual participation in school sports among children between the ages of 5 and 15 with different levels of family income. Physical activity rates are modestly lower among children with lower incomes. School sports participation is much lower among children with family incomes below \$25,000, but similar among children with incomes in higher income ranges. This suggests that low family income may be a barrier to formal participation in school

sports, perhaps resulting from transportation needs or program fees, although less of a barrier to physical activity more broadly.

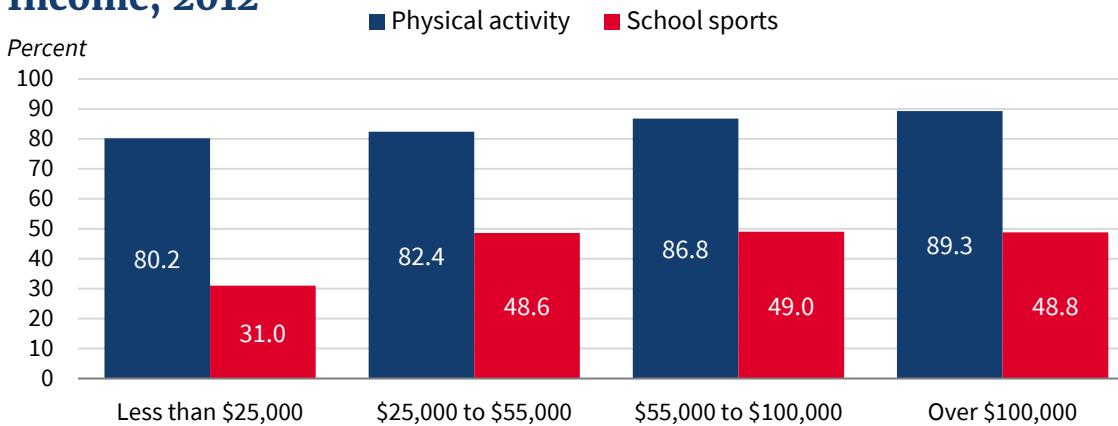
Figure 6. School Sports Participation by Age and Gender, 2012



Source: NHANES National Youth Fitness Survey; CEA calculations

Note: School sports exclude activities in physical education or gym classes. Respondents not currently enrolled in school are asked to respond on the basis of the last time they were enrolled in school.

Figure 7. Physical Activity During Past Week and School Sports Participation Among 5- 15-year-olds by Family Income, 2012

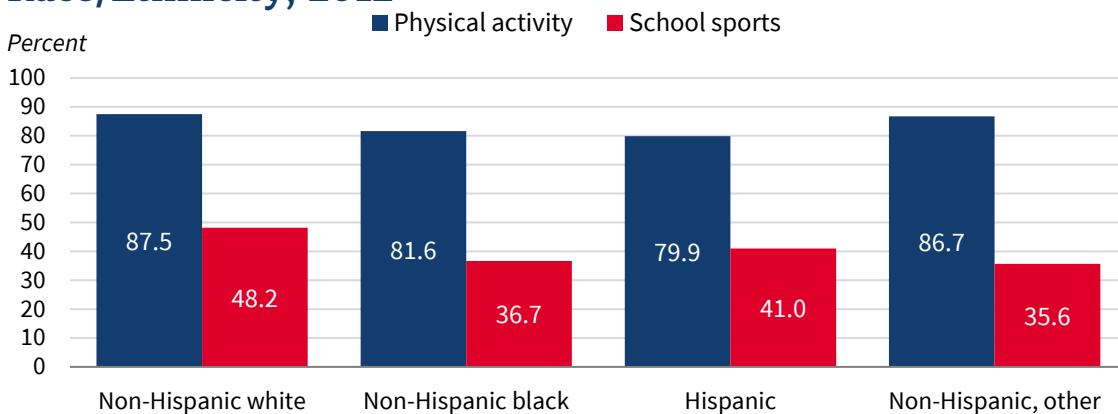


Source: NHANES National Youth Fitness Survey; CEA calculations

Note: Physical activity includes sports, lessons and other physical activities done in the past seven days. School sports exclude activities in gym classes. Respondents not currently enrolled in school are asked to respond on the basis of the last time they were enrolled in school. Sample includes children between the ages of 5 and 15.

Figure 8 shows participation rates by race and ethnicity. Weekly participation in physical activity is relatively similar across groups. However, non-Hispanic white children are more likely to participate in school sports than other children.

Figure 8. Physical Activity During Past Week and School Sports Participation Among 5- 15-year-olds by Race/Ethnicity, 2012



Source: NHANES National Youth Fitness Survey; CEA calculations

Note: Physical activity includes sports, lessons and other physical activities done in the past seven days. School sports exclude activities in gym classes. Respondents not currently enrolled in school are asked to respond on the basis of the last time they were enrolled in school. Sample includes children between the ages of 5 and 15.

2. Potential Importance of Youth Sports for Child Outcomes

Given the inequalities in youth sports participation highlighted above, what might the effect be of increased participation in youth sports? A growing literature evaluates the impact of various childhood interventions on children’s long-term outcomes. Examples include early education programs, increased access to safety net programs, and moves from public housing to higher opportunity neighborhoods (Heckman et al. 2010; Hoynes and Schanzenbach 2018; Chetty et al. 2016). These interventions, in some cases, are shown to improve the long-term health and economic and social wellbeing of children upon reaching adulthood. A number of mechanisms have been suggested and tested, including the formation of non-cognitive skills, reductions in stress, changed peers and environments, and improved physical health.

The economics literature offers reasons to expect youth sports participation to improve long-term outcomes even in the absence of evidence that specifically and directly measures these effects as some of the same mechanisms that appear to improve outcomes in other interventions are plausibly present in youth sports as well. Cabane and Clark (2015) summarize some of the potential pathways through which youth sports could improve adult outcomes.

First, youth sports may help participants develop skills, both cognitive and non-cognitive. Cognitive skills include problem solving and analytical skills, and the returns they generate in the labor market are well-documented in the economics literature. Non-cognitive skills include motivation, conscientiousness, perceptions of self-worth and social skills—factors that have each been estimated to positively impact earnings and/or employment (Dunifon and Duncan 1998; Kautz et al. 2014; Heckman et al. 2006; Deming 2017). There is also an increasing awareness of the importance of non-cognitive skills—including motivation, conscientiousness, perceptions of self-worth and social skills—for labor market outcomes (Dunifon and Duncan 1998; Kautz et al. 2014; Heckman et al. 2006; Deming 2017). Each of these factors has been estimated to positively impact earnings and/or employment. The magnitudes of the estimated effects are sizeable, with some estimates suggesting that non-cognitive skills influence labor market success as much as cognitive skills (Heckman et al 2006; Linqvist and Vestman 2011). And recent evidence suggests that technological change, along with other factors, contributed to an increase in the return to non-cognitive “social” skills over the decades spanning 1980 and 2012 (Deming 2017). To the extent that participation in youth sports enhances non-cognitive skill development, it can be inferred that this participation likely enhances long-term labor market outcomes. Moreover, the importance of non-cognitive skills may be increasing over time as technological change and other factors nudge American labor demand away from routine tasks and toward tasks requiring both analytical (cognitive) and social (non-cognitive) skills (Deming 2017). While all possible channels of causality are worth noting in any evaluation of the literature on youth sports and outcomes, the contribution of sports to non-cognitive skill formation seems in many cases to be a plausible causal mechanism.

Second, in addition to skill development, participation in youth sports can encourage physical fitness and thus improve health overall. Enhanced health is valuable for a number of reasons, including higher quality of life and reduced morbidity. Health is also a component of human capital and, therefore, a determinant of labor productivity; improved health is frequently found to boost labor market outcomes in developing countries, while Stephens and Toohey (2018) suggest that the relationship holds in developed countries as well. Moreover, a number of studies suggest that obesity is associated with reduced wages and employment in the labor market for developed countries, including the United States (Harris 2018; Johar and Katayama 2012; Cawley and Ruhm 2011).

A third avenue by which youth sports participation may affect labor market outcomes is through improvements in mental health. If engaging in sports improves the quality and quantity of social interactions, it may serve to improve the participant’s psychological state as well as bolster non-cognitive development. The economic literature on the return to mental health assesses primarily correlations as opposed to causal relationships, making the potential magnitudes here difficult to bound. A final avenue for improved outcomes, according to Cabane and Clark, is through the signal this participation sends to future employers. If

employers perceive sports participation to be a signal of “self-confidence, persistence, fair play, team spirit, and motivation,” participants may find themselves advantaged in their job search, regardless of whether there is an actual return to sports participation once employed (Cabane and Clark 2015).

Potentially offsetting some of these benefits, youth sports participation carries an inherent risk of injury. According to the Centers for Disease Control and Prevention, over 2.6 million children each year suffer injuries from sports or other recreational activities that require treatment in an emergency room (CDC 2017). Accounting for less severe injuries that either are self-treated or result in a doctor’s visit without hospitalization would suggest an even higher annual incidence of injury. Injury rates vary by sport, with significant portions of total sports-related injuries coming from football, basketball, and soccer (Sheu et al. 2016). Some injuries, such as concussions, may have harmful long-term effects. Because the risks differ systematically by sport, future programming could be designed in such a way as to minimize the risks—and therefore the expected costs—of injury.

3. Evidence on the Causal Impact of Youth Sports

Although several possible mechanisms for youth sports to affect children’s outcomes have been identified, measuring the outcomes for youth is complicated by selection into sports. If the types of children who choose to participate in sports also tend to have better (or worse) long-term outcomes independent of sports participation, this will complicate attempts to interpret statistical relationships between sports and life outcomes as causal. The empirical literature has generated a number of attempts to assess the causality of the relationship. Each of these assessments remains vulnerable to criticisms that might undermine claims of causality, and we highlight here the literature we view to be most empirically sound, while still noting the literature’s limitations.

As noted previously, the population of youth that play sports is far from random or quasi-random. For instance, Ransom and Ransom (2018) find that youth who participate in sports come from higher income families with more highly educated parents. While studies can and often do control for these types of observable baseline characteristics of individuals, individuals may differ based on unobservable characteristics as well. For example, youth sports participants may have stronger non-cognitive skills that induce them to participate in sports in the first place. And these types of non-cognitive skills may independently improve long-term labor market outcomes even as they contribute to the initial decision to participate in youth sports, which would serve to bias estimates of the contribution of youth sports to labor market outcomes regardless of whether youth sports participation by itself exerted an effect on non-cognitive skill formation.

Analyses of youth sports in the literature, however, have implemented econometric techniques that aim to address these concerns. In many cases, positive relationships between youth sports participation and education and labor market outcomes remain apparent.

Gorry (2016) examines the relationship between high school sports participation, education, and labor market outcomes. According to the analysis in Gorry (2016), participation in youth sports appears to be associated with improvements in labor market outcomes and in educational attainment. The magnitude of the relationship between sports participation and educational outcomes appears to be largest among the lowest-performing individuals, and the relationship to earnings gains appears to be largest among low-earning individuals. An instrumental variable strategy, intended to address concerns about causal interpretation, replicates the baseline specification's findings with respect to educational attainment though not with respect to earnings.

Troutman and Dufur (2007) estimate the relationship between participation in high school sports and educational outcomes. They find that participation in sports increases the probability of completing college within six years of graduation even after controlling for a rich set of school-level and individual-level covariates. Specifically, according to Troutman and Dufur (2007), the odds of graduating from college within six years are 41 percent greater for those who played sports in high school than for those who did not. The magnitude of this increase may raise questions of unobserved characteristics that bias estimates upward: those who play sports may have other characteristics that lead them to be disproportionately likely to graduate college that are not captured in the Troutman and Dufur (2007) set of covariates. Other studies, however, offer additional analysis that caveats the nature of the correlation between unobserved characteristics and outcomes that would need to exist in order for the apparent relationship between youth sports and outcomes to not be causal. For example, one study attempts to bound the causal effect of youth sports on future outcomes based on assumptions about how selection on unobservable characteristics relates to selection on observable characteristics (Ransom and Ransom 2018). The authors find little evidence of a strong causal effect. However, other studies reach different conclusions.

One such study, Barron et al. (2000), estimates the effect of participation in high school athletics on wages and educational attainment. According to the paper's results, in an echo of the literature as a whole, individuals who participate in high school sports tend to obtain higher levels of educational attainment and to obtain higher wages. They find additionally that high school participation specifically in sports exerts these effects: sports exert an independent effect on wages and educational attainment even when controlling for the overall level of extracurricular involvement and for generalized individual ability, measured by an individual's percentile score on the armed forces qualification test. According to Barron et al. (2000), replacing a non-sport extracurricular activity with athletics increases wages by between 4.2

percent and 14.8 percent. Because Barron et al. include controls for other non-sport extracurricular activities in their analysis that might proxy for unobserved student ability, they eliminate some, though not all, concerns over spurious correlation between youth sports participation and labor market outcomes.

In addition, the results in Barron (2000) intimate a mechanism that has found experimental corroboration. Their results demonstrate that intensive participation in high school athletics leads to at least some nonzero increase in the probability of becoming a supervisor at work—a result that suggests the possibility that non-cognitive skills formed through athletics may improve employees’ effectiveness in the workplace. Celse et al. (2017) analyze the behavior of athletes and non-athletes in an experimental public goods game. Athletes were shown to exhibit significantly less free-riding behavior and greater conditional cooperation (e.g., contributions to the public good in response to observed contributions by others) than non-athletes. The results in Celse et al. (2017) do not necessarily imply that participation in athletics *causes* the athletes to behave differently than non-athletes in the experimental setting. However, they are consistent with a rising value for non-cognitive skills (e.g., Deming 2017) and an apparent wage premium on athletic participation documented in Barron et al. (2000) and throughout the literature.

In principle, one could attempt to determine whether youth sports participation exerts a causal effect by running a randomized control trial (RCT) on the subject. However, this kind of a trial would require the assignment of some youth—and not others—the opportunity to participate in sports; we know of no such random assignment studies. Instead, to assess the causal effects of youth sports on outcomes and sidestep concerns about the influence of unobserved characteristics, economists often rely on “natural experiments” that generate variation that is effectively random with respect to the outcome variables of interest.

Stevenson (2010) considers such a “natural experiment” in which some youth were provided greater access to sports than others, and the factors that determined which youth received greater access was plausibly unrelated to any unobserved characteristics. Specifically, the study analyzes the passage of Title IX in 1972, which required high schools to equalize sports participation rates between female and male students. The result was that schools with high male participation rates in sports were required to increase access to female students more than in schools with low male participation rates. Assuming that unobservable characteristics of female students were not related to the proportion of male students participating in sports, the rollout of Title IX provides near-random assignment of girls to greater access to sports. Thus, any differences in outcomes among girls with varying amounts of increased access to sports can be attributed to participation in sports rather than to some other factor.

According to the analysis in Stevenson (2010), participation in sports indeed affects outcomes. The paper estimated large effects on educational attainment and especially employment, for which the magnitude of the estimate is non-trivial: a 10 percentage-point increase in high school sports participation by women increases employment among all women between the ages of 25 and 34 by up to 2 percentage points. If the increase in sports participation affected the labor market outcomes only of the sports participants themselves, these results would imply that up to one in five new sports participants was induced into employment as a result.

4. Policy Implications

The evidence as a whole supports the conclusion that youth sports improve outcomes, even as individual studies vary in robustness of methods or findings. While the barriers to implementing a randomized controlled trial on youth sports seem unlikely to change, policymakers could nonetheless attempt to identify mechanisms to allocate funding in a way that allows for the generation of more robust evidence.

Future efforts to expand youth sports should focus on two priorities: targeting youth sports programs towards the subpopulations likely to yield the highest social return, and tailoring the distribution of funds to maximize the rigor of the evidence they generate.

Given a fixed allocation of funding for investment in youth sports, an opportunity cost framework can inform how best to allocate that funding. That is, the net returns from investing in youth sports depend on the counterfactual allocation of children's time in the absence of the youth sports investment. For instance, suppose that investment in youth sports induced children to play sports rather than engage in activities that increase the risk of behaviors such as substance abuse later in life. Suppose, on the other hand, that investment in youth sports resulted in children reallocating time to sports away from academics or from extracurricular activities, like drama or music. The return on investment in youth sports in the case in which youth sports substitute for high-risk activities would exceed the return in the case of substitution away from academics or other extracurricular activities. To maximize the return on an investment of a given amount of funding in youth sports, a government allocating a given amount of funding for youth sports would rationally target the allocation of the funds toward the subpopulations for which youth sports seem likely to substitute for activities with the lowest returns.¹

Finally, promoting youth sports need not come at major cost. While the scope of this paper does not entail a full-scale cost-benefit analysis, the nature of youth sports leagues indicates

¹ The same principle of evaluating a prospective investment in youth sports based on its opportunity cost generalizes to the case in which a government allocate investment funds between different types of youth activities, of one which one is sports. The relevant set of opportunity costs, in such a case, would become the opportunity cost of investments in youth sports versus other possible uses of the funds (e.g., music).

that even small investments in this area could have a positive impact. Made possible by volunteers in many American towns and cities, youth sports leagues promote healthier lifestyles and facilitate positive relationships that can enhance outcomes later in life.

A well-targeted and well-designed youth sports program, then, has potential to generate benefits for its individual participants and for society as a whole.

References

- Barron, J. M., Ewing, B. T., and Waddell, G. R. 2000. "The effects of high school athletic participation on education and labor market outcomes." *Review of Economics and Statistics* 82(3): 409-421.
- Cabane, C., and Clark, A. E. 2015. "Childhood sporting activities and adult labour-market outcomes." *Annals of Economics and Statistics* 119-120: 123-148.
- Cawley, J., and Ruhm, C. J. 2011. "Chapter three: The economics of risky health behaviors." *Handbook of Health Economics* 2: 95-199.
- Celse, Jérémy, Michel Nicolas, and Pierre Schilling. 2017. "Are athletes more cooperative than nonathletes? A laboratory experiment." *Managerial and Decision Economics* 38(8): 1248-1261.
- Centers for Disease Control and Prevention, National Center for Health Statistics. NHANES National Youth Fitness Survey. Available at <https://www.cdc.gov/nchs/nyffs/index.htm>
- Centers for Disease Control and Prevention. 2017. "Protect the ones you love: Child injuries are preventable: Sports safety." Available at https://www.cdc.gov/safekid/sports_injuries/index.html
- Chetty, R., Hendren, N., and Katz, L. F. 2016. "The effects of exposure to better neighborhoods on children: New evidence from the Moving to Opportunity experiment." *American Economic Review* 106(4): 855-902.
- Council of Economic Advisers. 2018. "Economic Report of the President." February. Available at https://www.whitehouse.gov/wp-content/uploads/2018/02/ERP_2018_Final-FINAL.pdf
- Deming, D. J. 2017. "The growing importance of social skills in the labor market." *Quarterly Journal of Economics* 132(4): 1593-1640.
- Dunifon, R. and Duncan, G. J. 1998. "Long-run effects of motivation on labor-market success." *Social Psychology Quarterly* 61(1): 33-48.
- Eide, E. R., and Ronan, N. 2001. "Is participation in high school athletics an investment or a consumption good? Evidence from high school and beyond." *Economics of Education Review* 20(5): 431-442.
- Gorry, D. 2016. "Heterogeneous effects of sports participation on education and labor market outcomes." *Education Economics* 24(6): 622-638.

- Harris, M. 2015. "The impact of body weight on occupational mobility and career development." *Working paper* Available at <http://cber.haslam.utk.edu/staff/harris/HarrisIERsubedit2.pdf>
- Heckman, J. J., Moon, S. H., Pinto, R., Savelyev, P. A., Yavitz, A. Q. 2010. "The rate of return to the HighScope Perry preschool program." *Journal of Public Economics* 94(1-2): 114-128.
- Heckman, J. J., Stixrud, J., and Urzua, S. 2006. "The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior." *Journal of Labor Economics* 24(3): 411-482.
- Hoynes, H. W., and Schanzenback, D. W. 2018. "Safety net investments in children." *Brookings Papers on Economic Activity*, Conference draft, February 22. Available at https://www.brookings.edu/wp-content/uploads/2018/03/2_hoynesschanz1.pdf
- Jacob, Brian A. 2002. "Where the boys aren't: Non-cognitive skills, returns to school and the gender gap in higher education." *Economics of Education Review* 21(6): 589-598.
- Johar, M., and Katayama, H. 2011. "Quantile regression analysis of body mass and wages." *Health Economics* 21(5): 597-611.
- Kautz, T., Heckman, J. J., Diris, R., Weel, B. T., and Borghans, L. 2014. "Fostering and measuring skills: Improving cognitive and non-cognitive skills to promote lifetime success." *NBER working paper* No. 20749.
- Lindqvist, E., and Vestman, R. 2011. "The labor market returns to cognitive and noncognitive ability: Evidence from the Swedish Enlistment." *American Economic Journal: Applied Economics* 3(1): 101-128.
- Lipscomb, S. 2007. "Secondary school extracurricular involvement and academic achievement: A fixed effects approach." *Economics of Education* 26(4): 463-472.
- Ransom, M. R., and Ransom, T. 2018. "Do high school sports build or reveal character? Bounding causal estimates of sports participation." *Economics of Education Review* 64: 75-89.
- Rees, D. I., and Sabia, J. J. 2010. "Sports participation and academic performance: Evidence from the National Longitudinal Study of Adolescent Health." *Economics of Education Review* 29(5): 751-759.
- Sheu, Y., Chen, L. H., Hedegaard, H. 2016. "Sports- and recreation-related injury episodes in the United States, 2011-2014." *National Health Statistics Reports, U.S. Department of Health and Human Services* 99: 1-10.

Stephens, M. J, and Toohey, D. J. 2018. “The impact of health on labor market outcomes: Experimental evidence from MRFIT.” *NBER working paper* No. 24231.

Stevenson, B. 2010. “Beyond the classroom: Using Title IX to measure the return to high school sports.” *Review of Economics and Statistics* 92(2): 284-301.

Troutman, K. P., and Dufur, M. J. 2007. “From high school jocks to college grads: Assessing the long-term effects of high school sport participation on females’ educational attainment.” *Youth and Society* 38(4): 443-462.

United States Department of Labor, Bureau of Labor Statistics. American Time Use Survey. Available at <https://www.bls.gov/tus/>



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