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A Research Proposal to Study the Impacts of Safe Routes to School Programs in South King County

Research Question & Proposal: *What are the physical, social, and mental health benefits for children who walk or bicycle to school? Is the prevalence of walking and bicycling in persons of all ages higher in communities with high rates of children walking and bicycling to school? Conduct cross-sectional and longitudinal studies of schools to assess the relationships among walking and bicycling to school, obesity prevalence, hazard busing, school design, and environmental factors.*

Introduction: A Growing Health Crisis, Obese Kids, and Unhealthy Design:

Social policy and urban design decisions in the United States since the 1960s have created safety and physical barriers inhibiting young people's ability to walk, bike, and recreate. In 1969, about half of all school-age children walked or biked to and from school, and 87% lived within a mile from the school reached by foot or bike. By 2004, less than 15 percent of children and adolescents used either mode of transportation to and from school.¹

Overall, today's young people are less physically active than just a generation ago.² In the United States, obesity has become a national health crisis. Approximately one in three children ages 2-19 are either overweight or obese, and a third of all children born in the year 2000 are expected to have diabetes during their lifetime.³ During the last four decades, obesity rates in children ages 6-11 rose four-fold (4.2% to 17%) while the rate in adolescents ages 12-19 more than tripled (4.6% to 17.6%).² While the Physical Activity Guidelines for Americans suggests that kids and adolescents need at least 60 minutes of physical activity every day, fewer than one in five high school students today meets the 60-minutes-daily requirement.⁴

Physical infrastructure and urban design features preventing adults and children from exercising are well documented. A 2007 meta-analysis of research on obesity and the built environment found that most studies have reported statistically significant positive associations between some aspects of those two variables.⁵ The most common design barriers in the built environment that are prohibiting children from walking to school are distance, followed by traffic related dangers.^{1,6} Changing the physical infrastructure in neighborhoods has been found to encourage children—and their parents—to walk and bike to school.⁷

The last two decades has seen a growth in homegrown efforts around the country to encourage young people to engage in physical activity traveling to and from school. During that time, the planning and public health communities also have laid the foundation to address planning, community design, obesity, and physical activity issues in a collaborative fashion. Policies and support for changes that address barriers to physical activity are necessary to reduce the prevalence of obesity in all young people.

The U.S. Centers for Disease Control and Prevention has developed transportation policy proposals that could improve health. The CDC's recommendations call for "healthy community design elements"—transportation networks, street designs, land use policies—that can mitigate adverse impacts from air and noise pollution and reduce injuries.⁸ The proposals also call for policies that protect pedestrians and bicyclists, which in turn can have a profound positive impact on health. These include designing streets to reduce vehicle speeds and pedestrian and bike injuries and correcting hazards in infrastructure to make it safer for walkers and bicyclists.⁸

Safe Routes to School (SRtS): The CDC's proposals complement the national initiative launched in the 2005 Federal Highway Transportation Bill, which created the Safe Routes to School program. The program received an appropriation of \$612 million for activities from 2005 through 2009, providing funds to local governments, regional agencies, and non-profits to develop programs that would encourage primary and middle-school age students to walk and bike to school.⁷ Recipients were required to use 70% to 90% of funds for infrastructure projects, such as sidewalk improvements, traffic calming devices, bike lanes, crosswalks, and bike lanes. Eligible non-infrastructure improvements could include public awareness campaigns, traffic education and enforcement near schools, education activities on biking and pedestrian safety, and activities to help sustain the programs.⁹ Because research has shown that walking and biking can be increased with specific interventions, the national SRtS initiative encourages what are called the "five Es": engineering, education, enforcement, encouragement, and evaluation.¹⁰ The latest SRtS data, from winter 2010, show that \$584 million in funding from states has been announced. At last count from the winter 2010 quarter, the number of schools that have participated or will participate in SRtS is 10, 411.¹¹ Today the Safe Routes to School National Partnership is comprised of more than 500 nonprofits, government agencies, and schools working to advance a national SRtS agenda.¹²

Physical, social, and mental health benefits for children who walk or bicycle to school: The American Academy of Pediatrics in 2009 released a study that showed health benefits are associated with modifications to the built environment that promote more physical activity among children. The group recommended that pediatricians encourage patients to support SRtS and other active transportation programs like the walking school bus. The group also suggested parents advocate for more recreational infrastructure and routes for physical activity opportunities such as walking or biking to school.¹³

In general, research has found that children who walk and bike to school have higher daily levels of physical activity and better cardiovascular fitness than children who do not commute by muscle power to school. What's more, SRtS projects and walking school buses have been identified as having proof of promoting children's active commuting to school.^{7,14} A 2008 study by Davison et al. found health benefits from active commuting, including higher rates of physical activity and higher cardiovascular fitness, which are linked to reduced risk for heart disease, stroke, and cancer.¹⁴ European studies have reached similar conclusions concerning the benefits of active transportation. Voss and Sandercock (2010) concluded in their study of English children

that regular bicycling and walking to school were strongly associated with higher aerobic fitness, and thus a strong indicator of good health. The authors note active commuting was linked to better school and future health outcomes and that bicycling and walking to school significantly boosted the odds for being fit.¹⁵

Additional Benefits from Children Walking and Bicycling to School: Studies have noted that walking and biking to school also have been associated with mental health and social benefits. It is theorized that both mental health and social skills are enhanced through exposure to nature and social interactions while walking.^{16,17} A 2008 study by Wilson and Dannenberg examined if the public health benefits of SRtS projects, such as sidewalk and crosswalk enhancements and the development of new walking and biking trails, also led to health benefits for larger communities. They found that SRtS improvements to school areas in urban areas would effect the 65 million Americans who live within .5 miles from a public school.⁷ Increasing an area's walkability would lead to reductions in obesity and diabetes, given that people who live in place where it is convenient to walk tend to do so. Research also has found that more pedestrian-friendly neighborhoods have better air quality and higher levels of social capital among residents.⁷

Study Design Proposal for South King County: I propose a longitudinal study lasting approximately one school year that measures the effects of SRtS interventions in a major metro area. This study would examine the impacts that ongoing SRtS enhancements will have in six south King County school districts, all of which are receiving federal stimulus grant funding from the CDC's Communities Putting Prevention to Work (CPPW) program, administered by Public Health - Seattle & King County (PHSKC). In 2010, PHSKC received \$8.9 million to boost nutrition programs and physical activities, among other priorities.¹⁸ The schools districts receiving funding for SRtS are Auburn, Highline, Kent, Renton, Seattle, and Tukwila.¹⁹ My study proposal would focus on just seven elementary schools—in Auburn (Pioneer, Terminal Park, Washington), Kent (Scenic Hill, Meadow Ridge, George T. Daniel), and Highline (Madrona). These schools have a combined student enrollment of 3,492. They are located in ethnically diverse communities with a large number of non-native English speakers; 1,172 of the students in these schools speak English as a second language.²⁰

Study Elements: The study would entail three components: mandatory surveys gathered by National Center for Safe Routes to School using the center's survey tools, a national survey instrument that enables researchers to track both physical activity and obesity measurements, and qualitative methods to assess hazard busing and environmental factors. Sample sizes from the two groups should be sufficiently large to assure valid statistical measurements from survey data.

Proposed Methods: For the purposes of a longitudinal study, seven control schools would need to be identified that are not receiving CPPW grant funding. They would need to be comparable schools in terms of size and demographics (ethnicity, socioeconomic status), though there would not likely be perfect case-control matches. The survey data to be used would be the SRtS tally sheets for students that are required by all participating SRtS schools. The mandatory surveys, administered by teachers, are

conducted on two middle-week days, asking students how they arrived to school and planned to return home. Walking and biking are choices, as are bus, family vehicle, carpool, and transit. The surveys are gathered at the beginning of the academic year at schools and when the intervention is completed at the end of the school year, so any progress in active transportation can be recorded. Right now, the schools participating in the CPPW grant funding are doing surveys. For a longitudinal study to have efficacy, controls would need to be found immediately, in order to have consistency in measurements. IRB approval from the participating school districts would be required. (See table 1.)

A second set of optional surveys are also collected by the national SRtS program. These are parent surveys focusing on walking and biking to school. These tallies gather data on distances from home to school, modes of transportation for kids to school, time of travel, physical or other barriers for kids' travel to school, and opinions on the importance of biking and walking to school. Schools have the choice of administering these to parents. Again, for a longitudinal study to be successful, parents in both the case and control schools would need to take the survey, in order to capture data at two points in time during the administration of the program at the grant-funded schools and at the control schools. (See table 1.)

The surveys also leave room for comments. Should the surveys be sent to each household, parents can be asked by an accompanying letter from school administrators for information pertaining to hazard busing barriers, which is defined as the use of school buses to take students short distances to avoid unsafe roads and absent sidewalks. That information could be quantified for purposes of comparing data between case and control schools.

Data from both surveys is collected and sent to the National Center for Safe Routes to School, and is shared with the participating schools. It is a rich data set. As of 2009, the data system had gathered more than 207,000 parent surveys and 40,000 student tallies from approximately 2,650 schools in 50 states and Washington, D.C.²¹ In the case of the control schools, data could be collected by the research team and then compared to the data set returned from the national office.

Additional Measurements: Study design costs for this project would rise if it included additional survey instruments to measure obesity prevalence, hazard busing, school design, and environmental factors in the case and control schools. Qualitative methods would be used during bike and walking audits using standardized audit tools that are suggested by the national SRtS program.²² The case schools in south King County in this study design will have GIS maps prepared by a consultant for the walking audits. Similar maps should be drawn up for the control schools. Coding would need to be developed to identify urban environmental features at the school sites and in surrounding neighborhoods that represent barriers to active transportation. Data from the audits could provide researchers additional information to characterize how friendly or hostile the immediate urban environment is surrounding the case and control schools. (See table 1.)

To gauge students' obesity information, school faculties would need to acquire two body mass index (BMI) samples during the year. BMI computations can be derived from height and weight data captured in the CDC's National Youth Risk Behavior Surveillance System (YRBSS) survey for middle-school students.²³ Physical activity data supplementing the SRtS tally sheets also could be gathered from the five physical activity questions found in the YRBSS surveys.

A survey of students, adapted from the YRBSS, prior the implementation of SRtS plans would be conducted in the participating SRtS schools and control schools in the three school districts. I would propose only giving the survey to fifth graders. IRB approval from the districts, from the school administration, and from the PTAs would be required for such a survey to proceed. The YRBSS survey for middle-school students may not be suitable for 5th graders, so just the questions asking for height and weight measurements and the five questions on physical activity could be pulled from the YRBSS survey into a tool developed specifically for this study. Such a survey would not pose any ethical concerns, as long as student anonymity was maintained. Involvement of PTAs would ensure community support for the research. (See table 1.)

Implications of Research: Data collected from the SRtS tally sheets from students and parents and from YRBSS surveys would enable researchers to compare case and control outcomes over a short time (one year). Measures of statistical significance could be gathered on behavior changes by students as a result of changes to the built environments. There may also be statistically valid data collected from the parent survey tallies regarding changes to parents' perceptions of the environment as a factor predicting their children's active commuting to and from schools. Such findings could confirm past research that changes to the physical environment will not impact kids' active commuting behaviors unless parental attitudes are addressed.¹⁴ The impact of SRtS efforts in south King County schools also can test the theory that active commuting reduces BMI, which past studies has shown has weak evidence.¹⁴

PH-SKC seeks to demonstrate that the CPPW funding for health promotion is a smart investment of federal dollars. Positive results could demonstrate that such interventions merit future investments from local, state, or federal sources. PH-SKC is working to collect measurable results, to be shared with stakeholders, including members of the state's congressional delegation. If there are positive outcomes that highlight the SRtS interventions can reduce obesity, encourage active transport, and mobilize parents, that also could encourage the local municipalities (Renton, Auburn, SeaTac) to revisit existing comprehensive plans and capital improvement plans to prioritize infrastructure for pedestrian and bicycle use.

Future Directions: Future studies that examine the success of SRtS projects, like this design proposed for south King County, will require evidence-based research to identify predictors of active commuting, such as community, school, and family factors. Regional and local policies will need to be examined.¹⁴ Davison et al. suggest that standardized measurements and variables be used to allow for comparative studies, as well as a repository of information that can help land use and transportation planners as they consider changes to zoning and engineering standards in school areas.¹⁴ Finally, the

SRtS national office has a large repository of survey data. There should be a more consistent effort to publish outcomes of the SRtS surveys and share those findings with public health officials nationally, to help facilitate the ongoing dialogue between public health specialists and planners, who already are using tools like GIS to show spatial relations between built environment and health outcomes. SRtS data should be incorporated into the dialogue over future development decisions in south King County.

Table 1: A summary is provided of proposed data collection methods for a longitudinal study with case and control schools in south King County to assess the relationships among walking and bicycling to school, obesity prevalence, hazard busing, school design, and environmental factors. The intervention to measure is a SRtS program implemented at seven case schools with large populations of non-Native English speakers.

| Survey Tools | Variables Measured | Timelines | Other Details |
|---|--|--|---|
| SRtS students arrival and departure tally sheet | <ul style="list-style-type: none"> - Method of transportation to school (including biking/walking and family vehicle and bus) - Frequency of active transportation during week | To be administered in case and control schools before and after SRtS intervention | Administered by teachers with a show of student hands before and after SRtS intervention (always done on midweek days) |
| SRtS parent survey about walking and biking to school | <ul style="list-style-type: none"> - Active vs. other forms of transportation (driving, bus, transit) - Travel time and distance - Parent perceptions of built environment hazards/barriers - Parent views on active transportation - Parent views on safety and built environment hazards and barriers | Subject to research funding limits and school resources; should be administered at case and control schools at the start and completion of SRtS intervention | Hazard busing data can be gathered in parent comment sections of tally sheet; parents would require encouragement from schools to provide comments on traffic and other built environment hazards |
| Adapted YRBSS survey | <ul style="list-style-type: none"> - BMI of students - Level of students' physical activity | Subject to research funding limits and school resources; should be administered at case and control schools at the start and completion of SRtS intervention | Should only be administered to 5 th grade students at case and control schools; subject to IRB approval from local PTAs and school administrators |
| Walking audits | <ul style="list-style-type: none"> - Built environment hazards and barriers at and near case and control schools - Built environment features that promote active transportation at and near schools | To be administered before and after SRtS intervention at case and control schools | Audits should follow standards used in previous audits at SRtS school sites in King County |

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