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# Improving active travel to school and its surveillance: an overlooked opportunity in health promotion and chronic disease prevention

**Stephanie M. George**[1], **Sarah A. Sliwa**[2], **Kelly A. Cornett**[2], **Van Do**[3], **Andrew A. Bremer**[4], **David Berrigan**[5]

[1]Division of Extramural Research, National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institutes of Health, Bethesda, MD 20892, USA

[2]School Health Branch, Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA 30341, USA

[3]FHI 360, Washington, DC 20009, USA

[4]Division of Extramural Research, Pediatric Growth and Nutrition Branch, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health, Bethesda, MD 20892, USA

[5]Behavioral Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, National Institutes of Health, Bethesda, MD 20892, USA

## Abstract

Increasing active travel to school (ATS) could reduce the deficit in youth physical activity participation; however, surveillance of ATS is limited. Given that ATS contributes to our understanding of children's physical activity patterns nationwide, is influenced by local contexts and state laws, and occurs within communities, surveillance could be informative at the national, state, and local levels. Following a National Collaborative on Childhood Obesity Research workshop, this commentary offers insights into strengthening surveillance and data collection of ATS behavior as well as ATS environmental, policy, and program supports.

### Keywords

Physical activity; Youth; Active travel; Public health; School; Measurement

The benefits of physical activity for youth are well-documented. They include improved bone health, weight status, cardiorespiratory and muscular fitness, cardiometabolic health,

**Correspondence to: SM George,** stephanie.george@nih.gov.

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cognition (including memory, processing speed, attention, and academic performance), and fewer symptoms of depression [1]. The Physical Activity Guidelines for Americans, 2nd edition (PAG), recommend that youth ages 6–17 complete 60 min or more of moderate-to-vigorous physical activity (MVPA) daily [2, 3]. Unfortunately, only about one-quarter of U.S. youth meet this recommendation based on national surveys self-reported MVPA [4]. Strategies have previously been shared to increase youth participation in physical activity [5], but success in increasing population levels of youth physical activity has been limited. Increasing active travel to school (ATS) could reduce this deficit in youth physical activity participation, but national-level surveillance of ATS is incomplete or lacking entirely. Improved surveillance of ATS can inform adequate planning, implementation and evaluation of programs and policies aimed at increasing ATS [6]. Given that ATS contributes to our understanding of children's physical activity patterns nationwide, is influenced by local contexts and state laws, and occurs within communities, surveillance could be informative at the national, state, and local levels.

Support for the value of ATS has been growing over the past decade in the USA. In 2013, the Centers for Disease Control and Prevention's (CDC) Comprehensive School Physical Activity Program called out ATS as an implementable option for increasing youth physical activity [7]. In 2015, *Step it Up! The Surgeon General's Call to Action to Promote Walking and Walkable Communities* identified walk to (and from) school programs among options schools could prioritize to increase physical activity and connect with community-wide approaches to support active transportation [8]. In 2018, the Community Preventive Services Task Force recommended interventions to increase ATS based on evidence that they increase walking to/from school and reduce risks for traffic-related injury [9]. A companion economic analysis concluded that interventions to "improve infrastructure and enhance the safety and ease of ATS" have economic benefits that outweigh the costs of implementation, including averted healthcare costs [10]. CDC's Active People, Healthy Nation campaign, launched in 2020, includes "activity-friendly routes to everyday destinations" among its seven strategies to increase physical activity [11]. At present, these benefits of ATS are largely out of reach: a 49-country report gave the U.S. a D– for active transportation; and only 23% of children regularly participate in active transportation to *any* destination 5–7 days a week [12].

With the benefits of youth physical activity in mind, reports from recent roundtables have called for improved, robust surveillance of youth physical activity [13, 14] but have not commented on ATS specifically. However, surveillance for ATS is limited. For example, while Safe Routes to School program evaluation data exists at the local level [15], it alone cannot provide a comprehensive look at ATS. At present, only four North American surveillance systems track youth ATS behaviors and a few ATS-related built environment features, and no systems concurrently monitor supporting policies and programs [16]. The National Household Travel Survey (NHTS) is currently the only U.S.-based national surveillance system that can be used to analyze trends in youth ATS across all ages, using parent proxy for children ages 5–15 years and self-report for those older than 15 years; when used, it has yielded valuable data on ATS behavior. Some data concerning time spent in transport to school by youth ages 15 and older are also available in the American Time Use Survey [17, 18]; however, ATS is not readily operationalized or featured in publicly

available reports. Users need to specify the subpopulation of interest (e.g., enrolled in high school, ages 15–19), activity of interest (e.g., travel related to taking class), mode of interest (e.g., walking or biking), and times/dates of interest (e.g., nonholiday weekdays). We were unable to locate an American Time Use Survey study specifically reporting on student travel mode.

According to the 2017 NHTS, of the over 50 million children that traveled to school, only 10.4% reported walking or biking as their travel method on a usual school day [19]. Proximity to school is a strong predictor of ATS (<0.25 mile: 80.9%; 0.25–0.5 miles: 56.1%; 0.5–1 mile: 24.8%; 1–2 miles: 7%; 2+ miles: 9%) [19]. The Federal Highway Administration has administered this survey, which provides trip characteristics such as mode, duration, distance, and purpose, every 5–8 years, but its unpredictable intervals can make the data from this instrument hard to use for evaluation and planning. Further, child participation in ATS programs such as Safe Routes to School or walking school bus programs were last asked in 2009, were dropped in 2017, and are not planned in the next version of the survey, NHTS NextGen [20]. Capturing national participation in ATS programs would allow further examination of the adoption of evidence-based practices, prevalence, and trends of ATS behavior.

The National Collaborative on Childhood Obesity Research (NCCOR) held a workshop in Fall 2020 titled “Improving Surveillance of Youth Active Travel to School” to (i) identify gaps in existing surveillance systems; (ii) pinpoint needs of relevant decision-makers; and (iii) develop practical strategies and solutions to address those needs and strengthen surveillance where gaps exist [21]. NCCOR is a public-private partnership of the CDC, National Institutes of Health (NIH), Robert Wood Johnson Foundation, and the U.S. Department of Agriculture that addresses childhood obesity through research and evaluation and dissemination of research findings. A key priority for NCCOR has been to promote the common use of valid, standardized measures and methods across childhood obesity research, evaluation, and surveillance efforts [22]. The ATS workshop coupled a comprehensive assessment of indicators for surveillance with a pragmatic consideration of data collection opportunities. A synthesis of the workshop, metric prioritization activities, and postworkshop conversation and consultation, offers the following insights to strengthen surveillance and data collection of ATS behavior as well as ATS environmental, policy, and program supports.

## BUILDING ON EXISTING SURVEILLANCE SYSTEMS OFFERS EFFICIENCY.

Launching an entirely new surveillance system is both resource intensive and challenging given the complex landscape of federal surveillance systems. Incorporating feasible and high-quality measurements of ATS into existing data collection efforts related to youth physical activity, like NHTS, is likely more achievable and would allow for a better understanding of how ATS complements other opportunities for physical activity.

## SELF-REPORTED MEASURES AND SURVEY DATA ARE RELEVANT AND FEASIBLE FOR SURVEILLANCE OF ATS BEHAVIOR.

As shown in Fig. 1, the NCCOR workshop participants consistently gave “high feasibility” ratings to measures that could be collected by self-report, including via surveys. For example, self or proxy reports of mode of travel to/from school can be used to monitor the prevalence of ATS. Because ATS is a specific event, often occurring on a regular schedule, proxy reports for younger children and self-report for older children were described by participants as fairly accurate; many participants rated these as “high quality” methods. However, where more complete physical activity assessments are needed, such as for research on the contribution of ATS to physical activity guideline adherence or overall youth movement patterns, 24-hour recalls or device-based measurement are likely necessary for adequate validity [23].

## RESEARCH USING OBJECTIVE MEASUREMENTS OF THE ROUTE FOR ATS CAN INFORM SURVEILLANCE OF ACTUAL BARRIERS TO ACTIVE TRANSPORT IN THE LOCAL BUILT ENVIRONMENT.

Characterizing the attributes of the route traveled between a child’s home and school, using tools like global positioning systems (GPS), maps, geographic information systems (GIS), and direct observation can elucidate the actual environments supporting or discouraging ATS. Research designed to characterize route attributes—like the presence or absence of sidewalks or bike racks, or the walkability or rollability of a route—could help researchers and practitioners better understand the built environment barriers to ATS and identify potential targets for Safe Routes to School infrastructure interventions. This could then inform what type of spatial data features could be reliably and accurately measured in a community and advantageous to monitor via surveillance [24].

## MEASURES OF PERCEIVED BUILT ENVIRONMENT SUPPORT FOR ATS COMPLEMENT GIS AND RESEARCHER COLLECTED ENVIRONMENTAL DATA.

With both objective and perceived measures of the local built environment (see both Figs. 2 and 3), one has insight into the incongruence or congruence of these measures, which can provide a powerful guide for community-level action. This may be especially important when considering the route by which a child travels to/from school. One strategy to address the current gap in information is to embed more perceived environmental support measures into individual/household-level child-focused surveillance systems and make them school route-specific. Another strategy is to enable combining and/or integrating existing child-level data (e.g., student home address matched to school address) and spatial data to create route-specific environmental support metrics. In addition, collecting data about perceived environmental supports can enable analysis from an equity lens, by placing physical activity accrued through ATS in a broader context, such as considering ATS alongside stressors encountered in traveling to/from school. Integrated data can help communities working to

improve routes to/from school, because addressing single supports (or barriers) may not be enough to move the needle in promoting ATS.

## INCLUDING ATS POLICY AND PROGRAM SUPPORTS IN SURVEILLANCE EFFORTS AT THE LOCAL AND STATE LEVEL CAN PROVIDE DATA ON POTENTIAL LEVERS FOR ENABLING ATS AND PROMOTING CHILD HEALTH.

Helpful surveillance efforts might include measures (or links to them) regarding the presence/absence of policies for Safe Routes to School (e.g., requirements for crossing guards or traffic control measures), Complete Streets [25], speed zones around schools, minimum busing distances, and school start times. For example, school start and dismissal times play an important role in potential barriers and facilitators of ATS [26]. Early start times could require travel in the dark and start/dismissal times may not match parent schedules related to commuting, a challenge for younger children who may not be old enough to leave or return home alone. At the local level, policies related to zoning and land use as well as strategies in master/comprehensive plans could be paired to better understand the prevalence (or presence of) policies governing built environment infrastructure and features that support ATS, such as sidewalks, crosswalks, and bike lanes. One example is how the Physical Activity Policy Research and Evaluation Network is collecting data on zoning/land use laws for the most populous 300 U.S. counties, and will include markers for built environment supports for ATS that could be linked to GIS data or appropriately geocoded surveillance data [27].

## EQUITY CONSIDERATIONS ARE NOT SUFFICIENTLY INCORPORATED INTO METRICS, METHODS, AND ANALYSIS OF EXISTING SURVEILLANCE SYSTEMS.

Structural racism in the USA has created a highly disparate physical and social landscape for ATS to/ from school. Throughout American history, for example, land-use policies have created long-standing segregation along both race and class lines [28]. Even if infrastructure exists to facilitate ATS, people may not feel safe or welcomed to use the routes based on the color of their skin [29]. Without careful attention to these historical processes and current environments, we cannot adequately address the opportunities for and benefits of ATS across all communities.

As such, socioeconomic and demographic information that is properly geocoded and linked to individual behavior metrics may enable analysis from an equity lens. This information can also help assess whether initiatives are benefiting low-income students, students of color, students of all genders, students with disabilities, students in rural areas, and others. Schools in low-income communities have reported higher proportions of students walking or bicycling to/from school compared to higher-income areas [30]. This may reflect lower levels of vehicle ownership rather than youth preferences regarding ATS [29]. For rural communities, information on built environment characteristics, such as home residential

density and sidewalk presence [31], can help guide the development of tailored strategies for these students who are living at greater distances from school (e.g., having an earlier bus or car drop point). Overall, understanding both route attributes and the subjective experience of ATS could help researchers understand the extent to which ATS provides "age-appropriate, enjoyable opportunities for physical activity" [2] in addition to providing a means of getting to school.

## IDEAL TIMING FOR SURVEILLANCE WILL DEPEND ON HOW QUICKLY FEATURES CHANGE.

The appropriate frequency of surveillance measures will likely depend on whether the focus is ATS behavior, an environmental support, or a program or policy support and a mix of empirical and theoretical information concerning the time scale of change in surveillance targets of interest. Moreover, policy and built environment variables are not always examined on regular time scales although the U.S. Census Bureau's Topologically Integrated Geographic Encoding and Referencing /Line Files and Shapefiles are updated on a decadal cycle. Careful consideration of timing, spatial scale, and detail can be very helpful to create useful and affordable surveillance systems at multiple levels. ATS programming in a community may change in a matter of months or a year, while master plans may be in place for at least *5* years, or policies for 10 years. Further work can design the appropriate multilevel surveillance elements specific to ATS.

## INFORMATIVE DATA LINKAGE REQUIRES DATA FROM APPROPRIATE GEOGRAPHIES.

Systematically measuring and geocoding information about ATS behaviors, environmental supports, and policy and program support across the same jurisdictional levels would enable linkage of constructs across multiple domains. For example, an evaluation of the impact of municipal zoning and land use laws on ATS behaviors would likely require ATS behavioral data geocoded at the municipal level. Unfortunately, data sources aggregated at the state level would likely not be useful for exploring micro-scale environmental supports for ATS (e.g., presence of sidewalks, bike racks, or crossing signals). Furthermore, data aggregated at large geographies such as the state or census region would likely be of little use if smaller jurisdictions control efforts to increase ATS.

Collection and processing of data from salient geographies such as school districts, municipalities, or counties would fill a gap in local surveillance. Moreover, protected data centers housing spatially identified data and technical support for its use could allow greater use of existing and new data resources. Lastly, there are many contextual factors that would be important to monitor by linking them with other data sources. NCCOR workshop participants discussed data linkages related to health equity at length, as well as data about tree canopy, ultraviolet light exposure, traffic volumes, and air pollution.

## LOOKING FORWARD: NEW DIRECTIONS IN SURVEILLANCE.

We identified many variables of interest and relatively few data sources to build from. Creative efforts and transdisciplinary thinking could yield fruitful and smart ATS surveillance metrics that do not currently exist. While federally funded data sources have traditionally been used for state and national physical activity surveillance, and building on these can create efficiencies, the current dearth of available data sources also suggests opportunities to innovate. The public health community could capitalize on current and future technologies in the private sector to enable a national database of sidewalks, green spaces, and traffic. In addition, interactive dashboards describing routes to school and assessing them with respect to safety could be of great interest to parents and advocates. If feasible, dashboards comparing potential effects of interventions aimed at improving active transportation routes to schools could aid advocates and policy makers in selection of interventions for different school catchment areas.

Existing and future surveillance of environmental data could further be used to update and increase the geographic coverage of a school walkability index [32]. Moreover, nationwide data concerning school walkability could help prioritize environmental interventions and motivate school districts to engage with planning and transportation departments in their communities. Importantly, the mobilization, engagement, and empowerment of communities and schools will be a keystone in improving ATS. Tools like Photovoice [33] and Our Voice [34], for example, are adaptable and can be used to engage community groups and identify community perspectives and priorities concerning problems and barriers to ATS that would be appropriate attributes for surveillance.

Layered onto the ongoing challenge of helping youth meet physical activity recommendations, the COVID-19 pandemic has added barriers to physical activity. While we await data on the effects of the COVID-19 pandemic on youth physical activity levels, data on the first few months of school closure due to the COVID-19 pandemic in 2020 showed reductions in physical activity and increases in sedentary behavior [35, 36], which may be linked to the lack of in-person physical education and after school physical activity programs like youth sports. Better surveillance of multiple domains of youth physical activity, including ATS, can help evaluate long-term changes in physical activity associated with the pandemic and evaluate large-scale efforts to increase physical activity.

With tremendous investments in a safe return to school for all children (especially those in underserved populations) supported by the NIH-funded Rapid Acceleration of Diagnostics Underserved Populations (RADx-UP) Program [37], there is a concerted effort in the USA to address an equitable, safe return to school that engages local communities in the research [38]. With many children in the USA still awaiting vaccination and ongoing concerns about crowding on school buses and shortages of school bus drivers nationwide [39], the time may be ripe to make a safe return an *active* return that we measure. Planning and programming aimed at increasing ATS could help reduce crowding on school buses, address nationwide shortages of bus drivers, and increase youth physical activity. Youth who are regularly active also have a better chance of a healthy adulthood [2]. Thus, this commentary has provided a dialogue supporting the strengthening of ATS data collection and surveillance to inform

public health action at the local, state, and country level to help youth become and stay physically active, but also to better enable the study of the contribution of ATS to the overall health of U.S. children.

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## Implications

**Practice:**

Including active travel to school (ATS) policy and program supports in surveillance efforts can provide data on levers and best practices for enabling ATS.

**Policy:**

Better surveillance data could contribute both to top-down development of policies such as improving infrastructure for ATS, but also data-informed bottom-up efforts at the neighborhood and school level to develop local policies for improving factors such as traffic safety.

**Research:**

Surveillance of ATS across multiple levels can enable research on the contribution of this behavior to overall physical activity and health among youth.

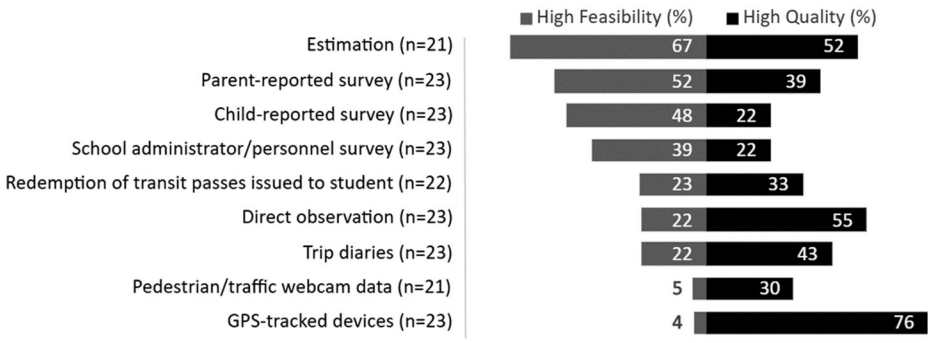


**Fig 1 l.**

Metrics of ATS behavior, rated by feasibility and quality by NCCOR workshop participants. Method of measurement: mode of travel to/from school first highest priority.

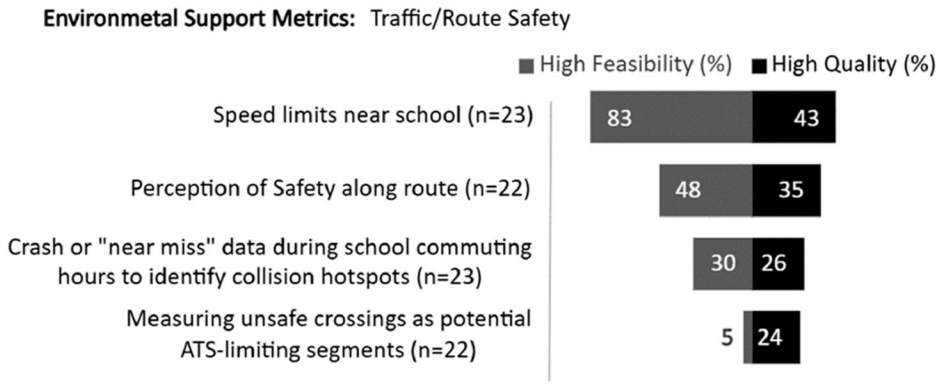


**Fig 2 l.**

Metrics of ATS micro-scale environmental supports, rated by feasibility and quality by NCCOR workshop participants.

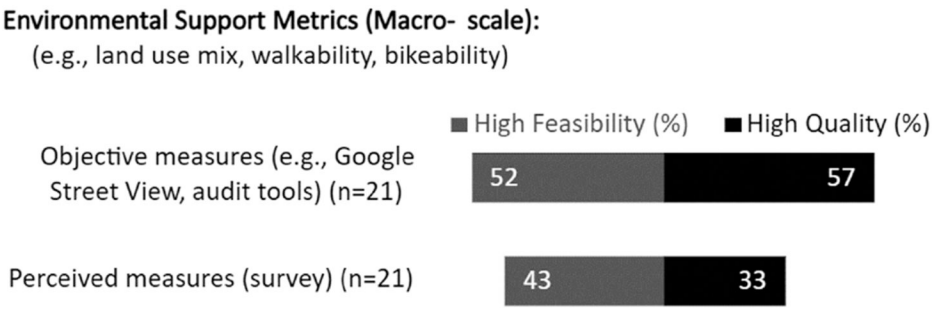


**Fig 3 |.**

Metrics of ATS macro-scale environmental supports, rated by feasibility and quality by NCCOR workshop participants.