

Physical Activity & The Sustainable Development Goals: A Public Health Approach Towards Advancing the Power of Movement

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Abstract: With the worldwide rise in noncommunicable disease, physical inactivity, obesity, and the global presence of Adverse Childhood Experiences (ACEs), health and sport science practitioners must be able to address each of these health domains while considering frameworks for the most urgent health and human development priorities in a sustainable manner. The sector of sport for development, which uses physical activity, sport, and game-based programming to address specific development and peace initiatives to empower individuals and communities, is one such approach that practitioners can employ to address such challenges. During the 2000-2015 era of the United Nations (UN) Millennium Development Goals (MDGs), the sport for development sector used sport to address several MDGs, contributing most significantly towards improving HIV/AIDS knowledge, attitudes, and behavior changes. Practitioners are still using sport to address the 2015-2030 UN Sustainable Development Goals (SDGs). This article explores case studies of 17 sport for development initiatives that are meeting key targets for each of the 17 SDGs. Furthermore, it provides recommendations for how to further advance sport for development's contributions. By synthesizing cost effective analyses and discussing key components to further the sport for development field, this article maps a way forward to advance sport for development as a cost-effective and viable tool for addressing the SDGs, reducing the effects of unresolved ACEs, and promoting physical activity to help individuals and communities lead healthy, empowered lives.

Keywords: Physical activity, sport for development, public health, Sustainable Development Goals, Millennium Development Goals

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Introduction

Noncommunicable diseases (NCDs), though largely preventable, are responsible for almost 71% of all deaths worldwide, including heart disease, stroke, cancer, diabetes and chronic lung disease¹. 15 million people between the ages of 30 and 69 die from an NCD annually, with over 85% of these premature deaths occurring in low and middle-income countries, defined by the World Bank as a Gross National Income of \$1,025 or less (low income), \$1,026-\$3,995 (lower middle income), or \$3,996-\$12,375 (upper middle income).² Epidemiological evidence supports that insufficient physical activity is a leading risk factor.³ Yet the prevalence of physical inactivity, defined as not meeting the World Health Organization (WHO)'s Global Recommendations on Physical Activity for Health, is as high as 80.3% in adults.⁴ The recommendations define the physical activity threshold as 150 minutes of moderate-intensity aerobic physical activity, or at least 75 minutes of vigorous-intensity aerobic physical activity, throughout the week, or an equivalent combination of moderate- and vigorous-intensity activity. To analyze the burden of physical inactivity, researchers calculated the Population Attributable Fraction (PAF), or the proportional reduction of mortality that would occur if an alternative behavior (physical activity) replaced the risk factor (physical inactivity). The PAF for physical inactivity is 9%, translating to physical inactivity being responsible for approximately 5.3 deaths globally in 2008, exceeding that of smoking (5 million) and obesity (3 million).⁵

Several social, political, and economic challenges persist with physical inactivity. Socially, physically inactive children are more likely to have increased levels of fat mass and lower academic achievement than their physically active peers.^{6 7 8} Such children are likely to repeat this pattern into adulthood and may earn less income, experience higher healthcare costs, and take one extra week of sick leave per year, as compared to their physically active counterparts.⁹ Politically, one in four children are considered too overweight for military participation, thus leading the Centers for Disease Control and Prevention (CDC) to posit that physical inactivity can threaten a country's national security and military readiness.¹⁰ Additionally, 2013 estimates found that physical inactivity cost healthcare systems \$53.8 billion (\$INT) globally.¹¹ Finally, deaths related to physical inactivity contributed \$13.7 billion in lost productivity and are responsible for 13.4 million Disability Adjusted Life Years worldwide in 2013.¹² Research estimates that physical inactivity will increase, with projections for physical-inactivity-related healthcare costs increasing as much as 477% in countries, such as India from 2008-2030.¹³

The social, political, and cost saving benefits from increased physical activity are appreciable. Johns Hopkins University (JHU) Global Obesity Prevention Center found that 31.9% of children engaged in 25 minutes of high-calorie burning physical activity three times a week (the Sport and Fitness Industry Association's definition of "active to a healthy level," which falls below the WHO Global Physical Activity Guidelines). If children continue to engage in this trend, \$1.1 trillion annual medical costs and \$1.7 trillion in lost productivity would result annually, whereas if half of children engaged in this same level of physical activity, the number of obese and overweight youth decreases by 4.18%, thus saving \$8.1 billion in medical costs and \$13.8 billion in lost productivity annually. If 50% of children engaged in the U.S. Physical Activity Guidelines recommendations (which are the same as the WHO Global Physical Activity Guidelines) for the

remainder of their childhood, this would avert \$11.4 billion in medical costs and \$25.1 billion in lost productivity annually.¹⁴

Adverse Childhood Experiences & Their Association With Physical Inactivity

In 1985, the Adverse Childhood Experiences (ACE) study showed that turning to certain behaviors (such as physical inactivity) could be a coping mechanism to address childhood trauma.^{15 16 17 18}

¹⁹ Dr. Vincent Felitti, from the San Diego Obesity Clinic, was puzzled by the 50% dropout rate of his patients at the clinic and subsequently interviewed 286 of these dropout patients. He discovered that most of these patients had experienced childhood sexual abuse. ACE cohort data showed that those reporting four or more adverse childhood experiences had a two-fold increased risk of severe obesity.²⁰

Several subsequent studies showed further associations between obesity and ACEs. A systematic review conducted by Palmisano, Innamorati, and Vanderlinden found several studies demonstrating that abuse is associated with obesity in later life.^{21 22 23 24 25} Additionally, the California Women's Health Survey found that obese women were 27% more likely to report a history of childhood physical or sexual abuse.²⁶ Furthermore, a 2014 meta-analysis of 41 studies found an association between childhood maltreatment and risk of later obesity.²⁷ Finally, children raised by an adult with ACEs are 1,000 times more likely to suffer their own ACEs, which cycles into nearly two-thirds of the adult population living with at least one ACE. Adults with ACEs are two times more likely to experience physical health issues, three times more likely to experience mental health issues, and more likely to experience possible risk outcomes of physical inactivity, smoking, alcoholism, drug use, and missed work.^{28 29 30} ACEs contribute such deleterious consequences to individual well-being that Dr. Robert Block, former President of the American Academy of Pediatrics called it, "[t]he single greatest unaddressed public health threat facing our nation today."³¹

ACEs are still measured in the U.S. via the Behavioral Risk Factor Surveillance System.³² Globally, ACEs are captured via the WHO ACE Global Research Network, which also asks about exposure to violence, war, and poverty.³³ While the current causal levels of physical inactivity are largely attributed to insufficient participation in leisure time physical activity and a global increase in sedentary behavior, ACEs such as gender-based violence (GBV), gender norms, female genital mutilation, child marriage, human trafficking, violence, war and armed conflict, the use of mass rape, displacement, corrective rape, and "extreme" poverty, defined as \leq \$1.90, may all contribute to physical inactivity.³⁴

Adverse Childhood Experiences, Human Rights, & Physical Activity

To break the cycles of inactivity, obesity, and ACEs, advocates have largely turned to human rights frameworks. For example, the *Olympic Charter* states: "The practice of sport is a human right. Every individual must have the possibility of practicing sport."³⁵ This human rights-based approach to sport and physical activity is affirmed by the 1978 International Charter of Physical Education on Physical Activity and Sport,³⁶ 1989 UN Convention on the Rights of the Child,³⁷ 2006 UN Convention on the Rights of Persons With Disabilities,³⁸ and the 2015 Revised International Charter of Physical Education, Physical Activity & Sport.³⁹ In a 2018 report surveying 546 sport for development organizations, Laureus Foundation discovered that 44% of these organizations served youth with moderate to high levels of trauma from ACEs.⁴⁰ One

approach to address ACEs through physical activity includes “trauma-informed sports programming,” which focuses on adaptations of play structures, and “trauma-sensitive coaching” to provide players with safe spaces, agency, and long-term program engagement.^{41 42} By addressing physical inactivity and ACEs through sport, practitioners can help prevent obesity and promote the positive behaviors associated with physical activity, including decreased likelihood to smoke, a 15% increased likelihood to attend college, higher earnings throughout the lifespan, reduced prevalence of NCDs, and increased likelihood to become active adults (whom are more likely to raise active kids).⁴³

Similarly, sport scientist researchers, in partnership with Nike, codified these positive benefits in the Human Capital Model (HCM).⁴⁴ Seeking to change the discourse surrounding physical activity from a negative manner (i.e. “fighting” heart disease) to a positive manner, the HCM describes the social returns of physical activity. The six domains of HCM (intellectual, financial, physical, social, individual, and emotional capital) are built upon findings from over 500 articles on physical activity. Often, *physical* capital is discussed as a primary benefit of physical activity, such as NCD mitigation. By discussing aspects from other domains, including cognitive functioning, job attainment, and productivity, practitioners demonstrate how physical activity programming enhances individuals and communities in areas beyond physical health, thus demonstrating its effectiveness as a multi-faceted intervention.

Investing in physical activity that has positive effects on human capital is also cost-effective. To further justify physical activity as a cost-effective method for reducing healthcare costs across the lifespan, JHU Global Obesity Prevention Center researchers found lifetime cost savings in every age range. When moving from obese to healthy weight, they found findings as low as \$16,882 per 80-year-old person, to as high as \$36,278 per 50-year-old individual.^{45 46}

The aforementioned research demonstrates economic cost savings in achieving healthy weight. To specifically evaluate cost savings from physical activity and sport, the United Kingdom (UK)-based foundation Sported published a 2016 impact assessment of the sport for development sector, finding £4,174.12 in cost savings per participant in sports programming.⁴⁷ Furthermore, in 2015, the UK Department for Culture, Media & Sport found that the predicted reduction in general practitioner visits as a result of good health associated with sport participation leads to cost savings of £13.25 per person per annum.⁴⁸

Millennium Development Goals

Understanding these physical, psychosocial, and economic benefits of physical activity within a human rights approach, sport for development and physical activity advocates used physical activity to leverage the United Nations (UN) Millennium Development Goals (MDGs). The eight MDGs, established for the years 2000-2015, aimed to eradicate or reduce poverty, hunger, child mortality and disease, and to promote education, maternal health, gender equality, environmental sustainability and global partnerships.⁴⁹ In 2002, the UN Inter Agency Task Force on Sport for Development and Peace convened to promote sport as a tool for development and peace and provided recommendations on using sport to address the MDGs.⁵⁰ This initiative was furthered by the UN General Assembly’s creation of the “International Year of Sport and Physical Education” in 2005 to encourage governments, sports organizations, and athletes to achieve the

MDGs.⁵¹ Throughout 2005, the UN called upon governments, the private sector, and civil society to research and publish the ways in which organizations have integrated sport into their programs.⁵² Multilevel stakeholders elevated this initiative, including The Lancet's special issue on medicine and sport.⁵³

During the MDG era, the Sport for Development and Peace Working Group outlined how sport can address all eight MDGs.⁵⁴ Several organizations focused particularly on MDG 6: *Combat HIV/AIDS, malaria, and other diseases*, yielding impact including increases in HIV related knowledge, positive attitudes towards HIV testing, condom use, self-efficacy in condom use, delayed sexual debut, respect for females within the context of gender norms, and reduced stigma towards People Living With HIV/AIDS.⁵⁵ ⁵⁶ Findings of a systematic review of sport for development organizations addressing HIV/AIDS suggest that such programs were aligned with 2011 UN Political Declaration on HIV/AIDS targets.⁵⁷ Furthermore, in 2013, the UN General Assembly created "The International Day of Sport for Development and Peace" on April 6 to promote sport as a contributor to development.⁵⁸

Additional achievements of the MDGs, outside of sport for development, include the reduction of maternal mortality by 54% and child mortality by 44%. Furthermore, the MDGs increased developmental assistance by 66%, leading to a reduction by more than half in the number of people living in extreme poverty (then defined as \$1.25 per day), and 147 countries meeting the safe drinking water target.⁵⁹ Despite many successes, 12 out of 17 MDG targets were not achieved.⁶⁰ Critiques of the MDGs include unrealistic goals, the lack of inclusion of vulnerable populations and environmental sustainability, and a binary role of higher-income countries primarily serving as financiers, rather than participants, in addressing the MDGs.⁶¹ ⁶²

Sustainable Development Goals

Recognizing that sport assisted in MDG advancement, the UN Declaration for the 2015-2030 Sustainable Development Goals (SDGs) states that "[s]port is an important enabler of sustainable development."⁶³ While the MDGs were critiqued for being created with little citizen input, the SDGs were developed through a participatory process such as 70 Open Working Groups, face-to-face consultations in over 100 countries, and public input through online mechanisms and door to door surveys,⁶⁴ including the UN's "My World 2015".⁶⁵ Citizen input on SDG achievement, to promote accountability for governments and institutions, occurs on the UN MyWorld2030 website.⁶⁶ Another key difference is a unified approach to poverty alleviation. The MDGs were partially created by country members from Organization for Economic Cooperation and Development, which mostly consists of high-income economies, with MDG funding generated by higher-income countries to support lower-income countries.⁶⁷ ⁶⁸ Conversely, the SDGs focus on the responsibility of *all* countries to work towards targets. Finally, the SDGs are far more robust in breadth than the MDGs (17 goals, 169 targets, and 230 indicators, as compared to eight goals, 21 targets and 63 indicators, respectively).⁶⁹ ⁷⁰

Case Studies of Programs Addressing SDGs

The following programs serve as case examples for addressing each of the 17 SDGs and specified target(s) to demonstrate the variety of program strategies, locations, and resources that organizations can utilize to address the SDGs. While the Human Capital Model and aforementioned studies provided insight

on sport's ability to improve lives and communities, by examining cogent examples as to how sport can address all 17 SDGs and strategies for increased impact, the sport for development sector can increase sport's growing recognition as an integral tool for the empowerment of individuals, communities, and the world.

SDG 1: End Poverty in all its Forms Everywhere

Program: The Homeless World Cup Foundation

Relevant Target:

1.1: By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.90 a day

The Homeless World Cup Foundation (HWC) supports a network of 73 grassroots projects globally and is most well known for its annual HWC tournament: a week-long street football tournament bringing together over 500 players from over 50 countries, each of whom have faced homelessness. Attracting over 80,000 visitors and millions more in broadcasting, HWC provides visibility to homeless individuals from a strengths-based perspective. HWC's 70 implementing partners assist participants in building social support and accessing resources (such as substance abuse treatment and job training).⁷¹ Impact evaluations show that 83% of participants improved social relations with family and friends, 77% state that their lives significantly changed because of football involvement, and 71% continue to play the sport. Continued engagement in sport is noteworthy; physical activity may not be prioritized for individuals experiencing homelessness, given the number of competing priorities in their lives. HWC also aids in changing perceptions about homelessness, as findings from spectators at the 2016 Glasgow HWC found that 83% of attendees developed a more positive attitude towards people experiencing homelessness. A 2016 HWC evaluation found that 25% of participants get off the streets each year, and the tournament generated an estimated \$13 million in social capital.⁷² HWC creates visibility of populations that are often socially excluded from physical activity, while also fostering empowerment. Further directions to advance impact can include longitudinal follow-up of participants to measure job attainment, as well as increasing job training.

SDG 2: End Hunger, Achieve Food Security & Improved Nutrition & Promote Sustainable Agriculture

Program: Jack Brewer Foundation

Relevant Targets:

2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious & sufficient food year round

2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons

The Jack Brewer Foundation (JBF) Worldwide Global Ambassadors Program connects influential people, such as professional athletes, artists, and entertainers, to philanthropic organizations to strengthen food security, bolster medical aid, and improve disaster relief, education, cultural exchange, and sport for development initiatives focused on empowering the local community. In 2008, the first Global Ambassadors delegation traveled to Malawi to focus on nutrition education through sport, in partnership with the One World Play Project and Chevrolet. Outcomes included delivering over 11,000 footballs, a youth football match, and structured physical activity programming. Food security is a paramount public health issue in Malawi, with a 2016 state of national disaster declared as food crop production decreased by 12.5% compared to the 2014–2015 growing season, requiring external food assistance. JBF also developed a microfinance program in Malawi, assisting 676 families with loans. The microfinance program provides loans that are used to purchase government-subsidized fertilizer to increase families' harvests. JBF particularly focuses on empowering women to promote social and economic development. Further program development includes plans to launch sports nutrition products with RiceBran Technologies through a one-to-one business model, with proceeds benefitting organizations in Malawi to provide food supplementation to children in local orphanages. 3,800 individuals have benefitted from this food assistance over the past decade. As part of the program implementation, JBF will provide data on child malnutrition levels.⁷³ By combining physical activity along with microfinance and nutritional resources, JBF demonstrates how sport can address systemic health issues. Future directions can include greater reporting and evaluations to show the impact of these microfinance and nutrition programs, as well as engaging local citizens in the RiceBran Technologies partnership.

SDG 3: Ensure Healthy Lives & Promote Well-Being For All at All Ages

Program: Grassroot Soccer

Relevant Targets:

3.3 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases

3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being

3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programs

Grassroot Soccer (GRS) is a soccer-based adolescent health program in 45 countries, predominately in Sub-Saharan Africa. GRS implements evidence-based curriculum, mentorship, and access to healthcare focusing on malaria, HIV/AIDS, Sexual and Reproductive Health and Rights (SRHR), and gender and youth development. GRS participated in 40 research studies since 2005 in 24 countries, including three randomized control trials, as well qualitative studies and mixed methods impact and process evaluations.⁷⁴ An evaluation by Stanford Children's Health Council showed that GRS graduates in

Zimbabwe were six times less likely to report early sexual debut, four times less likely to report sexual activity in the past year, and eight times less likely to have more than one sexual partner.⁷⁵ Furthermore, GRS research found 32% improvement in knowledge of malaria treatment adherence and 22% improvement in knowledge about bed net maintenance among participants.⁷⁶ GRS has delivered over 18,000 bed nets in the communities it serves. According to the WHO, HIV incidence is approximately two million people annually, while approximately 219 million cases of malaria occur each year.⁷⁷ Thus, sports-based initiatives offer a unique platform for disseminating education, prevention, and treatment of these high health burdens. GRS focuses on prevention, education, testing at sports events, and access to treatment and adherence by partnering with local organizations. Future directions can include scale up and research measuring reported bed net usage to evaluate malaria-related prevention behaviors and attitudes.

SDG 4: Ensure Inclusive & Equitable Quality Education & Promote Lifelong Learning Opportunities For All

Program: Open Doors to Inclusion

Relevant Targets:

4.1 By 2030, ensure that all girls and boys complete free, equitable & quality primary & secondary education leading to relevant & effective learning outcomes

4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education

4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations

Open Doors to Inclusion is a partnership between UNICEF, FC Barcelona, Rodrigo Mendez Institute, and the Brazilian Ministry of Sport to guarantee access, retention, learning, and completion of education for children and adolescents with disabilities in primary and infant education through sport that began in 2012 with the mission of training educators from various regions of Brazil to promote school inclusion of youth with disabilities through safe sports practices. This program expanded to 16 cities, impacting more than 43,000 students, teachers, school administrators, and family members through local intervention projects focused on improving teaching strategies, family involvement programs, strengthening governmental policies, community-adapted physical activity interventions, and changes to the built environment. In 2015, Open Doors created a “compilation of practices” guide for public dissemination with strategies to promote inclusive education and physical activity, urging communities to adapt to their local customs.⁷⁸ Future directions can include mixed-method evaluations to understand programming impact on students, their families, and their communities.

SDG 5: Achieve Gender Equality & Empower All Women & Girls

Program: Moving the Goalposts (MTG)

Relevant Targets:

5.1 End all forms of discrimination against all women and girls everywhere

5.3 Eliminate all harmful practices, such as child, early & forced marriage & FGM

5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life

5.6 Ensure universal access to SRHR as agreed in accordance with the Program of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences

Females are less likely, by six to seven percentage points, to meet recommended levels of physical activity compared to males.⁷⁹ Programming for females is not only imperative to achieve the WHO Global Recommendations on Physical Activity for Health but is instrumental in addressing gender equity. MTG provides access to soccer for females ages 9-25 in Kilifi, Kenya, as well as education, a savings group, financial literacy, business opportunities, SHRH, menstrual hygiene management, HIV testing and counseling services, breast and cervical cancer screenings, contraceptive access, and mental health support. Furthermore, MTG engages male and female coaches in delivering training focused on gender equity via transforming norms, behavior and attitudes. Moreover, MTG provides education to fathers and male guardians about responsible fatherhood, gender equality, and GBV.⁸⁰ MTG not only addresses physical activity, but key social determinants of health and barriers to empowerment, as well as prevention measures of the first and fourth leading cancers among women globally (breast and cervical, respectively).⁸¹ Future directions can include mixed-method evaluations to further understand how this program impacts gender attitudes of community members and assess female participants' levels of reported self-efficacy.

SDG 6: Ensure Availability & Sustainable Management of Water & Sanitation for All

Program: WASH United

Relevant Targets: 6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.B Support and strengthen the participation of local communities in improving water and sanitation management

Disdain towards women's menstruation can be found globally. A U.S. study found that both men and women see a menstruating woman as less competent and less likeable, with tendencies to psychologically and physically avoid her.⁸² In Nepal, the tradition of Chaupadi requires women to eat alone during menstruation, avoid physical contact with both others or tap water, and sleep with little or no bedding. In certain areas, women must sleep outside in a small hut until they are no longer menstruating. During winter months, some females die, while others suffer increased risk of rape and exposure to wild animals

and snake bites.⁸³ These attitudes and behaviors demonstrate the need for women's sanitary needs to be at the forefront of sustainable development in both low- and high-income countries.

WASH United addresses both water and sanitation infrastructure needs, along with behavior and attitude changes, through play-based water, sanitation, and hygiene (WASH) education to over 200,000 youth in Sub-Saharan Africa and South Asia.⁸⁴ In East Africa, WASH United partners with soccer programs to promote WASH behaviors, including menstrual hygiene management and prevention of diarrhea, the ninth leading cause of death globally and 8.6% of all deaths among children under five.⁸⁵ One of WASH's most comprehensive programs is the "Team Swachh Bharat" (which translates to "Clean India") initiative, developed by WASH United and UNICEF in partnership with the Indian government. This multi-year initiative utilizes cricket, the country's most popular sport, as a platform for sanitation and toilet use. In 2016, this initiative launched a campaign during the T20 Cricket World Cup to educate millennials and youth on the importance of using toilets, reaching over 14,503,632 people. Sport and game-based activities, such as the "WASH Challenge Cup," are youth football tournaments in which scoring is based on both the sports game as well as WASH knowledge. Teams must be comprised of a 50:50 male to female ratio, thus promoting gender equity. These games enable communities to raise awareness and generate demand for sanitation at the local level. According to the World Bank, poor sanitation causes Indian economic losses amounting to 6.4% of India's GDP in 2006 or USD 53.8 billion (Rs. 2.4 trillion) per year.^{86,87} WASH United demonstrates that both attitude and knowledge changes can occur through sport, while inciting local-level demand for WASH. Future directions can include evaluations to measure participants' reported use of sanitation (where available) and attitudes about menstrual health and sanitation.

SDG 7: Ensure Access to Affordable, Reliable, Sustainable & Modern Energy for All

Program: PlanLED Shine

Relevant Targets:

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services

7.3 By 2030, double the global rate of improvement in energy efficiency

PlanLED's Shine initiative is a partnership with professional sports teams, along with star athletes and the Green Sports Alliance, to provide LED lighting to schools and non-profit organizations. A portion of the income generated through PlanLED lighting projects is used to provide LED lighting in schools. Using the vehicles of sport and athletes, as stadiums upgrade their lighting, the local community participates in education about lighting and health. The correlated color temperature of LED lighting can be adjusted, in turn offering greater flexibility for altering nonvisual efficacy to either increase or decrease mental alertness, which research suggests may help with balancing circadian rhythms.^{88,89} Afterwards, a PlanLED shine event brings together speakers for a presentation to community stakeholders on the biological effects of light. Together, the sports team and PlanLED select a nonprofit organization or school before donating lighting products and/or installing LED lighting.⁹⁰ In a case study of a PlanLED Shine partnership with the New York Yankees and two schools in New York City, an evaluation found a 322 ton reduction of

CO₂ per year, resulting in \$50,000 in energy savings.⁹¹ Future directions can include increased monitoring and evaluation of stadiums, schools, and nonprofits engaged to calculate energy efficiency improvements, which directly correlates with target 7.3.

SDG 8: Promote Sustained, Inclusive and Sustainable Economic Growth, Full & Productive Employment & Decent Work for All

Program: Society Empowerment Project (SEP)

Relevant Targets:

8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training

Kenya's Nyanza Province experiences the country's highest HIV/AIDS burden, with many youth orphaned and facing lack of access to education due to caregiving or financial barriers.⁹² To empower youth, SEP established a youth football for agribusiness program in Homabay and Migori Counties. The player's family dedicates a portion of crop land to the care of their youth participant. The child maintains this plot and, after meeting basic food needs, uses income from crop sales for education. SEP curriculum equips players with financial empowerment, HIV/AIDS education, agricultural training and education, and gender inclusion through sport, resulting in over 350 youth attending primary and secondary schooling, 50,000 Kenyan Shillings generated by youth for educational use, and youth trained in coaching and refereeing to ensure program sustainability. 75% of program participants are female.⁹³ Furthermore, SEP coordinates local annual soccer tournaments and camps. During these sessions, global (Travel 2 Change) and local partners (Nyanza Reproductive Health Services) disseminate WASH education and promote voluntary male medical circumcision.⁹⁴ Future directions may include capturing metrics pertaining to participants' employment before, during, and after program participation to more accurately capture impact on target 8.5.

SDG 9: Build Resilient Infrastructure, Promote Inclusive & Sustainable Industrialization & Foster Innovation

Program: World Bicycle Relief

Relevant Target:

9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

Malaria is a noxious parasitic illness, with over 219 million cases reported globally in 2017.⁹⁵ The economic impacts of malaria include missed days of work or school and the expensive and time intensive process of medical treatment.⁹⁷ Timely access to care and medication can mitigate adverse health outcomes. In a project led by Medicine for Malaria Venture, Transaid, and the Zambian National Malaria Elimination

Centre in the Serenje district of Zambia, trained health workers utilized bicycle transport to deliver medication to children with suspected severe malaria and provided hospital transportation via a trailer attached to a bicycle. This facilitated timely drug treatment and linkage to care, resulting in a 96% reduction in mortality compared to the prior year when the drugs and transport were unavailable.⁹⁸

Similarly, World Bicycle Relief (WBR) empowers healthcare and education access while driving local economic development. WBR builds and distributes locally assembled bicycles to provide affordable transportation in rural areas. Impact evaluations found a 45% increase in community healthcare volunteer patient visits, 28% increase in student attendance, and 25% increase in crop delivery among farmers with access to WBR bicycles.⁹⁹ The social enterprise model allows for scalability and sustainability. WBR engages individuals in physical activity while providing a lifesaving resource for educational, economic, and health empowerment. Future directions can include scale up to more countries along with encouraging governments to support structural changes to the built environment to facilitate safe cycling.

SDG 10: Reduce Inequality Within and Among Countries

Program: Special Olympics International: Unified Sports

Relevant Targets:

10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status

People with disabilities comprise 15% of the global population.¹⁰⁰ Unified Sports provides students and community members without disabilities an opportunity to understand, interact with, and embrace those with an intellectual disability through physical activity. Over 5.7 million individuals are involved globally in Unified Sports through Special Olympics. Students with disabilities are more likely to drop out of school, experience bullying, and face increased peer rejection compared to their non-disabled peers. However, Special Olympics evaluations showed that students with and without disabilities interact more often in school settings through Unified Sports participation. In fact, 90% of European partners reported spending time with their athlete outside of Unified Sports.¹⁰¹ Focus group evaluation findings showed that Unified Sports athletes experienced improved confidence, social inclusion, and enhanced communication skills. Unified Sports demonstrate that integration of people both with and without disabilities (or “different abilities”) fosters mutual cohesion, understanding, and social integration in school and community settings globally. Future directions can include programming initiatives that also engage in political and economic inclusion to align with target 10.2, such as an evaluation to determine job attainment or training that resulted from increased social connection through Unified Sports participation.

SDG 11: Make Cities & Human Settlements Inclusive, Safe, Resilient & Sustainable

Program: 11th St Bridge Park

Relevant Targets:

11.7 By 2030, provide universal access to safe, inclusive and accessible green and public spaces, in particular for women and children, older persons and persons with disabilities

11.A Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

The 11th Street Bridge Park will be Washington, D.C.'s first elevated public park located on the piers of the former 11th Street Bridge, spanning the Anacostia River. With an expected opening of 2023, the project will bridge Wards 6 and Ward 8, which have disparate socioeconomic, social capital, health, and crime outcomes. In Ward 8, 42.8% of residents are obese, compared to 22.1% of Ward 6 residents. Furthermore, the median income of Ward 8 is \$31,642 compared to \$90,903 in Ward 6.¹⁰² This project focuses on resident participation in the planning process to address concerns, such as property tax increases and displacement. Results of a Health Impact Assessment (HIA) led to the formation of an Equitable Development Taskforce to address residents' social determinants of health.¹⁰³ This includes workforce development training, preferential hiring for all Bridge Park operations to local community members, home and small business ownership consultations to address concerns over rental price increases, a community leadership workshop to teach community members about community organizing, and offering children's savings accounts to help build residents' capital in order to retain residents. Additionally, the Bridge Park will connect to existing trails and urban gardens to promote physical activity and supply nutritious foods.¹⁰⁴ Finally, an Environmental Performance Metrics Analysis was conducted to assess the Bridge Park's environmental impact and to develop a strategic plan to manage future challenges.¹⁰⁵ The 11th Street Bridge Park is a community-driven initiative that will increase access to physical activity while supporting positive social, economic, and environmental outcomes. Future directions can include scale up of community-driven physical activity, social, and economic spaces similar to the Bridge Park in other locations while publishing a "good practices" guide for successful community integration.

SDG 12: Ensure Sustainable Consumption & Production Patterns

Program: Green Sports Alliance

Relevant Targets:

12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses

12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

Green Sports Alliance (GSA) is a global alliance that leverages sport governing bodies, universities, teams, professional sports leagues, venues, fans, and partners to adopt renewable energy, healthy food service delivery, recycling, water efficiency, and safer chemical use in 14 countries. Specifically, GSA resources include composting implementation, solar energy installation, e-waste collection, water resource management, management of locally supplied nutritious food, sustainable waste

management practices, green cleaning supplies use, fan engagement in sustainability, and sustainable transportation to sporting events and venues.¹⁰⁶ The GSA Foundation also engages youth and athletes in sustainable behavior change through sports. GSA launched the “Playing for the Next Generation” campaign to encourage the sports industry to commit to the U.N. Sports for Climate Action Framework, a 2018 initiative to elicit sports organizations to promoting greater environmental responsibility, reducing overall climate impact, developing climate action education, promoting sustainable and responsible consumption, and advocating for climate action through communication.¹⁰⁷ GSA contributes scalable strategies, rooted in key SDG targets, to affect physical activity, nutrition, and climate landscapes through sport. Future directions can include impact evaluations on global food loss and waste averted by partners to demonstrate contributions to SDG targets.

SDG 13: Take Urgent Action to Combat Climate Change & Its Impacts

Program: National Hockey League (NHL) Green

Relevant Targets: 13.2 Integrate climate change measures into national policies, strategies and planning

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

The NHL Green initiative is an industry approach to advancing sustainable practices within hockey. Invested in preserving long-term access to hockey for future athletes, NHL Green measures the NHL’s climate impact, while providing resources to engage clubs, communities, partners, fans, and employees in sustainability. NHL Green tracks organizational energy, water consumption, and waste production via NHL Metrics: an online tracking tool. Additionally, NHL Green invests in water restoration certificates to replenish rivers, and renewable energy certificates to offset its carbon footprint. Future initiatives include low emission energy installations, composting in venues, and youth environmental education to address climate change.¹⁰⁸ This is a salient example of how an overarching sport organization can change the culture of its fans, athletes, employees, and communities through organizational-level change. Future recommendations may include dissemination of NHL sustainable practices and curriculum with other national level sport governing bodies to promote sustainability in their sport, as part of advancing target 13.2. Additionally, capturing and conveying knowledge or attitude change among youth can help advance target 13.3.

SDG 14: Conserve & Sustainably Use the Oceans, Seas & Marine Resources For Sustainable Development

Program: Surfers Against Sewage (SAS)

Relevant Targets:

14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution

14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

SAS began in 1990 as a response from the UK surfing community to address ocean pollution. In the 1980s, UK surfers disproportionately experienced the effects of raw sewage, such as gastroenteritis, skin infections, hepatitis, and e-coli. SAS campaigned for water quality improvement by collating evidence on the effects of raw sewage, applying pressure on water companies to improve sewerage infrastructure, and urging decision makers to implement stronger legislation to protect water users. These efforts contributed towards water companies investing £5 billion, as well as the passage of the EU Bathing Water Directive and the Urban Waste Water Treatment Directive. Continued campaigning on water quality improvement led to 98.5% of the 625 designated bathing waters around the UK being classified as “excellent,” “good,” or “sufficient.” Beyond water quality, SAS coordinates beach cleans, community education, and campaigning to protect coastlines. SAS created the “Safer Seas Service” app to protect citizens from Combined Sewer Overflows, monitoring 330 beaches across England & Wales.¹⁰⁹ Further efforts include campaigning successes that led to the creation of a petition to reinstate a plastic bottle deposit policy, which the UK government passed in March 2018, along with a plastic bag charge. SAS programming includes outdoor education via the “Ocean Schools” program and “Be the Change” litter curriculum. SAS’ most recent policy initiative focused on “Plastic Free Communities, Schools, and Parliament” to eliminate single-use plastics, with 507 communities and 750 schools designated as certified-plastic free communities or in progress of earning this certification.¹¹⁰¹¹¹¹¹² The 2018 Autumn beach clean resulted in the collection of over 35.9 tons of marine plastic pollution, including 7,600 single-use drink containers. This was shared with the UK Government for consultation on a deposit return scheme for plastic drink bottles.¹¹³ These efforts, along with over 329,000 petition signatures, contributed toward the passage of a Deposit Return Scheme to reinstate bottle deposits¹¹⁴. With over nine published research papers, SAS uses evidence to inform their policy, advocacy, and community efforts. Future directions can include using SAS research papers and policy enactments to work with governments to create a marine protection and restoration plan to support the vastly approaching 2020 and 2025 14.2 and 14.1 targets.

SDG 15:

Programs: Girls Gotta Run Foundation (GGRF); U.S. Sport Commitment to Cookstoves

Relevant Targets:

15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally

Approximately 41% of the global population burns wood, charcoal, dung, crop residues, coal, or other solid fuels to cook food,¹¹⁵ resulting in environmental damage and contributing to 3.8 million deaths annually due to fume inhalation from open fires or inefficient cooking stoves.¹¹⁶ Based on many countries' gender norms surrounding cooking tasks, women and girls are disproportionately affected. GGRF equips adolescent girls in Ethiopia with health, leadership, economic development, and environmental education through running. Incorporated into their curriculum is a unit on sustainability, which covers culturally competent safe alternatives to deforestation through the use of firewood for cooking.¹¹⁷ Similarly, NASCAR, Major League Soccer (MLS), United States Tennis Association (USTA) and Major League Baseball franchises address deforestation by financing 7,252 cookstoves in Kenya, Malawi, Mozambique, Zimbabwe, and India to offset carbon emissions, spurring economic development through job creation for maintenance of these units.¹¹⁸ Cookstove use can create behavioral changes in areas most heavily impacted by the health consequences of fume inhalation. Further sport for development initiatives can take a combined education and social enterprise model approach to address deforestation and health consequences of open fire fume inhalation.

SDG 16: Promote Peaceful & Inclusive Societies For Sustainable Development, Provide Access to Justice For All & Build Effective, Accountable & Inclusive Institutions at All Levels

Program: Line Up Live Up

Relevant Targets:

16.1 Significantly reduce all forms of violence and related death rates everywhere

16.4 By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime

In April 2015, the Doha Declaration on Integrating Crime Prevention and Criminal Justice into the Wider United Nations Agenda to Address Social and Economic Challenges and to Promote the Rule of Law at the National and International Levels and Public Participation was passed by the UN, acknowledging that “sustainable development and the rule of law are closely interrelated and mutually reinforcing.”¹¹⁹ To address youth protection from violence and maximizing protective factors related to crime, the UN Office on Drugs and Crime launched “Line Up Live Up,” a youth sport lifeskills-based crime and drug prevention curriculum available in five languages. Content focuses on increasing knowledge about drugs, violence, and crime, including perception of risk, as well as providing positive social interactions to yield changes in decreased acceptance of drugs and reduce exposure to and acceptance of violence and crime. The intermediate and long term health outcome goals include developing resilient behavior and decreasing engagement in antisocial behavior through curriculum on resisting social pressures to engage in delinquency, coping with anxiety, and effective peer communication.¹²⁰ As of 2017, 77 sport coaches, 1,000 youth and two multipliers have been trained in Brazil and South Africa. Process and impact measures include checklists, questionnaires, and interview templates. Future plans include a multi-site mixed methods trial to assess impact and program expansion to seven additional countries.¹²¹ Line Up Live Up provides opportunities for physical activity, while directly addressing SDG targets through constructs of the Health

Belief Model and the Social Cognitive Theory to facilitate behavior change. Future directions can include public availability of the program's process and impact measures to encourage other programs to develop robust evaluation measures.

SDG 17: Strengthen the Means of Implementation & Revitalize the Global Partnership for Sustainable Development

Program: Sportanddev.org

Relevant Targets:

17.3 Mobilize additional financial resources for developing countries from multiple sources

17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the SDGs, including through North-South, South-South and triangular cooperation

The SportandDev.org global platform is an online resource focused on capacity building, knowledge-sharing, and resource guidance for program planning, implementation, research, and scaling up of sport for development organizations. To facilitate a community of practice, SportandDev.org features resources on sport and the SDGs, education, youth development, peacebuilding, disaster response, health, gender, economic development, and child protection. The platform features capacity building, project management, partnership building, monitoring and evaluation, and child protection and safeguarding toolkits.¹²² Available in both French and English, SportandDev.org features a bi-monthly newsletter of events, research, and updates in the field. By helping build, strengthen, and unite multi-stakeholder networks in partnerships for sustainable development and peace goals, SportandDev.org mobilizes global communication, partnership, and learning. Platforms such as SportandDev.org serve as cross-sectoral links (such as business, sport management, and public health) to increase impact and resource sharing. The sport, development and peace communities can contribute to collaboratively measuring SDG impact by assessing and reporting on the contributions of sport to the SDGs, with SportandDev.org serving as a backbone resource for communication of good practices.

Initiative to Address All 17 SDGs: Global Goals World Cup

A final case study is the Global Goals World Cup (GGWC): a women's soccer tournament uniting women to execute social change in their communities. Women play in the tournament while committing to take action on one of the 17 SDGs. Program impact includes reaching over 1,200 female participants across four continents since 2016. Of those participants, 75% developed confidence in advocacy, 35% were previously physically inactive, and 78% reported increased motivation to play sports.¹²³ GGWC demonstrates sport's ability to engage individuals with diverse physical activity experiences in active living while contributing to community-level social change. Furthermore, GGWC demonstrates the power of a social network to engage previously inactive females into the adoption of physical activity. Future directions can include follow-up evaluations of participants at one, two, and three years post-participation to determine what corresponding changes have occurred in participants' communities.

Limitations and Future Directions

Many of the aforementioned programs did not exclusively mention their focus on the selected SDG. To advance global attention and action towards the SDGs, concerted efforts from sport for development organizations must focus on which indicators their program addresses with coordinated monitoring and evaluation tools to capture impact. This will make it possible to disseminate measurable advancements in the SDGs from the sport for development sector.

Additionally, some of these programs center around the sports industry or athletes, but do not have physical activity incorporated into their programs. While certain organizations are better positioned to effect change at institutional levels, it is possible to still incorporate physical activity within such organizations in order to help individuals meet the WHO Global physical activity guidelines to aid in non-communicable disease prevention.

Finally, while it is unlikely that any single program will have the capacity to meaningfully address all 17 SDGs, many programs can likely address multiple SDGs by focusing on the inclusion of women, girls, people with disabilities, and engaging in sustainability. While each organization has a specific program focus, it is possible for organizations to expand their impact by incorporating intersectional approaches to include less privileged populations and promote sustainability by changing organizational culture and policies.

Further Recommendations

If each organization and institution publicly communicated how their work addresses the SDGs, and then reported such findings to global platforms such as SportandDev.org or the UN SDG Good Practice Platform,¹²⁴ this would provide evidence for sport for development as a viable tool for achieving the SDGs. This would help with further recognition of sport for development and perhaps increase funding opportunities.

Similarly, Collective Impact (CI) is a tool that could unify the physical activity and sport for development sectors. To effectively organize multi-stakeholder initiatives in addressing a social change policy or practice, CI coordinates efforts and stakeholders by gathering actors within a field to commit to a common agenda towards solving a shared challenge. CI differs from collaboration in that a shared set of metrics, continuous communication, dedicated staff to oversee the CI process, and mutually reinforcing activities occur among all participants.¹²⁵

A Stanford Social Innovation Review describes five key elements essential for CI:

- 1) All participants have a common agenda for change, including a shared understanding of the problem and a joint approach to solving it through agreed-upon actions.
- 2) Collecting data and measuring results consistently across all the participants to ensure shared measurement for alignment and accountability.
- 3) Developing and implementing a plan of action that outlines and coordinates mutually reinforcing activities for each participant or organization.

4) Open and continuous communication across the many participants to build trust, assure mutual objectives, and create common motivation.

5) A backbone organization(s) with staff who possess a specific set of skills to serve the entire initiative and coordinate participating organizations and agencies.¹²⁶

A successful example of CI applied to physical activity includes “Shape up Somerville:” a citywide effort to reduce and prevent obesity in elementary school children in Somerville, Massachusetts. Key actors included Tufts University, CDC, Robert Wood Johnson Foundation, Blue Cross Blue Shield of Massachusetts, United Way of Massachusetts Bay and Merrimack Valley, government officials, educators, businesses, nonprofits, and citizens. Constituents defined wellness and weight gain prevention practices. Schools committed to offering healthier foods, nutrition education, and physical activity promotion. Local restaurants earned a certification if they offered low-fat, high-nutrition food. The city government provided farmers’ markets and healthy lifestyle incentives, while improving sidewalks and crosswalks to promote walking to school. A statistically significant decrease in body mass index was found among the community’s children between 2002 and 2005, thus demonstrating the power of CI.¹²⁷

Within sport for development, the platform SportandDev.org can serve as a backbone leader in providing metrics for program impact and evaluation. Each sport for development organization can submit reports addressing agreed-upon metrics to their ministry of sport or leading sports infrastructure. In the case of the U.S., which lacks a specific ministry dedicated to sport, the President's Council on Fitness can identify a key staff member who would be responsible for managing such information. These reports can be reviewed by SportandDev.org and submitted to the U.N. to show impact in specific SDG targets through sport, long term reduction in NCDs, and, in turn, increasing funding for scale up and expansion of programs.

Final recommendations include increased cost effectiveness and social return on investment analyses to compare the cost of physical activity program spending with physical inactivity costs, utilizing a data-driven approach. Furthermore, increased cross-sectoral communication can facilitate development-oriented approaches to physical activity programs, while also engaging communities. All approaches must focus on engaging populations with the least access to physical activity, resources, and programs to make the greatest impact.

Discussion

The International Society for Physical Activity and Health considers sport opportunities for all people throughout the lifespan to be one of seven effective investments to increase population-level physical activity.¹²⁸ This endorsement, coupled with research demonstrating the cost effectiveness of sport and physical activity for improving health outcomes and human capital, as well as its effectiveness in addressing ACEs and the SDGs, highlight the need for increased funding for sport for development programs. As programs grow, it is vital for the sport and development sector to communicate broadly, partner with diverse stakeholders, and capture impact through shared metrics that include SDG targets to gain recognition of sport as an efficacious development tool. Given the high social and economic costs of physical inactivity and the ubiquitous influence of sport, sport for development programs offer a unique platform for increasing physical

activity, ameliorating non-communicable disease risks, and empowering humans and the planet through the Sustainable Development Goals.

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