Safe Routes to School (SRTS) Statewide Mobility Assessment Study - Phase I Report

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SAFE ROUTES TO SCHOOL (SRTS)
STATEWIDE MOBILITY ASSESSMENT STUDY PHASE I REPORT

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16. ABSTRACT

This report presents the results of phase one of a two phase study designed to support state-level management of the Federal Highway Administration Safe Routes to School (SRTS) program. The study aims to achieve three objectives: (1) identify and use existing tools to establish benchmarks for children walking and biking to school, (2) provide recommendations for future allocation of SRTS funds, and (3) identify methods and tools to continue to evaluate the effectiveness of SRTS investments.

Phase one focused on the first objective. Rates of walking and biking to school were found to vary considerably. Therefore, benchmarks of children walking and biking to school should come from individual schools. The best tool for establishing these benchmarks was the National Center for Safe Routes to School (NCSRTS) Student Travel Tally.

The second two objectives were only explored in phase one. A literature review identified four major barriers to walking and biking to school that could be used to help filter program applications. Data collected by this study, the NCSRTS, and other agencies can contribute to SRTS project evaluations but because SRTS programs vary from state to state and the program is relatively new, many data are incomplete. Consistent, standardized SRTS data collection is necessary to support robust project evaluations. These preliminary findings will be explored further during phase two.

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❖ Executive Summary

The Federal Safe Routes to School (SRTS) program provides funding for local projects that make it safer for more children to walk or bike to school. Federal SRTS funds are administered through each state department of transportation. In most states, demand for federally funded SRTS projects exceeds the funds available by a factor of three or four. This indicates that (a) the amount of SRTS funding available for states is insufficient, (b) criteria to assess SRTS project applications are necessary so that projects with the greatest need and highest potential for success are awarded funding, and (c) methods to evaluate funded projects are necessary so that practices that result in effective projects can be identified. Several states—Washington, Florida, Texas, Mississippi, and Alaska—worked together as part of a Transportation Pooled Fund (TPF) Study to explore these issues. The goal of this "Statewide Mobility Assessment" Transportation Pooled Fund (TPF) study is to study and recommend SRTS application assessment criteria and best practices for project evaluation to support state-level SRTS program management. The intent of the research partners is to produce study results that may also be used to demonstrate the value of the SRTS program to those making decisions about future SRTS program funding. To achieve these goals, the TPF project has three objectives:

(1) Identify and use existing tools to establish benchmarks for children walking and biking to school.

Benchmarks of rates of children walking or biking to school can be used to help identify communities in need of pedestrian safety measures or opportunities to increase rates of active transport to school (ATS). Benchmarks will also help coordinators measure the effects of the SRTS program, enhance or initiate partnerships, and address forthcoming governmental requirements for project performance measures.

Preliminary findings: Rates of children walking or biking to school vary widely, depending on many factors. Because of this variability, the most reliable benchmarks should come from individual schools, whether or not they are already participating in an SRTS project.

Conclusions/next steps: Schools applying for SRTS funding should provide student counts of children currently walking and biking to school as part of their applications in order to establish a benchmark by which to compare the effects of implemented SRTS projects.

(2) Provide recommendations for future allocation of SRTS funds.

Understanding common barriers to walking or biking to school can help weed out those projects that are not likely to be successful and prioritize projects that plan to target barriers that can be overcome. This process can help identify projects that may be most successful.

Preliminary findings: A literature review identified four common barriers to walking or biking to school: (1) long distances between children's homes and schools, (2) higher income families having access to individual cars and time to drive children to school, (3) parental fear of traffic and crime, and (4) parental schedules and values that conflict with children walking or biking to school.

Conclusions/next steps: According to the literature, longer distances between children's homes and schools create a clear barrier and could be used to screen projects with little potential for success. Income, fears, schedules, and values are more complex issues and must be explored in greater detail before they can be used to identify projects with the greatest potential for success.

(3) Identify methods and tools to continue to evaluate the effectiveness of SRTS investments.

Because the SRTS program is relatively new and varies from state to state, methods of evaluating the effectiveness of the program should be established now so that practices that result in effective SRTS projects can be identified.

Preliminary findings: Data from this Pooled Fund project, the National Center for Safe Routes to School (NCSRTS), and various other sources can contribute to an understanding of the characteristics of successful SRTS projects, and more generally, child commute behavior and parent attitudes.

Conclusions/next steps: This project will explore how existing data can be used to evaluate program effectiveness. However, consistent, standardized SRTS data collection is necessary to support more robust evaluations. To support this goal, state departments of transportation should use the NCSRTS student in-class travel tally and parent survey as a part of the application process and post-project evaluation. As funds and resources allow, additional efforts should be made to monitor and report pre- and post-project student pedestrian and bicycle collisions. Ideally, the same data over the same time period should be collected from schools that are not awarded SRTS funding so that the SRTS programs can refer to "control" schools or projects to better evaluate SRTS programs.

Documents and project tasks completed during Phase I of the TPF Project are included in the appendices. A literature review provided a foundation of knowledge on rates of walking and biking to school, social and environmental characteristics associated with walking and biking to school, and previous SRTS evaluations (Appendix A: Literature Review). Data on SRTS projects and schools are being collected from TPF states; a preliminary review of project characteristics was completed by using data from Mississippi and Washington state (Appendix B: Pooled Fund Project Data Tallies). Various databases were identified and reviewed for relevance to this study (Appendix C: National and State Databases of Possible Interest). Data from the national Center for Safe Routes to School were found to be the most relevant to this project and were reviewed in detail (Appendix D: National Center for Safe Routes to School Data Review). Finally, descriptive statistics of youth pedestrian and bicycle collisions, as well as neighborhood characteristics, were developed for schools in Washington State that received SRTS funding (Appendix E: Washington State SRTS 2005-2007 – Descriptive Statistics of SRTS Funded Projects by School).

❖ Introduction

The Federal Safe Routes to School (SRTS) program's goal is to increase the number of children safely walking or biking to school. It provides funding for local projects that make it safer and easier for children to walk or bike to school. Federal SRTS funds are administered through each state department of transportation (DOT). Several states—Washington, Florida, Texas, Mississippi and Alaska—are working together as part of an SRTS Transportation Pooled Fund (TPF) Study to develop resources for state DOTs to use for SRTS project selection and evaluation. These resources are intended to support state-level management of the federal SRTS Program.

In most states, demand for SRTS projects exceeds the supply of SRTS funding by three to four times. This primarily speaks to the need for increasing the amount of SRTS funding available for states. It also highlights the importance of methods to evaluate SRTS project applications so that projects that serve the greatest need and exhibit the highest potential for success are awarded funding. Finally, it suggests that project evaluations are necessary to ensure that the limited funding is, indeed, awarded to effective projects and that the characteristics contributing to the success or failure of a project are identified and used to refine project selection criteria. These evaluations can also be used to document the value of the program and, if desired outcomes are being achieved, argue for increased funding.

Although states currently use criteria to select SRTS project applications, these criteria vary from state to state and may not be based on sound evidence. The TPF Project will make objective SRTS project selection criteria available to all states. These criteria will be based on research on the factors that influence whether or not children walk or bike to school, as well as evaluations of past and present SRTS projects. The study will also recommend project evaluation methods so that state SRTS programs can be refined as more feedback becomes available.

To develop these state-level SRTS program management resources, the TPF Project seeks to achieve three objectives:

(1) Identify and evaluate tools for establishing benchmark rates of children walking and biking to school. These can be used to identify need, determine safety (e.g., monitor rates of pedestrian and bicycle collisions), and help measure the effectiveness of the program.
(2) Recommend approaches for determining the future allocation of SRTS funds so that they will be awarded to the most promising projects.
(3) Develop methods and tools for continuing to evaluate the effectiveness of SRTS investments.

The project consists of two phases. Phase One focused on the first objective. Phase Two will focus on the second and third objectives. This report summarizes the activities of Phase One and the direction the project is taking as it moves into Phase Two. This report first highlights the demand for the federal SRTS program. Each project objective is then discussed separately. Activities are summarized and key findings are presented. On the basis of these findings, conclusions are drawn and next steps are proposed.

❖ Demand for Funding and Funded Projects

OVERVIEW

In most states, the demand for SRTS projects exceeds the supply of SRTS funding by three to four times. This indicates the importance of the Federal Highway Administration's (FHWA) SRTS program within state DOTs and the need for more federal funding for the program. It also suggests the importance of more uniform criteria to guide the SRTS project selection process and methods to evaluate the effectiveness of funded projects. Currently, different state DOTs do not use the same review criteria for project selection or evaluation methods.

PRELIMINARY FINDINGS

The federal SRTS program allocates funds to each state based on the basis of its population of school-aged children. Each state receives a minimum $1 million annually, and states with more school-aged children receive more funding. States are in various stages of awarding federal SRTS funds. So far, National Center for Safe Routes to School (NCSRTS) data show that California, Florida, New York, Texas, and Washington have announced the most funding for SRTS projects (Table 1). Mississippi is 19th in terms of funding announced, and Alaska has announced some of the lowest levels of funding, in part reflecting this state's low “student” population.

Demand for SRTS projects is consistently high at the state level. Only three states (Alaska, Delaware, Massachusetts) and the District of Columbia have been able to fund all funding applications received. Nationally, 37 percent of SRTS project applications have been awarded funding, representing only 25 percent of the total funding requested (Table 1). Of the states in the Pooled Fund, Mississippi and Texas received requests for about three times the federal SRTS funding they had available. They were able to award only 52 percent and 68 percent of applications received, respectively. Even though Washington state awards included state and national SRTS funds, it was only able to fund 22 percent of both SRTS applications and dollars requested. Both of these figures for Washington state were below the national average. The states with the greatest unmet need for SRTS projects were New Jersey and Pennsylvania, with funds awarded to less than 10 percent of requests and the percentage of applications selected in the low teens.

Table 1: Safe Routes to School state program status for selected states (figures reflecting totals from the beginning of national SRTS funding in 2005 to March 31, 2009)

State	SRTS Funded Schools/ Programs	Funding Announced[1]	Funds requested for SRTS projects	Percentage of funds awarded [funds requested/awarded][2]	Percentage of Applications Selected [applications selected/total]
Alabama	55	$4,887,771	$7,200,000	74%	70% [26/37]
Alaska	9	$715,851	N/A	N/A	100% [6/6]
California	219	$87,039,750	$269,000,000	25%	27% [219/806]
Florida	928	$43,587,599	N/A	N/A	N/A [237/N/A]
Illinois	113	$8,337,721	$105,600,000	8%	11% [113/1044]
Michigan	51	$10,387,451	$22,000,000	64%	79% [48/61]
Mississippi	68	$5,969,597	$18,500,000	34%	52% [34/65]
New Jersey	98	$8,157,000	$120,000,000	7%	11% [60/537]
Oregon	68	$2,330,206	$3,100,000	85%	80% [36/45]
Pennsylvania	11	$1,261,687	$56,000,000	6%	14% [16/112]
Texas	525	$24,678,953	$69,000,000	36%	68% [244/360]
Virginia	15	$3,530,932	$9,000,000	40%	63% [31/49]
Washington	32	$10,517,000	$47,000,000	22%	22% [32/143]
Total	~ 5224	$333,538,189[3]	$1,297,100,000	25%[4]	37% [2,558/6,995][5]
Yrly average (3 yr est.)	1741	$111,179,000	$432,366,667	25%	[653/2331)

Bold = lowest and highest with data available for percentage of funds awarded and applications selected
Red = states in the Pooled Fund
[1] Funding Announced includes the amounts that state SRTS programs have announced they will spend on specific local SRTS projects or programs. This does not identify funds that have actually been dispersed. It also does not include the amounts that a state has committed to making available through its application process.
[2] Percentage of funds awarded based on funds requested shows the percentage of SRTS funds each state has announced relative to the total dollar amount of SRTS funds requested, which is shown in the previous column. The percentage is calculated by summing the values in the table's Funding Announced and any statewide spending (not shown in this table) and dividing by the number that appears in the Funds Requested column.
[3] Total Funding Announced: Although the Funding Announced column values for California, Florida and Washington display $87.0M, $43.6M $10.5M, respectively, this total for all states does not include the funds California, Florida and Washington announced beyond the amounts apportioned to those states ($67,618,011, $29,116,392, and $10,175,004, respectively) through the current SAFETEA-LU legislation. The California, Florida and Washington dollar values used to calculate the total equals those states' apportioned amount minus their statewide spending.
[4] Total Percentage of Funds Awarded based on Funds Requested only includes states where the funding announced, statewide spending (not shown in this table), and amount of funding requested were known and provided.
[5] Total Percentage of Applications Selected only includes number of applications received and selected for funding cycles where the number of applications received and number of applications selected were known.
Source: http://www.saferoutesinfo.org/resources/collateral/status_report/1stqrt09TrackingReport1.pdf

The variations in state's abilities to meet SRTS project demand may be due to differences in federal SRTS funds available, project requirements, application processes, awareness of the program, alternative funding sources for pedestrian and bicycle infrastructure, and numerous other factors. Some variations in program administration may be reflected in the average SRTS project cost by state (calculated by using NCSRTS figures for funding announced divided by SRTS funded schools/programs). Nationally, the average SRTS project cost is $64,000. California and Washington have the highest average cost per project ($400,000 and $330,000 respectively). Mississippi is 17th and Alaska is 22nd, with average project costs of $88,000 and $80,000, respectively. Texas is 38th and Florida is 39th, with average project costs at about $47,000. The average cost per project may be lower in some states, such as Mississippi, partly because of low-cost planning grants that other states do not offer. The implications of these and other state-level program differences are discussed in the next section.

CONCLUSIONS/NEXT STEPS

Despite variations in state SRTS program administration, the figures clearly illustrate that demand for the SRTS program has been great, and current funds allocated only begin to address communities' needs. This finding is particularly robust because it is based on the actual number of *applications* made to the program each year, a solid indication of communities' needs, interest, and willingness to extend themselves to improve the safety of children as they travel to and from school. More SRTS funding should be made available to support communities that wish to improve the health and safety of their school-age children. In the meantime, because demand for SRTS programs outstrips the available funds, criteria are necessary for identifying SRTS programs that will use funding most efficiently, and evaluation methods are required to ensure that funds are spent wisely. The three objectives of the Transportation Pooled Fund study address these needs.

❖ Characteristics of Funded Projects, the Elements of SRTS

OVERVIEW

As mentioned in the previous section, some of the variation in the percentage of SRTS projects each state is able to fund is likely due to differences in state-level program administration. The FHWA requires that 70 to 90 percent of federal SRTS funds be allocated to engineering improvements. The remainder must be used for non-infrastructure or the other elements of enforcement, education, encouragement, and evaluation. States that fund each element in a project are probably less capable of funding a large number of projects; states that fund fewer elements per project are probably capable of funding more projects. In addition, non-infrastructure programs usually cost much less than infrastructure projects, so states that have awarded up to 30 percent of their funding for non-Infrastructure programs will likely have a lower cost per project than other states that are nearer to meeting the 10 percent non-infrastructure funding requirement.

PRELIMINARY FINDINGS

A preliminary review of funded SRTS programs in Mississippi and Washington, two TPF states, using data collected in this study (see Pooled Fund Project Data in the section *Objective 3: Methods to Evaluate the Effectiveness of SRTS Investments*) showed that most projects (87 percent) feature a combination of infrastructure and non-infrastructure components, but that some contain strictly non-infrastructure (10 percent) or infrastructure (3 percent) components (Figure 1). Combined projects receive more funding on average than projects that feature only infrastructure or non-infrastructure components. Combined projects also affect fewer schools on average than projects that feature only infrastructure or non-infrastructure components. This means that the average cost per school affected is much higher for combined projects than projects that involve only infrastructure or non-infrastructure (Figure 2). However, combined projects are likely to be more in depth and complex. So while strictly infrastructure or non-infrastructure projects appear to affect more students for less money, combined projects may have a greater impact on those students who are affected.

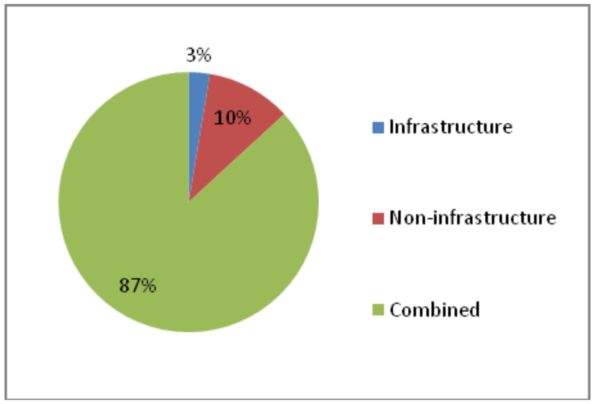

Figure 1: Portion of SRTS projects in Mississippi and Washington states by type

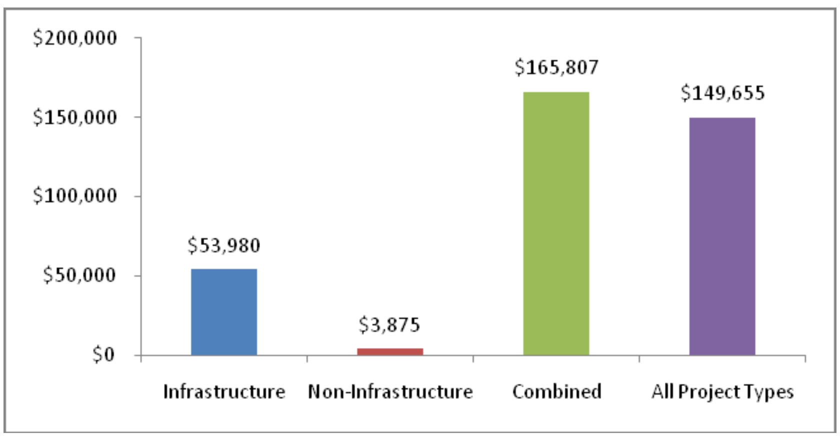

Figure 2: Average funding awarded per school affected in Mississippi and Washington states by project type (excludes projects that did not affect specific schools).

CONCLUSIONS/NEXT STEPS

The variation in how the elements of the program are addressed from project to project and state to state may allow for exploration of the effectiveness of "deep" projects (those that address many elements at few schools) versus "broad" projects (those that address fewer elements at many schools). Project data compiled by the study or from the NCSRTS could be used to facilitate this analysis (see the section *Objective 3: Methods to Evaluate Effectiveness of SRTS Investments* and appendices B and D).

❖ Objective 1: Benchmarking Children Walking/Biking to School

OVERVIEW

Measuring state-based benchmarks of children walking/biking to school is important for several reasons. The information can be used with other data, such as the number of children living within a mile from the school, to identify need. It can also be used to determine the rate of collisions based on the number of children walking and biking to school so that changes in rates of children walking and biking can be compared with changes in collision rates. It will also help coordinators measure the effects of the SRTS program, enhance/initiate partnership opportunities, and address any governmental requirements for performance measures. The TPF study found that rates of children walking or biking to school vary widely depending on — among other things — location, student population, and survey instruments. Because of this variability, the most reliable benchmark of children walking/biking to school for SRTS programs will come from the individual schools themselves. It is this study's recommendation that schools applying for SRTS funding should be required to provide student counts as part of their applications.

PRELIMINARY FINDINGS

We have identified a number of benchmark measures taken at the national, state, and local levels. At the national level, it seems that the National Household Transportation Survey (NHTS) is the most reliable source of information on rates of active transportation to school (ATS). This survey began in 1969 and has recorded a declining trend in the occurrence of walking and biking to school (Table 2). These statistics were an important part of the impetus for funding SRST at the national level. According to the NHTS, 12.9 percent of children walked or biked to school in 2001. This rate may be lower than reality because respondents tend to underreport non-motorized trips during transportation surveys. In 2001 the survey was modified to capture more non-motorized trips, but the problem may persist.

Table 2: National Rates of active transport to school (ATS) 1969-2001

Year	Total ATS	Walk	Bike
1969	40.7	NA	NA
1977	23.5	22.5	1
1983	15	14.5	0.5
1990	19.2	18.2	1
1995	11.7	10.6	1.1
2001	12.9	12.1	0.8

Source: Appendix A

While nationally rates of walking and biking to school were at 12.9 percent in 2001, a review of the literature showed that the number of children walking or biking to school can vary considerably from place to place. Summarizing specific recent (>1999) research projects, the figures range from 6 to more than 50 percent of the children using ATS (Table 3; note that these figures draw from a range of target populations).

This wide range in the rates of children walking and biking to school begs the question, what is a desirable threshold for SRTS programs? To be useful, benchmark measures of students using active transport to school have to be representative of defined target populations (e.g., state, county, school, classroom populations) and the school context (such as the percentage of the children living close to the school). Also, these measures are meaningful if the data are collected in the same fashion at one time or over a period of years. The NHTS does not provide a sufficient number of responses to generalize this information to the state level. Nor is it administered frequently enough to serve the needs of the Safe Routes to School Programs. At the state level, the data are more difficult to gather, as different instruments are available in different states, and not all of these instruments are administered on a regular basis. The same issues arise at the local level. Transportation and activity surveys are available for independent schools in metropolitan areas only.

Table 3: U.S. Active transportation to school figures (>2000, selected from the review of the literature in Appendix A): Portion of students using ATS by region and year (% ATS column is total portion of children walking, biking, or using some other form of active commuting)

Region	Year	Population	N	Commute	Frequency	Measurements	% ATS	% Walk	% Bike	Primary Author, Publication Date
U.S.	2004	Age 5-18	1,588	AM/PM	At least once a week	Parent survey	17	17	NA	Martin 2005
State of NC	2001	Grade 6-8	2,151	AM	At least once a week	Child survey	12.1	9.4	4.1	Evenson 2003
		Grade 9-12	2,297				6.4	4.9	2.8	
Communities in AZ, MD, MN, LA, CA, and SC)	2007*	Grade 6 girls	1,596	AM	At least once in three days	Physical activity recall	14	14	NA	Saksvig 2007
				PM			18	18	NA	
Communities in AZ, MD, MN, LA, CA, and SC)	2002	Grade 6 & 8 girls	480	AM	At least once a week	Child survey	42.3	NA	NA	Evenson 2006
10 CA communities	2006*	Grade 3-5	1,244	AM	Usual	Parent survey	21	NA	NA	McMillan 2006
College Station, TX (Figures only represent students within a 2-mile walk zone of school)	2007*	Grade 5-6	84	AM	Usual	Parent survey	29.5	11.6	17.9	Folzenlogen 2007
				PM			38.2	18.7	19.5	
				AM/PM			36	19.8	16.2	
		Grade 7-8	102	AM			38.2	20.6	17.6	
				PM			53	35.6	17.4	
				AM/PM			47.1	31.4	15.7	
Lane County, OR	2007	Elementary school Children	1,197	AM	>2 days a week	Parent Survey	14.4	NA	NA	Yang 2008
				PM			15.4	NA	NA	
King County, WA	2006*	Age 5-18	259	AM/PM	5 days a week	Parent survey	18.1	NA	NA	Kerr 2006
					At least once a week		25.1	NA	NA	

Source: Appendix A

Table 3 (continued) U.S. Active transport to school Figures (>2000, selected from the review of the literature in Appendix A): Portion of students using ATS by region and year (% ATS column is total portion of children walking, biking, or using some other form of active commuting)

Region	Year	Population	N	Commute	Frequency	Measurement	% ATS	% Walk	% Bike	Primary Author, Publication Date
Columbia, SC	2005*	Grade 5	219	AM/PM	5 or more trips a week	Child survey	5	NA	NA	Sirard 2005b
					1-4 trips a week		11	NA	NA	
Wake County, NC	2005*	Elementary	800	AM	Not reported	Parent survey	5	NA	NA	Rhoulac 2005
				PM			2.7	NA	NA	
		Middle		AM			6	NA	NA	
				PM			5	NA	NA	
Rural NE	2005*	Age 10	320	AM	All school trips over one week period	Child survey	24.7	17.3	5.3	Heelan 2005
				PM			41.9	34.2	5.3	
				AM/PM			33.3	25.7	5.3	
2 small cities in OR	2004	Grade 6-8	287	AM	Primary mode	Parent Survey	15	9.8	5.2	Schlossberg 2006
				PM	Primary Mode		25.1	19.5	5.6	
				AM/PM	Ever		46	30	16	
Columbia, SC	2002	Elementary schools	8 schools, 3,911 students	AM	All school trips over one week period	Direct Observation	5	NA	NA	Sirard 2005
				PM			5	NA	NA	
				AM/PM			5	NA	NA	
Gainesville, FL	2000/ 2001	Grade K-12	709	AM/PM	Survey day	Travel diary	7.9	4.5	3.9	Ewing 2004
Alameda County, CA	2000	Age 5-18	614	AM	2 consecutive survey days	Travel diary	19	NA	NA	McDonald 2007b
San Francisco Bay Area, CA	2000	<18	4352	AM	Weekday	Travel diary	18.7	16.2	2.5	Yarlagadda 2008
				PM			15.4	12.9	2.5	
SC Lowcountry	1998/ 1999	Elementary – High Schools built pre-1983	200 Schools	PM	Usual	Principal survey	16	NA	NA	Kouri 1999
		Elementary – High Schools built post-1983					4	NA	NA	
Southern CA	1990	Grade 4-5	924	AM	>3 days in past week	Child survey	20	NA	NA	Rosenberg 2006

Source: Appendix A

An example of a statewide survey that has the potential to serve as a benchmark is the Washington State Healthy Youth Survey (HYS). As a result of SRTS stakeholders working with the Washington State Department of Health on the survey design, the HYS now includes questions that provide a representative statewide figure of students walking or biking to school. It asks how many days a week, on average, a student walks or bikes to school. The paper and pencil survey is administered in the fall of even years to sixth, eighth, tenth, and twelfth graders. Results from the 2008 HYS indicate that 33.5 percent of sixth graders and 37.1 percent of eighth graders walk from school at least once a week. These numbers appear to be unusually high relative to rates of walking and bicycling to school collected at individual schools in Washington state. This could be due to how the question is worded in the study. An additional drawback to the survey is that it may not be representative of smaller geographic areas within the state. In Phase Two, the TPF study will continue to investigate the usefulness of this survey instrument. The TPF study is also in the process of identifying other sources of data that can inform the benchmarking process, both in terms of instruments and appropriate thresholds to be used (see Appendices B and C).

CONCLUSIONS/NEXT STEPS

This study concluded that the best way to reliably benchmark walking/biking to school for SRTS programs is to require schools applying for projects to provide counts as part of their application for SRTS funding (this is practiced already in the states of Mississippi and Florida). Schools in these states that are awarded SRTS funds must provide counts after the infrastructure projects have been completed, for 3 to 5 years in the case of Mississippi. How the schools should best count children has not been determined, but members of the Pooled Fund project agree that the data collection should be not only reliable, but also simple, and should not overburden school administrators, teachers, and children. The NCSRTS student in-class travel tally form is likely the best existing instrument to facilitate this data collection. Phase Two of this study will continue with NCSRTS student in-class travel tally data collection and analysis in the participating states so that a more definitive conclusion to this issue may be reached (see discussion with Objective 3).

❖ Objective 2: Prioritizing Projects with the Greatest Potential for Success

OVERVIEW

Identifying common barriers to walking or biking to school at the project level can be used to identify projects that may be most successful at increasing the number of students safely walking and biking to school – either because these barriers are absent and many students already walk or bike to school, or because a project will address these barriers particularly well. A literature review identified four important barriers to walking or biking to school: (1) long distances between children's homes and school, (2) higher income families having access to individual cars and time to drive children to school, (3) parental fear of traffic and crime, and (4) parental schedules and values that conflict with walking or biking to school. Distance is a clear barrier and should be used as one criterion to identify projects with the greatest potential for success. Income, fears, schedules, and values are more complex issues and must be explored in greater detail before they can be used to identify projects with the greatest potential for success.

PRELIMINARY FINDINGS

The literature review (see Appendix A) provided a sound set of data identifying the major barriers to children walking to school. The main barriers are as follows:

- children living long distances from school (the distance from a child's home to school is the strongest predictor of ATS; with the consolidation of schools over time, children live farther away from their school than in the past)
- high income (fewer children from higher income families walk to school than children from lower income families)
- parents' fears for the safety of their children from traffic and crime
- parents' schedules and values, which may influence when and how children travel to school.

Distance from Home to School

Distance from a child's home to school is the strongest predictor of walking or biking to school. Several studies analyzed the exact relationship between distance and walking or biking to school. One Irish study found that a 1-mile increase in a child's distance from school decreased the probability of active commuting by 71 percent (the majority of walkers lived within 1.5 miles of school, and the majority of cyclists lived within 2.5 miles). A U.S. study found that 48 percent of children living within a mile of school used active transportation and that a 1-minute increase in the time it took to walk to school led to a 0.2 percent decrease in the likelihood of a child walking to school (see Appendix A). Relationships such as these could be used to estimate the maximum distances that students can be expected to walk or bike to school. Other researchers have used school enrollment and census data to estimate the portion of students who can reasonably be expected to walk or bike to school (see Appendix A). They found that 6 percent of elementary school students, 11 percent of middle school students, and 6 percent of high school students in the state of Georgia could reasonably be expected to walk to school. State SRTS coordinators could use similar methods to identify schools at which the greatest number of school-age students could be expected to walk or bike to school.

Income

Regarding the influence of the children's socioeconomic status on travel mode, research has shown that more children from lower income families walk to school. Clearly, car ownership and parent's ability to have children driven to school influence the rate of ATS (see Appendix A). Questions are already being posed with respect to the schools' access to the program: are the demands of the application process handicapping schools with fewer resources (staff and budget), especially schools serving higher proportions of disadvantaged populations? Research is being carried out at the national level to investigate these issues.[1]

The TPF project performed a preliminary socio-demographic review of schools that received funding in Washington state. Data from the Office of the Superintendent of Public Instruction (OSPI) showed that schools receiving SRTS funding varied in the percentage of non-white students over the years but averaged slightly higher than the 2007 state average (Table 4). Census-based analyses also indicated that SRTS funds were allocated to schools in areas with a higher percentage of non-whites and lower economic status than the state average (Table 5). Contrary to these trends, schools affected by a SRTS project had a lower percentage of children

[1] Active Living Research. "Federal Transportation Policy Implementation, Economic Investment in Low Resource Communities through Safe Routes to School". Grant awarded to Angie Cradock and Willard Fields. January 2009 to December 2010. http://www.activelivingresearch.org/node/11897. Also see Active Living Research. "The Equity of Federal Safe Routes to School Investments". Grant awarded to Noreen McDonald, Ruth Steiner, and Ilir Bejleri. January 2009 to December 2009. http://www.activelivingresearch.org/node/11905.

using the reduced or free lunch program than the 2007 state average (Table 4). These conflicting results may warrant further investigation. Note that while Washington state does use need as part of its selection criteria for SRTS projects, none of the indicators mentioned above has been required information on the application forms.

Table 4: Characteristics of student populations of schools receiving SRTS funding (both state and federal funding) in Washington state (OSPI data 2006, 2007)

Characteristics	SRTS Project Schools 2004/2005	2005/2007	2007/2009	All years	All Schools WA State (2007)
# of SRTS Projects	11	20	19	50	
# of Schools affected by SRTS projects	22	33	29	84	
School enrollment	9,976	11,884	12,076	33,936	1,031,846
Students using school bus [a]	31.22% (3,115)	56.96% (6,769)	43.47% (5,250)	44.60% (15,134)	46.21% (~476,791)
Percentage of non-white students	30.05% (2,998)	50.19% (5,965)	27.87% (3,366)	36.33% (12,329)	33.85% (349,244)
Students with reduced or free lunch	8.47% (845)	10.57% (1,256)	9.54% (1,152)	9.59% (3,253)	36.08% (372,309)

[a] Two schools had exceptionally high rates of school bus ridership. Blue Ridge Elementary School in Walla Walla had 98%-120% of students riding a school bus. Keller School (K-6) in the city of Keller had 100%-206% of students riding a school bus. This is likely due to transportation cooperatives, where one school district provides bus service for one or more other districts. It is not possible to identify all the schools that participate in these transportation cooperatives. See Appendix E.

Table 5: Socio-demographic and economic characteristics of areas around schools receiving SRTS funding in Washington state (2000 Census Block-groups)

Characteristics		Areas around SRTS funded schools Count	Percentage	WA State Percentage
Population	Total	493,335		
Gender	Male	246,041	49.87%	49.72%
	Female	247,987	50.13%	50.28%
Age	Aged 3 and younger	26,266	5.32%	5.32%
	Aged between 4-19	103,819	21.04%	23.11%
Race	White	369,394	74.88%	81.69%
Households	Total	204,093		
	Family household [a]	115,288	56.49%	66.43%
Household income	less than $15,000	32,924	16.13%	13.06%
	$15,001-$25,000	26,861	13.16%	11.67%
	$100,000 and above	20,921	10.25%	12.56%
Housing Units	Total	215,924		

[a] A family household includes a householder and one or more people living in the same household who are related to the householder by birth, marriage, or adoption. See Appendix E.

Parents' Fears about Traffic and Crime

In two recent nationwide Centers for Disease Control parent surveys, traffic danger and crime were the second and fourth most commonly reported barrier to ATS (the most frequently reported barrier was distance). Nationally, the rate of child pedestrian-auto related collisions has been decreasing. This is sometimes attributed to declining rates of walking and bicycling and, thus, decreased exposure to the risk of a collision. In order to meet the intent of the Safe Routes to School program and prevent a reversal of child pedestrian-auto collision rates, projects must first address traffic danger issues before encouraging children to walk and bike to school. A preliminary assessment of the Washington state SRTS program indicated that while the numbers of children walking and biking to school increased, there is no evidence that child pedestrian-auto collisions within 0.5 miles of SRTS schools increased (see Appendix E).

Researchers in Baltimore City, Maryland, found that neighborhood characteristics positively associated with the frequency and severity of pedestrian collisions involving school-age children within a quarter mile of school are as follows:

- the percentage of the population that is non-white
- population density
- percentage of school-age children within the census block group area associated with the school (see Appendix A).

Because greater population densities, percentage of non-white residents, and percentage of school-age children near schools are likely associated with increased rates of ATS, these characteristics likely represent an increased child pedestrian presence and, thus, an increased exposure to the chance of a motor vehicle collision. What is less understood is whether non-white, high density neighborhoods have fewer pedestrian facilities then other neighborhoods and how that may affect pedestrian collision rates and severity. Research has suggested that traffic dangers can be mitigated through pedestrian safety countermeasures commonly included in SRTS programs (see Appendix A). Additionally, some studies have found the presence of sidewalks, bike lanes, street trees, and “eyes on the street” to be associated with higher rates of ATS. Conversely, major road crossings, parental concern about traffic speed and volume, insufficient sidewalks, insufficient lighting, and insufficient crossing infrastructure have all been associated with lower rates of ATS. Together, these research findings suggest that the appropriate pedestrian safety infrastructure and non-infrastructure components can both make the school commute safer for children who already walk or bike and change the commute modes of children who do not walk or bike to school.

Parents' fear of crime or abduction persist despite declining rates of violent crimes against adolescents (trend data for children are not available) and evidence of low risks of abduction and other violent crime against children, especially by strangers. These concerns appear to be greatest for parents of young children and often spike after media coverage of an abduction, which may lead parents to conclude that the problem is more widespread than it actually is. Letting a child walk or bike to school alone is sometimes seen as a sign of neglectful or irresponsible parenting (see Appendix A). Parental concerns about crime need to be understood and addressed if the SRTS program is to be effective at increasing rates of walking and biking to school.

Parents' Schedules and Values

Generally, parents with favorable attitudes toward non-motorized travel and physical activity, or those who do not have a "car-centric" lifestyle, are more likely to encourage their children walk or bike to school (see Appendix A). This suggests that efforts to address parental values could result in more children walking or biking to school. NCSRTS parent surveys could be examined to better understand these relationships and how SRTS projects may influence parents' attitudes. Few studies have examined the relationship between parent and child travel behavior. Those that have examined that relationship found that children usually travel with their mothers, and greater parental schedule constraints are associated with a lower likelihood of walking and biking to school. The relationship between parents' and children's travel patterns should be explored in greater depth. This understanding could allow SRTS programs to be designed to better address parents' needs and constraints. A study parallel to the TPF will be investigating these issues in the Seattle region.

CONCLUSIONS/NEXT STEPS

A greater understanding of how these four barriers affect the SRTS program is required. This could inform methods for overcoming barriers and increasing the number of children walking and biking to school. In Phase Two of this project, the investigators will focus on further examining the nature of these barriers and how they may be addressed in order to achieve one of the main goals of the project, identifying ways to *increase* the number of children walking/biking to school. Specifically, the study will explore distances commonly found to be associated with more children walking or biking. School bus ridership data, which are provided by school districts, could be used, as they include the number of children living within certain threshold distances from their school. Parents' surveys from the NCSRTS will provide further information on parents' perceptions, attitudes, and schedules that affect the children's mode of transport to school.

❖ Objective 3: Methods to Evaluate the Effectiveness of SRTS Investments

OVERVIEW

Because the SRTS program is relatively new and has no national-level evaluation requirement, few data sources exist that support program evaluation at the state level. Methods of evaluating the effectiveness of the program should be established now so that practices that result in effective SRTS projects can be identified. Data from this study, the NCSRTS, and various other sources can contribute to a more complete analysis of SRTS projects, child commute behavior, and parents' attitudes. To facilitate ongoing and more complete evaluations, state DOTs should

- use the NCSRTS student in-class travel tally as a part of the application process and for post-project evaluation
- use the NCSRTS Parent Survey form pre- and post-project implementation.

As funds and resources allow, additional efforts should be made to

- report pre- and post-project student pedestrian and bicycle collisions
- collect the same data over the same time period from schools that are not awarded SRTS funding to have information from a "control" group that has not been funded by the SRTS program.

Note: There are multiple challenges associated with bicycle and pedestrian crash statistics. Not all pedestrian and bicycle collisions are captured in reported law enforcement records. Typically, the number of reported pedestrian and bicycle crashes involving children near schools is low and presents an element of randomness. Therefore, it is important that collisions are tracked over time by using the same data sources and techniques. At a minimum, evaluation efforts should be used to determine whether pedestrian and bicycle collision rates increase over time at SRTS project locations.

PRELIMINARY FINDINGS

SRTS projects vary. Some states fund planning grants for communities to develop an SRTS plan before implementation. Some states also fund statewide programs to develop SRTS resources that can be used by multiple communities or reach large audiences. Planning projects appear to be a good way for schools to begin communicating with the state DOT, understand the potential of an SRTS project, and develop a SRTS project that fits their needs. Statewide resources appear to be an efficient means to educate and encourage a large population. However, they are sometimes limited in their appeal to all schools and all ages. The utility of these and other investments will be investigated in the second phase of the project.

This study identified several databases that may be useful for understanding SRTS projects, as well as children's walk/bike to school behavior in general (see Appendix C). The National Center for Safe Routes to School data are likely the best available data for this project's purposes (see Appendix D). Other data exist, coming from various transportation, health, and commute behavior surveys. Finally, the TPF project is assembling its own project database to understand the nature of SRTS projects across states, determine the types of improvements most requested, and determine which activities are more likely to result in an increase in walking/biking safely (see Appendix B).

National Center for Safe Routes to School Data

After exploring a variety of databases, this study concluded that the National Center for Safe Routes to School (NCSRTS) database appears to be the most appropriate and useful to the programs. NCSRTS data, being structured to focus on SRTS projects, represent the best opportunity to monitor the programs and evaluate their effectiveness. The data can serve to establish baseline numbers of students walking or biking to school, check whether and how the programs have altered the number of children doing so, and assess barriers and opportunities perceived by the parents.

The data, however, remain difficult to use because of their uneven distribution. As of June 2009, data for the five participating Pooled Fund states included 143,000 student in-class travel tallies and 32,000 parent surveys for 60 programs affecting 345 schools. Most of these data were from the large states, Florida and Texas; the numbers of schools that submitted data equaled about 22 percent and 28 percent, respectively, of the number of schools affected by these state-funded programs. Although the numbers of tallies and surveys from Mississippi were smaller, they represented 50 percent of schools affected by state SRTS funds and, thus, could provide a sound basis for generalization for that state. Note, however, that these data may not necessarily come from projects awarded funding through a state DOT SRTS program. The NCSRTS collects data from any SRTS project, including those that are proposed but do not receive funding and those funded by sources other than the FHWA or state DOTs. Most state SRTS programs only "encourage" projects to contribute to the data being collected, with the result that only those schools with the organizational and staffing capabilities actually respond. It would be of interest to compare schools that fill in the data with those that do not—based on school size, resources available, and attitude towards the SRTS program—to understand possible differences in the profiles and characteristics of schools that do contribute data and schools that don't.

Using NCSRTS data for project evaluation is also problematic because of the low number of schools that have submitted data at two points in time. As of June 2009, only 23 schools in Florida had submitted pre- and post-project student in-class travel tally data. Only 19 schools in Florida and three in Washington State had submitted pre- and post-project parent survey data. One Washington state school submitted mid- and post-project parent survey data. These figures may change as more SRTS projects are implemented.

Other Data

Various data sources were reviewed and are presented in Appendix C. National figures on commute mode to school can be derived from the National Household Transportation Survey (NHTS). Many metropolitan areas administer their own surveys on activities and transportation which would be useful locally. The School Health Profile) contains information on school health programs, and some states may include data on SRTS programs in this profile. The National Survey of Pedestrian and Bicyclist Attitudes and Behaviors (Appendix 3, p. 10), HealthStyles Survey, and Surface Transportation Policy Project Poll have also explored the prevalence of and barriers to active commuting to school.

Other state surveys focus on health risks (School Physical Activity and Nutrition Project) and occasionally include information relevant to SRTS (Youth Risk Behavior Surveillance System; Healthy Youth Survey). Other datasets contain health (Behavioral Risk Factor Surveillance System) or transportation (U.S. Census; Omnibus Household Survey) information, but these data are only about adults.

Similar to the NCSRTS, *iwalk.org* maintains a database of schools that have voluntarily registered for walk to school events.Bus ridership data are available from the Office of Superintendent of Public Instruction in Washington state,) as well as from similar sources in other participating states. Finally, an evaluation of the Texas SRTS program was recently funded and may provide a useful source of data in the future. Two national-level evaluations have been funded by the Robert Wood Johnson Foundation.[2]

SRTS Pooled Fund Project Data

We inventoried SRTS projects in the five states of the Pooled Fund project. Each state SRTS coordinator provided data in a template that was developed for the project, from which a database was created. The fields contained in the database are listed in Table 6. Not all fields are available for all states. To this date, data have been submitted for four states. The accuracy of the data has been verified for two of the four states. Once complete and accurate data exist for all the TPF project states, these data will be analyzed.

These data will initially be used for simple analyses to better understand how states manage their SRTS program. A preliminary review of data for two states with complete and accurate data has already shown that states fund a variety of projects that range in cost and breadth of impact (see Appendix B and the section on *Characteristics of Funded Projects, the Elements of SRTS*). Tallies performed to date include the following:

- number of projects in each state, by funding source
- projects by geographic impact
- number of each type of project
- number of projects that address each of the program elements
- number of program elements addressed by projects
- number of projects featuring a sidewalk improvement
- total funding awarded
- average funding awarded per project, by project type
- average number of schools affected per project, by school type

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[2] Active Living Research. "Federal Transportation Policy Implementation, Economic Investment in Low Resource Communities through Safe Routes to School". Grant awarded to Angie Cradock and Willard Fields. January 2009 to December 2010. http://www.activelivingresearch.org/node/11897. Also see Active Living Research. "The Equity of Federal Safe Routes to School Investments". Grant awarded to Noreen McDonald, Ruth Steiner, and Ilir Bejleri. January 2009 to December 2009. http://www.activelivingresearch.org/node/11905

- number of schools affected by School type
- number of schools affected by project type
- number of schools affected by each of the project elements (engineering, education enforcement, and encouragement)
- average funding awarded per school affected, by type of project
- number of projects by agency type
- total funding awarded to each agency type
- average funding awarded per project by agency type
- pre-project rates of active transportation to school (ATS)
- average rates of change in students walking, biking, or using active transportation to school.

Table 6 Pooled fund projects data fields

Project-level Data		School-Level Data
TPF Project ID	Enforcement	School ID
State Project ID	Encouragement	TPF Project ID
Project Title	Education	School Name
Project Type	Promotion	School Type
status (pending, open, or closed)	Sidewalk	School District
Agency Type	Shared use path	School Street
City	Bike lane	School City
County	Crosswalk	School State
State	Bike rack	School Zip
Contact	ADA improvement	Enrollment
Legislative district	Traffic calming	Students walking Pre
Congressional District	Traffic control	Students Walking Post
Fund Cycle	School zone flasher	Walking % increase
Date Funded	Speed feedback signs	Students biking pre
Funding Amount ($)	Increased emphasis patrols	Students biking post
total funding request ($)	Crossing guard	Biking % change
Infra request ($)	Walking School Bus	Total ATS pre
Non-Infrastructure request ($)	Bike train	Total ATS post
matching funds ($)	Bicycle rodeo	Total ATS % Change
Funding Source	Walk/ride to school day	Total ATS absolute change
Geographic extent	Mileage club/pedometer use	
Schools Affected (number)	Curriculum development	
Crash History	Media campaign	
Risk: Inadequate Infrastructure	Performance: Bus service	
Risk: Auto (rail) Traffic	Performance: parent drop off	
Risk: Unsafe Ped Behavior	Performance: police activity	
Congestion Relief	Performance: walking/biking	
Engineering		

CONCLUSIONS/NEXT STEPS

Because many of the data necessary for comprehensive evaluations of SRTS projects are incomplete or absent, the study recommends that state DOTs embark on more extensive data collection efforts. As noted earlier, state DOTs should

- use the NCSRTS student in-class travel tally as a part of the application process and post-project evaluation
- use the NCSRTS Parent Survey form pre- and post-project implementation.

As funds and resources allow, additional efforts should be made to

- monitor pre- and post-project student pedestrian and bicycle collisions
- collect the same data over the same period from schools that are not awarded SRTS funding. These schools would serve as control schools when the long-term impacts of SRTS projects are evaluated.

The existing NCSRTS student in-class travel tally and parent survey are the most widely used and cost-effective instruments available. Their consistent use within and across states would allow for consistent evaluations over time. States or schools wishing to ask for additional information from students or parents could and should add questions to the existing instruments in order to maintain a continuous base of consistent data.

Phase Two of the TPF Project will further explore each of the three objectives stated above in more depth. It will include the five original partner states, Washington, Florida, Texas, Mississippi and Alaska, plus Wisconsin and all other states interested in joining the study. More information about Phase Two can be found at http://www.pooledfund.org/projectdetails.asp?id=399&status=4.

❖ Appendices

Appendix A: Literature Review

Appendix B: Pooled Fund Project Data Tallies

Appendix C: National and State Databases of Possible Interest

Appendix D: National Center for Safe Routes to School Data Review

Appendix E: Washington State SRTS Program 2005-2009 –Preliminary Assessment Overview

Appendix A

Literature Review

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❖ Introduction

Safe Routes to School (SRTS) is an international movement that encourages students to walk or bike to and from school while simultaneously making these commute modes safer. More children walking and biking to and from school is seen as a simple means to achieve several benefits: healthier children, decreased congestion, less pollution, stronger communities, and greater childhood independence, among others. In the U.S., SRTS programs have been established for only slightly more than a decade, first through local and state movements and more recently through a structured federal grant process. SRTS programs are now under way in all 50 states and the District of Columbia.

The rapid expansion and formalization of SRTS programs within the U.S. have been accompanied by a rapid expansion of literature on the subject. This document collects and consolidates this literature while extracting information pertinent to the development of successful SRTS programs.

This literature review first summarizes the history and current status of SRTS programs in the U.S. It then describes the methods used to collect relevant articles, reports, and other resources. The findings of this body of literature are organized into five sections: (1) rates of walking and biking to school, (2) factors correlated with children walking or biking to school, (3) reported barriers to walking or biking to school, (4) evaluations of SRTS programs, and (5) additional resources of possible use to SRTS programs.

❖ SRTS Background

SRTS is a concept that originated in Denmark during the 1970s.[1] At this time, Denmark had the highest rate of child traffic fatalities in Western Europe. In response, a pilot program in the city of Odense was implemented. The program identified and addressed specific traffic dangers and created a network of bicycle and pedestrian paths. By the early 1980s, this demonstration project was credited with reducing child pedestrian and bicycle collisions during the school journey by 82 percent. Following Odense's success, Denmark established a national SRTS program, and similar programs were implemented in other parts of Europe, Australia, Canada, New Zealand, and the U.S.[2, 3]

The first U.S. SRTS programs began in 1997 in the state of Florida[4] and the New York city borough of the Bronx [1]. By 2003, two SRTS demonstration projects were funded by the National Highway Traffic Administration (NHTSA) and completed in Marin County, California, and Arlington, Massachusetts. These projects were considered successful, and momentum for SRTS began to build. Several grassroots SRTS programs sprouted throughout the U.S., and many organizations began lobbying for national SRTS funding. These efforts culminated in 2005, when Congress passed the federal surface transportation bill, Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). This legislation established a national SRTS program through the Federal Highway Administration (FHWA).[3]

The national SRTS program makes federal funds available to local SRTS programs via state departments of transportation (DOTs). Each state DOT receives a minimum $1 million per year through 2009 to create and operate an SRTS program. Funds are awarded to each state DOT on the basis of statewide elementary and middle school enrollment [3]. A total of $612 million will be appropriated through fiscal year 2009, with the largest share, a projected $67.5 million, going to California. As of March 31, 2008, all 50 states had hired program coordinators, 49 states had started the process of awarding funds to grantees, and about 2,700 schools nationwide were participating in the program.[5]

To ensure that disadvantaged schools were not underfunded, SAFETEA-LU established a 100 percent federal share for SRTS projects – no matching state or local funds are required. The National Safe Routes to School Task Force, however, recommended that future SRTS legislation allow matching funds for infrastructure projects to stimulate state and local spending while maintaining the full federal funding for projects that serve disadvantaged schools or schools in areas where child pedestrians are at a higher risk.[6] Funds are to be split between infrastructure, such as street crossing improvements and sidewalk installation, and non-infrastructure activities, such as bicycle education programs and increased traffic enforcement in school zones. No less than 10 percent and no more than 30 percent of funds are to be spent on non-infrastructure activities. Infrastructure improvements must be located within bicycling and walking distance of school, defined as 2 miles.

SAFETEA-LU also established the National Center for Safe Routes to School (NCSRTS), a clearinghouse of resources and technical assistance for state and local SRTS programs. While SAFETEA-LU mandates a mix of infrastructure and non-infrastructure activities, the NCSRTS encourages every SRTS programs to incorporate the “five Es”: evaluation, engineering, education, encouragement, and enforcement. Evaluation involves collecting information on current commute conditions at a school. This information helps establish which specific program components may be most effective and allows for tracking any effects the program may have. Engineering is the actual construction of pedestrian and bicycle infrastructure improvements. Education teaches children and/or parents about pedestrian and bicyclist safety. Encouragement involves special events, contests, and other methods of inspiring students to walk or bike to school. Enforcement efforts focus on changing driver behavior through police or crossing guard presence.[3]

The five Es represent a shift in SRTS programs – from merely improving the safety of children who already walked or biked to school to increasing the rates of children who walk or bike to school safely.[7] In the U.S., declining rates of children walking or bicycling to school and increasing rates of children commuting to school in private vehicles[8] are believed to adversely affect children’s health, child pedestrian and bicyclist safety, and air quality around schools. Therefore, SRTS programs are seen as a means to address concerns regarding childhood obesity, child bicycle and pedestrian safety, and air pollution and congestion around schools.[6]

This recent expansion and formalization of SRTS programs has been accompanied by a growing body of research on issues surrounding SRTS and, more generally, children's travel behavior to and from school. This body of literature was reviewed for important findings, data sources, and methods that may support the development of effective SRTS programs. The remainder of this document describes the methodology used to collect this literature and the findings contained therein.

❖ Methodology

A 2008 literature review on the subject of active commuting to school provided a foundation of the literature cited in this review.[9] Additional literature was identified through searches of PubMed, ScienceDirect, the National Transportation Library, Active Living Research, and the University of Washington libraries' databases. These searches were conducted during June 2008 by using relevant keywords. Additional SRTS resources were obtained through the NCSRTS and the Safe Routes to School National Partnership, an organization of SRTS stakeholder groups.

❖ Findings

The findings of this review of SRTS literature are organized into the following subjects: (1) existing data sources on transportation modes used by children traveling to and from school, along with the methods and instruments used to capture this travel behavior; (2) factors correlated with children walking or biking to school, as well as a conceptual framework that describes theorized causal paths; (3) a discussion of the most frequently reported barriers to walking and biking to school; (4) a summary of SRTS evaluations; and (5) additional resources designed for the benefit of SRTS programs. These summaries focus on findings, data sources, and methodologies that may inform the development of a successful SRTS program.

(1) ACTIVE TRANSPORT TO SCHOOL: FIGURES

The only longitudinal source of data on children's mode of travel to and from school in the U.S. is the National Household Transportation Survey (NHTS).[8] Prior to 2001, this survey was known as the National Personal Travel Survey. This population-based survey collects data on all trips made by members of selected households on a given survey day. The U.S. DOT conducted the NHTS in 1969, 1977, 1983, 1990, 1995, 2001, and 2008. data from 2008 will be available in late 2009.[10]

McDonald[8] analyzed data from all survey years through 2001 to determine the prevalence of active transport to school (ATS). NHTS data do not explicitly identify school trips, so McDonald defined a school trip as one involving a child ages five to 18, occurring on a weekday morning, and with a purpose of school, civic/educational/religious, or school/church (depending on the survey year). Only the primary mode used to reach school was collected by the survey, so if a child walked a short distance to a school bus stop, the trip would be counted as a school bus trip. The results are summarized in Table 1.

Table 1: National Rates of Active Transport to School (ATS) 1969-2001

Year	Total	Walk	Bike
1969	40.7	NA	NA
1977	23.5	22.5	1
1983	15	14.5	0.5
1990	19.2	18.2	1
1995	11.7	10.6	1.1
2001	12.9	12.1	0.8

Percentage of children ages five to 18 walking or biking to school, from the National Household Transportation Survey (NHTS).[8]

ATS declined by 27.8 percent from 1969 to 2001 with the greatest decline occurring between 1969 and 1983. Because rates of bicycling have remained consistently low throughout the years – accounting for less than 10 percent of active commuting – a decline in walking was primarily responsible for the decline in ATS. The decline was largest among elementary school children. The decrease in ATS also corresponded with an increase in automobile commuting to school, which rose from 17.1 percent to 55 percent during the same period. School bus and public transit commuting to school declined only slightly during this time. The slight increase in ATS in 2001 was likely due to prompts that were included in the survey to encourage the report of non-motorized trips.[8]

Figures from the NHTS coincide with results from other national surveys that have examined the portion of students walking or biking to school (see Table 2: U.S. ATS Figures, page A-51). In 1996, a national study of fourth through twelfth graders used a telephone interview of parent-child pairs to determine the prevalence of ATS.[11] This study found that 11.4 percent of children usually walked and 2.6 percent usually bicycled. Two Centers for Disease Control and Prevention (CDC) mail surveys conducted in 1999[12] and 2004[13] asked parents of five- to 18-year olds about their youngest child's active commuting habits. The 1999 survey asked whether the child had walked or biked to school at least once a week in the preceding month; 19 percent reported walking and 6 percent reported biking. The 2004 survey asked how many times the child walked to or from school during a usual week; 17 percent reported walking.

Additional figures on the prevalence of ATS in the U.S. have been gathered at the city level, regional level, across multiple regions, and at the state level. These rates are summarized in Table 2: U.S. ATS Figures (page A-51). Rates vary from 4.2 percent to 53 percent. Much of this variation may be explained by the geographic area, year of data collection, and age group surveyed. The lack of a standardized definition of active commuting has also likely contributed to the variance. As illustrated in Table 1, studies vary in their assessment of active commuting. Some define active commuters as those students who have ever walked or biked to school;[14] others define active commuters as those who walk or bike to school at least five days a week.[15]

Rates of ATS also vary from morning to afternoon. Analysis of travel diaries in the San Francisco Bay area showed that children use the same mode of travel to and from school 72 percent of the time. Of the eight studies that gathered distinct rates of ATS for morning and afternoon commutes, five recorded increases from the morning to the afternoon,[14, 16-19] two recorded decreases,[20, 21] and one recorded no change.[22]

Most U.S. ATS figures are collected through child or parent surveys. Child surveys are usually completed at school and have been included as components of other evaluations such as physical fitness assessments[16, 19, 23, 24] or the CDC's Youth Risk Behavior Surveillance System (YRBSS).[25] Parent surveys have been sent home with students to be completed by parents,[14, 26] directly mailed to parents,[17, 18] conducted via telephone,[15] or included as components of other telephone surveys.[27] ATS data have also been culled from travel diaries distributed by DOTs or planning agencies,[28, 29] obtained from school principals or other personnel,[30] and directly observed at school entrances.[22]

(2) ACTIVE TRANSPORT TO SCHOOL: CORRELATES

The various factors thought to be correlated with ATS have been studied in the fields of transportation, planning, and public health. Because of the inherent complexity of travel behavior and the range of outcomes that may result, numerous correlates of active commuting to school have been hypothesized and tested. This review identified hundreds of unique variables that have been tested for correlation with the use of ATS. Placing the results of this research into a conceptual framework of children's travel behavior for the trip to and from school provides a manageable way of examining trends and patterns. It also offers a more holistic understanding of how multiple factors that may be associated with a student's mode choice for the trip to school interrelate.

McMillan[31] offered the basis for a conceptual framework of children's travel behavior for the school commute. Her "Conceptual Framework of an Elementary-Aged Child's Travel Behavior" builds on the activity-based framework of travel behavior developed in the transportation field, as well as on the social ecological model developed in the public health field. The activity-based framework explains travel choices by emphasizing an individual's preferences and choice constraints, as well as attributes of the origin, route, and destination. The social ecological model suggests that travel behavior is influenced by intrapersonal, social, and environmental variables that function interactively.

McMillan's conceptual framework suggests that urban form characteristics, such as sidewalks, crosswalks or other features of the built environment, do not have a direct effect on a child's mode of transportation to or from school. Instead, on the basis of these urban from characteristics, a parent develops opinions about the ability of the built environment to support different modes of travel for their child's trip to school. These opinions are called mediating factors because they act as intervening causal variables, or mediators, on a child's travel behavior. Mediating factors include other factors that are hypothesized to have a direct effect on a child's transportation options, such as the availability of a car or bike. These mediating factors are moderated – either intensified or diminished – by cultural norms, attitudes, and other factors external to the immediate environment and the trip to school. They are called moderating factors. The interaction of mediating and moderating factors shapes the decision of how a child travels to or from school.

Hypothesized outcomes of children walking or biking to school include physical health improvements, air quality improvements, and congestion relief near schools during peak commute times. Expanding McMillan's conceptual framework to encompass these hypothesized outcomes results in a complete conceptual framework of the factors related to children's use of ATS. It provides an outline for examining all the diverse variables that have been tested for correlation with children's use of ATS. This expanded conceptual framework of a child's commute mode to/from school is diagramed in Figure 1.

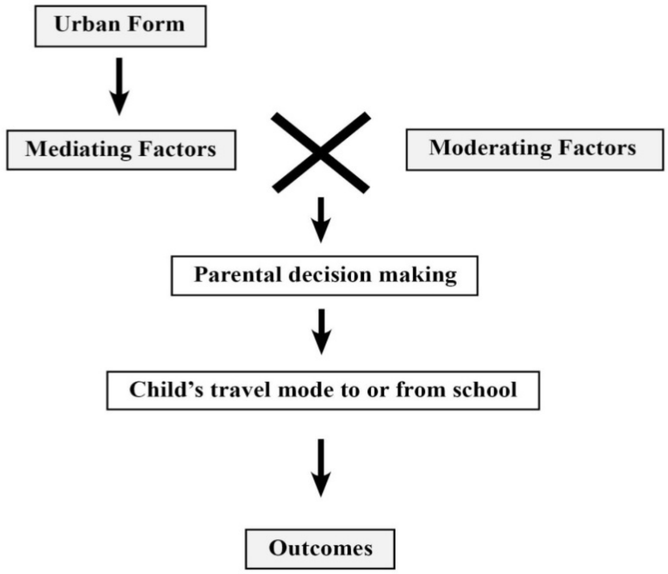

Figure 1: Expanded conceptual framework of a child's commute mode to/from school. Arrows indicate hypothesized direction of relationships, X indicates interaction between mediating and moderating factors. Adapted from McMillan.[31]

According to this framework, a neighborhood with dilapidated buildings and broken windows (urban form factor) may cause a parent to believe that there is high rate of crime in the area (mediating factor). A perceived high rate of crime may cause that parent to feel that it is unsafe for his child to walk to school. This fear may be intensified if the child is young (moderating factor). These factors would cause the parent to drive the child to school, resulting in the child receiving less physical activity (health outcome).

The variables found in this literature review that were tested for correlation are organized and discussed on the basis of this expanded conceptual framework. Variables are categorized as urban form factors, mediating factors, moderating factors, or health outcomes. Exactly where some of these variables fit into the model is debatable. Their placement represents a best assessment based on the literature from which the findings were drawn.

There are also some caveats to using this expanded conceptual framework to understand research findings on the correlates of ATS. The framework was originally developed for elementary-age students and may be less accurate for younger children, who likely have fewer transportation options because of developmental limitations, or older children, who may have more say in their mode of travel. Qualitative research suggests that a child's travel mode on the trip to school is more of a negotiation between child and parent than purely a parental decision.[32] Although McMillan[31] contends that the ultimate decision is likely to be made by the parent, this framework also suggests paths of influence. Paths may be helpful for thinking about the relationship between correlates of ATS. The vast majority of research on the subject, however, is cross-sectional and does not identify causation. So while a study may indicate that those students who walk or bike are more physically fit, it is not clear whether ATS makes a child more physically fit or physically fit children are more likely to walk to school.

Urban Form Factors

Urban form factors are features of the physical environment in which a child's commute to school occurs. McMillan's conceptual framework suggests that urban form has no direct effect on a child's school commute mode. Urban form only influences parents' assessments of which commute modes are best for their child's trip to or from school.

Researchers often measure urban form variables objectively through government data, aerial imagery, or direct observations. Some studies rely on subjective measurements, such as parent or child surveys. This is usually the case for measurements of distance from a child's residence to school. The accuracy of these self reports was validated by Nelson et al.,[33] who found no significant difference between reported distances from children's homes to school and those distances measured on a map. Self-report urban form variables that can be directly measured, such as distance to school or the presence of pedestrian or bicyclist trails, are included in this category. Self-report urban form variables that offer a more subjective assessment of the environment, such as neighborhood aesthetics, are included in the mediating factor category because they represent an interpretation of the environment. Urban form variables that have been tested for correlation with the use of ATS are tabulated in Table3: Urban Form Factors (page A-53).

Distance from a child's home to school is the strongest predictor of ATS. In all 19 studies that examined distance, a significant negative relationship was found between distance to school and the use of ATS. Some of these studies have attempted to analyze the exact relationship between distance and travel mode choice. McDonald[34] found that a 1-minute increase in the time it takes to walk to school leads to a 0.2 percent decrease in the likelihood of a child walking to school. Nelson et al.[33] found that a 1-mile increase in a child's distance from school decreased the probability of active commuting by 71 percent.

Nelson et al.[33] also found that the majority of walkers lived within 1 1/2 miles of school and the majority of cyclists lived within 2 1/2 miles. These thresholds vary slightly from McDonald's[34] finding that for school trips less than 1 mile, distance has a strong linear effect on the probability of walking, with the chances of students walking to school decreasing at a constant rate as their distance from school increases. However, for trips greater than 1 mile, the probability of walking drops to a constant low rate. On the basis of empirical evidence, Yarlagadda and Srinivasan[20] found 6 miles to be the maximum distance a child will walk or bike to or from school. They also found distance to have a greater impact on travel to school than travel from school, suggesting that pressure to arrive at school on time may result in greater sensitivity to distance.

From 1969 to 2001, active commuting to school declined as the distances that students traveled to school increased. However, only 47 percent of this decline in the use of ATS was explained by greater distances.[8] So while distance appears to be a very strong correlate of ATS, it cannot be the only factor. Other urban form factors that have been tested can be categorized as traffic safety, active commuting infrastructure, neighborhood characteristics, and school characteristics.

A frequently examined traffic safety variable is the presence of a major street crossing along a child's route to school. While this variable was found to be associated with less active commuting in Switzerland[35] and Australia,[36] no association was found in an Oregon study.[14] Routes to school along major roads[36] and well-lit streets[23] were not found to be associated with walking or biking to school. A lack of lights and crossings were associated with less active commuting,[36] and "eyes on the street," measured as the portion of street segments with more than half the houses with windows facing the street, were associated with more active commuting.[37]

Active commuting infrastructure, such as sidewalks and bike paths, were sometimes found to be positively associated with ATS, while other studies found no significant association. Interestingly, one Texas study[17] found that sidewalk density, or the number of linear miles of sidewalk per acre within a 2-mile walk zone of a school, was negatively associated with walking and positively associated with biking, while bike lanes were positively associated with walking only. The authors of this study suggested that children may feel safer biking on a sidewalk.

Neighborhood characteristics tested for a relationship with the practice of ATS have included street layout, urbanization level, various measures of land-use mix, population density, and even the presence of bad smells. The majority of these variables have been found to be associated in the hypothesized direction (e.g., greater walkability was associated with more ATS[15]), or no significant association was found. There are two exceptions to this generalization. The first counter-intuitive finding comes from Tudor-Locke et al.,[38] who found that Philippine children living in rural areas were more likely to walk to school. This may have been due to lower socio-economic status in rural areas of the Philippines and therefore fewer transportation options. The second exception comes from an Australian study[36] that found 10- to 12-year-olds were less likely to do ATS if their route to school was more direct, measured as road network distance divided by straight line distance. The authors of this study speculated that more direct routes may carry more vehicular traffic and thus be less safe, discouraging the use of ATS.

These mixed findings suggest that urban form variables may have differing effects over different regions. For example, a Texas study[17] found that the amount of trees or greenery in a neighborhood was positively correlated with ATS. A separate study involving six communities across the U.S.[23] found no significant relationship. This leads to speculation that street trees may have a greater influence on the choice to walk or bike to school in hot climates, such as Texas.

Local geography may also influence the effect of urban form on the commute mode to school. In a comparison of physical environment and social environment variables, physical environment (i.e., urban form) variables were found to be more significant for walk trips greater than 1 mile, while social environment variables (mediating and moderating variables in the conceptual framework) were more significant at shorter distances.[28] The author suggested that urban form plays a greater role in influencing trips at the margin of what is considered walkable, while social factors have a greater influence on trips that can easily be walked.

Mediating Factors

Mediating factors are variables thought to have a direct influence on a parent's choice of the child's travel mode to or from school. They include direct effects of the environment – such as crime rates, traffic collision rates, or the weather – and the way in which parents and children interpret their environment – such as perceived risks of crime or traffic. Also included in this category are factors that have a direct effect on a child's transportation options, such as the availability of a car or extracurricular activities that may require additional travel. All mediating variables that have been tested for correlation with the use of ATS are tabulated in Table 4: Mediating Factors (page A-57).

Concerns about general safety[15, 17, 26, 39] and traffic safety[13, 17, 36, 40] have been sometimes negatively associated with active commuting to school. Several other studies found no significant relationship[15, 23, 26, 35-37, 40, 41]. Interestingly, Fulton et al.[11] found a positive correlation between the use of ATS and children who felt it was unsafe to play in their neighborhood. This cross-sectional study could not determine causation, but it is possible that a child might realize that it was unsafe to play outside because of an increased awareness of his or her environment as a result of walking or biking to or from school. And although crime has been reported as a barrier to active commuting,[12, 13] it was only found to be significantly associated with the actual use of ATS in one London study.[42] The issues surrounding crime and traffic safety are discussed in greater detail in the barriers to active commuting section.

Students living in neighborhoods perceived as walkable were more likely to walk or bike.[18] Similarly, children who reported interesting things to look at and places to walk to in their neighborhood were more likely to walk or bike.[16] Neighborhood aesthetics were also found to be positively associated with the practice of ATS.[15] Children in neighborhoods with few other children around were less likely to walk or bike.[36] Parents who perceived weather as a barrier to ATS were more likely to have children that walked or biked.[13] However, a separate study found no relationship between actual weather and the practice of ATS.[17] Bad smells in a child's neighborhood were found to be associated with less walking and biking.[23]

Transportation options appear to correspond with the decision to walk or bike to school. The number of cars available in a household is sometimes shown to have a negative relationship with ATS. Although most of these studies were conducted in areas outside the U.S.,[35, 38, 42, 43] this relationship was also found in Oregon[18] and Florida.[29] Some studies showed that students with a driver's license were less likely to walk or bike.[8, 44] One study showed that parents who drove to work were less likely to have children that walked or biked to school.[39] And, intuitively, two studies found that parents who considered it convenient to drive their children to school were less likely to have children that walked or biked to school.[29, 37] No adult home after school, and therefore, presumably, no adult to pick the child up from school, was seen to increase the odds of children walking or biking in a North Carolina study.[25] This same variable, however, had no significant relationship to the use of ATS in an Australian study.[36]

The type of school a child attends was found to be correlated with ATS. Children at public schools were more likely to walk or bike than students at private[39, 42] or alternative schools.[18] This is likely because private schools draw students from a larger area.[45] Parents who reported a school policy that acts as a barrier to walking or biking to school were less likely to have children who walked or biked to school.[13] In England, parents who perceived a parking problem at school were more likely to have children who walked or biked to school,[43] but no relationship was found in Texas.[17] The same Texas study did find concern about a child's extracurricular activities to be negatively associated with the use of ATS,[17] while no relationship was found for this variable in a North Carolina study.[25]

Moderating Factors

Moderating factors take into account the greater context in which the mode choice for the trip to and from school is made. These factors have no direct hypothesized relationship with the actual decision whether or not to walk or bike to school. They moderate – either strengthen or weaken – the decision. So the strength of the relationship between a mediating variable and ATS is adjusted by the moderating variable. Because moderating variables encompass all factors external to the immediate travel mode decision, they cover a range of characteristics – from a child's height to a parent's employment status. All moderating variables that have been tested for correlation with ATS are tabulated in Table 5: Moderating Factors (page A-60). For discussion here, they are categorized as child characteristics, parent characteristics, household characteristics, and neighborhood characteristics.

Age and gender were the most commonly examined child characteristics. Results on the relationship between a child's age and the use of ATS were mixed, with several studies finding negative correlations, several others finding positive correlations, and several more finding no significant relationship. Generally those studies showing a negative correlation between age and ATS included only older children, ages nine to 18.[11, 25, 38, 46, 47] Studies showing a positive relationship focused primarily on younger children, ages five to 14.[17, 34-36, 39] These findings support the suggestion that children are more likely to do ATS until they receive a driver's license, at which point the use of ATS begins to decline.[28] Other researchers speculate that this trend may be due to older youth living farther away from their schools and distance being an important barrier to ATS.[11] A study that distinguished between walking with a parent and walking alone found that younger children were more likely to walk with their mother, while older children were more likely to walk alone.[20]

In gender, the trend is clearer. All studies that found a significant relationship saw boys more likely to walk or bike than girls. Boys were also found to be more likely to walk alone and less likely to walk with their mother.[20] This confirms other research indicating that girls spend less time in the public urban setting than boys, are more likely to be supervised, and have a more restricted home range.[32, 48] The age or gender of the parent does not appear to matter.[11, 15, 43]

Lower parental education levels were twice found to be associated with greater use of ATS,[25, 41] although the balance of studies found no association. A similar trend emerged for a parent's employment status, with more active commuting occurring when a parent had an occupation of lower status,[41] was unemployed,[18] or a stay-at-home parent.[43] Again, however, the majority of studies showed no significant association. Household income was more likely to predict active commuting to school, with seven of

14 studies showing a negative association between the two variables.[8, 18, 29, 37, 38, 44, 46] Taken as a whole, these findings regarding parent's education, employment, and household income suggest that children of lower socio-economic status are more likely to walk or bike to school. This relationship is particularly troubling given that schools in more impoverished areas are surrounded by greater crime and traffic dangers[49] and encounter greater institutional barriers to accessing SRTS funding.[6] This conclusion that poorer students are more likely to walk to school, however, is somewhat contradicted by two studies that found no association between area-level socio-economic status and ATS[22, 36] and another study that found a positive correlation between neighborhood disadvantage and ATS to be significant only for Hispanic students.[28]

Studies of correlation between race or ethnicity and the prevalence of active commuting offer no clear conclusions. Most found no significant association, while two found African Americans more likely to walk or bike to school,[25, 28] one found non-whites more likely to do so,[8] and another found Asian and multi-racial children less likely to do so.[34] Asian children were found to be more likely to walk with their mothers, and Caucasian children were found to be more likely to walk alone.[20] These findings suggest that other factors may be stronger correlates of ATS, which McDonald[44] demonstrated in a study using a nationally representative sample. She initially found significant differences in rates of ATS by racial groups, but found no differences after controlling for several individual and neighborhood covariates such as distance to school, household income, and density.

The presence of siblings is often associated with greater rates of ATS.[17, 34, 37] Presumably this is because older siblings can accompany younger siblings on the walk or bike ride to or from school. No significant association was found between single-parent families and the use of ATS.

Generally, parent and child attitudes that are supportive of child independence, physical activity, and walking or biking for transportation were found to be correlated with greater use of ATS. This trend is in line with an English survey that found parental attitudes of promoting health and independence to be associated with greater independent mobility in children.[48]

Health Outcomes

The use of ATS is thought to result in numerous positive outcomes, such as reduced congestion, less air pollution, and greater physical and mental health.[6] Physical health factors, however, were the only variables found to be tested in correlational research. These studies tested the hypothesis that children who walk or bicycle to or from school are more physically active than students who are driven. Regular physical activity is desirable to reduce the risk of high blood pressure, diabetes, heart disease, obesity, and other health risks.[50] Physical activity during childhood promotes strong bones, cardiovascular capacity, and overall physical development.[3] A child's level of physical activity is also shown to track into adulthood,[51] making ATS a potential means of instilling life-long healthy habits in a person. The physical health variables that have been examined in relation to the use of ATS are tabulated in Table 6: Physical Health Outcomes (page A-66).

Both objective (accelerometers) and self-report methods (physical activity recall surveys and other surveys) have been used to compare the physical activity levels in children who do ATS to those who use inactive forms of transportation. Results are promising overall. A greater level of physical activity was correlated with ATS in 11 studies.[11, 16, 19, 47, 52-56] No relationship between the use of ATS and physical activity was found in four studies.[24, 25, 40, 57] And no studies found a significant negative correlation between ATS and physical activity.

The relationship between ATS and body mass index (BMI), a "reliable indicator of body fatness for most children and teens,"[58] appears to be weak. A North Carolina survey found that ATS was negatively correlated with BMI in sixth to eighth graders, but not in high school students.[25] Direct measurements of fourth and fifth graders in southern California found that boys who walked or biked to school had a significantly lower BMI than those who did not, but no significant relationship was found for girls.[24] Several other studies using objective measurements[16, 38, 56] and surveys[11, 59] found no significant relationship between BMI and ATS. Surveys and other self-report methods for measuring BMI, however, may not be entirely accurate. A Mississippi study found that BMI derived from actual measurements were higher than BMI derived through the CDC's Youth Risk Behavior Surveillance System for middle school students.[60]

In other measures of fatness, skinfold thickness measures were negatively correlated with ATS, but only for boys.[24] Skinfolds were not found to be significantly related to users of ATS of both genders in another study.[19] Cardiovascular fitness tests in Denmark showed that students who rode bicycles were more fit than both students who walked or were driven to or from school.[61] Five studies examined the relationship between weight alone and ATS.[17, 24, 36, 56, 59] None found a significant relationship.

Two studies measured the health effects of active commuting over time.[19, 24] Neither study found a significant decrease in BMI among students who walked or biked to school over a two-year period. In fact, one study saw an increase in BMI among overweight children who did ATS in rural Nebraska.[19]

While no studies were found that directly examined the environmental health correlates of active commuting to school, a study that estimated the environmental benefits of schools built in walkable neighborhoods as opposed to those built in auto-oriented areas suggested that these 'neighborhood' schools would produce a 13 percent increase in walking and biking to school.[62] This would translate into reduced auto traffic and a corresponding 15 percent reduction in harmful emissions. An FHWA report[63] stated that when bicycling and walking replace car trips, they reduce the pollution and environmental damage that would have been caused by those car trips. Additionally, during the 1996 summer Olympic games in Atlanta, Georgia, a large-scale effort to reduce motor vehicle traffic was associated with a measurable reduction in traffic density, ozone concentrations, and asthma acute care events for children.[64] Similar outcomes may be achieved on a smaller scale by efforts to reduce vehicle trips to and from school.[6]

(3) ACTIVE TRANSPORT TO SCHOOL: BARRIERS

Traffic

In two national CDC surveys, traffic danger was the second most frequently reported barrier to ATS (distance being the first). In 1999, 40 percent of U.S. parents reported traffic danger as a barrier to their children Walking or biking to school.[12] In 2004, 30.4 percent of parents reported traffic danger as a barrier, and it was found to be correlated with lower rates of ATS.[13] Additionally, in 1990, an English survey found that more than 40 percent of parents restricted children ages seven to 11 from coming home alone from school because of traffic danger.[65] A qualitative study involving 32 parents in the U.K. found that 12 mothers cited traffic safety as one of their main concerns.[66] A majority of these mothers drove their children to school, even though they would have preferred that their children walk. All of the mothers interviewed could relate stories of actual pedestrian collisions or near misses.

These traffic safety barriers are reported despite declining absolute rates of child pedestrian and bicyclist traffic collisions in the U.S. The CDC reported that the rate of youth (ages five to 15) killed in pedestrian-auto related incidents had decreased from 1.33 to 0.7 child pedestrian deaths per 100,000 child traffic deaths from 1995 to 2002. The rate of child pedestrian traffic injuries dropped from 57.3 to 33.2 per 100,000 child traffic injuries during this same period.[67, 68] Other sources show that the pedestrian injury/death rates for children ages 14 and younger dropped 51 percent and for bicyclists dropped 60 percent from 1987 to 2000.[69] This downward trend in pedestrian and bicyclist injury rates is attributed to declining rates of walking and bicycling among children, not a safer environment.[70] Fewer children walking or bicycling results in less exposure to the risk of a collision. Because these rates of youth pedestrian and bicyclist collisions are based on population – not exposure – data, they do not reflect the true risk of walking or bicycling.

The persistent dangers of children walking and bicycling are highlighted by a Transportation Research Board report[71] that found bicycling and walking to be the two most dangerous commute modes to and from school when analyzed on the basis of exposure. The risk of bicycling to or from school was found to be greatest, with 2,050 injuries and 12.2 fatalities occurring per 100 million miles. For walking, the second riskiest commute mode, 590 injuries and 8.7 fatalities were found to occur per 100 million miles. For comparison, the third riskiest commute mode to and from school is travel in a passenger vehicle with a teen driver, which was found to result in 430 injuries and 2.4 fatalities per 100 million miles. School bus travel was found to be the safest form of travel to and from school, with only 20 injuries and 0.1 fatalities per 100 million miles.

These relative risks of children walking and bicycling to and from school are not unique to the U.S. An analysis of national travel mode data and traffic injury data over a two-year period in New Zealand found similar results.[72] Children ages five to 17 made up 11.4 percent of traffic-related injuries during school travel times. The portion of these injuries by mode was 30.7 percent pedestrian, 30.3 percent bicyclist, and 27.7 percent auto passenger. When risk was assessed by injuries occurring per million trips, bicycling was found to be the most dangerous, followed by walking. Auto travel was found to be safest.

Schools may also be a particularly dangerous place for pedestrian and bicycle commuters because of the high volume of vehicular traffic in the area during school start and end times. The number of cars on the road between 7:15 and 8:15 a.m. has been found to increase 30 percent during the school year,[62] and locally 20 to 30 percent of morning traffic during the school year is attributed to parents driving their children to school.[3] In 1999, a national survey found that two-thirds of drivers exceeded the posted speed limit in school zones during the 30-minute period before and after school.[73] A national observational survey found that many motorists at intersections in school zones and residential neighborhoods violated stop sign, 45 percent by not coming to a complete stop, 37 percent by rolling through, and 7 percent by not even slowing down.[74]

Certain school and neighborhood characteristics may exacerbate child pedestrian traffic danger. A Baltimore, Maryland, study examined pedestrian-auto collision data with a ¼-mile buffer of 163 public schools.[75] The presence of recreation facilities at a school was associated with greater collision severity and that of driveways was associated with less collision severityfor pedestrians of all ages. Neighborhood characteristics found to be positively associated with crash severity for pedestrians of all ages were commercial access, percentage of non-white residents, population density, and mixed use. For collisions involving only school-age children, crash severity was found to be positively associated with the percentage of non-white residents, population density, and percentage of school-age kids in the neighborhood.

A study of 73 public elementary schools in Austin, Texas, also showed socio-demographic disparities in pedestrian safety around schools.[49] Researchers found that schools with higher poverty or Hispanic attendance rates were located in areas with greater traffic danger (measured by average traffic volume, percentage of high-speed streets, and yearly crash rate) and crime danger (measured by the yearly crime rate).

Compounding the traffic dangers associated with some schools, younger pedestrians have been found to be at a greater risk of traffic collisions. In a traffic safety study involving five-, seven-, nine- and 11-year-olds in Glasgow, Scotland, researchers concluded that children up to age nine are at "considerable risk."[76] Researchers in this study tested children's ability to identify dangerous street crossings and select safe crossing routes by using scenarios created with toy cars and pedestrians arranged on a 1.2- x 1-meter mat printed with a street layout, photographs, and the real environment near the school that the child attended. Five- and seven-year olds of both genders exhibited poor skills in identifying dangerous road crossings. They based their assessment exclusively on the presence of cars in the vicinity. This finding corresponds with other literature suggesting that, in Western contexts, significant increases in a child's home range occurs between the ages of eight or nine years, when a child is more developmentally capable of negotiating his or her neighborhood.[48] Unfortunately, increased exposure at this age may also explain why children ages 11 to 13 are more likely than younger or older children to be in a vehicle-pedestrian crash.[77]

Parents often take steps to mitigate these traffic dangers through education and supervision, although the effectiveness of their actions may be questionable. In a survey of 732 parents of children enrolled in four urban elementary schools in a U.S. city, the majority taught their children about safe street crossings (85.8 percent) and safe routes to school (95.5 percent).[66] Parents in this study who lived in objectively high-risk and high-income neighborhoods reported more safety teaching, close supervision, and correct child pedestrian safety knowledge. This suggests that, at least in high-income areas, parents recognize traffic exposure and the associated risks and take action. All parents in this study, however, did poorly on a pedestrian safety quiz. Only 15 percent answered all four questions correctly: 15 percent did not know which age group of children are most likely to be hit by a car; 27 percent did not know that pedestrians are more likely to be hit by a car at a midblock crossing than an intersection; 45 percent incorrectly thought children younger than age 10 could safely cross a local street, and 54 percent incorrectly thought that being shot or abducted was more common for children than being hit by a car. Additionally, a survey of more than 2,000 parents found that 94 percent thought five- and six-year-olds were too young cross residential streets alone, but 33 percent reported allowing their kindergartener to do so.[66] Another report showed that parents of five- to eight-year-olds greatly overestimated their children's pedestrian skills.[66] Increased supervision may be a sound solution to addressing traffic dangers on the pedestrian school commute. In an Auckland, New Zealand, study, walking with an adult was shown to reduce child pedestrian injury risk by almost 70 percent.[78]

Efforts to slow traffic have also been shown to hold promise for reducing the frequency and severity of child pedestrian-auto collisions. Greater vehicle speed results in greater injury severity for pedestrian-vehicle collisions, especially for children. One estimate places the maximum vehicular confrontation speed for children ages six and younger at 10 mph[79] Slower traffic, therefore, would likely result in fewer and less severe collisions. Dumbaugh and Frank[77] reviewed the results of empirical safety evaluations of ten pedestrian countermeasures commonly included in SRTS projects. They found that active police enforcement and physical traffic calming features, such as speed humps, slow motorists to a degree that would reduce the frequency of pedestrian-vehicle collisions. Sidewalks and raised medians were found to reduce the actual frequency of pedestrian-vehicle collisions. Dumbaugh and Frank found that the effectiveness of other common SRTS program elements was largely assumed. Signalized crossings were found to result in safer pedestrian-auto interactions, but unsignalized crosswalks were found to result in more collisions. School zone flashing lights were found to reduce speeds only by about 5 mph, with average travel speeds remaining above speed zone limits. The safety effects of bicycle lanes were found to be disputed. Motorist education programs were found to result in little or no behavior change. Child pedestrian education programs were only shown to increase safety knowledge in pencil and paper tests. And finally, Dumbaugh and Frank found no studies on the safety effects of crossing guards. Research examined in their evaluation, however, did not specifically measure the effects of these devices on children, nor did the evaluations take into account any possible combined effects of these measures.

An Oakland, California, study that did evaluate traffic calming measures specifically on children revealed promising results. Researchers found that speed humps make children's environments safer.[80] After controlling for race and ethnicity, living within a block of a speed hump was associated with significantly lower odds of children (ages 15 and younger) being injured by a car in their neighborhood or being struck by a car on the block immediately in front of their home.

Other research suggests that programs that simply increase the number of people walking or bicycling, such as SRTS, could be an effective way of improving their safety. Motorists have been found to adjust their behavior in the presence of groups of bicyclists or pedestrians.[81]

Crime

Danger from crime was the fourth most commonly reported barrier to ATS (excluding "other" barriers) in two nationally representative CDC surveys.[12, 13] In 1999 and 2004, 18 percent and 11.7 percent, respectively, of parents reported this barrier. It was not, however, found to be significantly associated with the actual application of ATS.[13] It was more commonly reported among parents of younger children.[12, 13]

No trend data exist on violent crimes (homicide, rape, robbery, and simple and aggravated assault) against young children; however, the rate of violent crime against 12- to 19-year-olds has declined.[70] From 1973 to 2005 the rate of these crimes dropped from about 80 to 44 cases per 100,000 children.[82] Specifically, kidnapping makes up only 2 percent of violent crimes against youth, and only 4 percent of all kidnappings occur around schools.[83] Additionally, children, like adults, are statistically much more at risk of being harmed by people they know.[32]

Despite evidence of low risks of abduction or other violent crimes against children, other research confirms the parental concerns reported by the CDC. Interviews with 42 parents in a diverse New York City neighborhood found that walking to school was considered one of the most dangerous activities in which a child could take part.[84] A questionnaire indicated that parents most frequently consider abduction to be the greatest danger faced by primary-school-age children.[32] An English survey of parents found that 90 percent were worried about their child being abducted or molested; these concerns were correlated with greater use of the car to transport their child to or from school.[42] An Australian survey also found a high level of parent concern regarding the vulnerability of their children to attack while traveling to school unsupervised.[85] Concern was greater for daughters, city-dwellers, and parents from non-English-speaking backgrounds. These concerns were found to diminish as children grew older. Children themselves also demonstrated fears of crime while in public space. A North American survey of seven- to

11-year-olds found that 28 percent were afraid to go out because of a fear of being hurt by another person; 50 percent reported being harassed by adults or children while outside; and 12 percent reported that they had been physically attacked by other children.[32]

An English qualitative study revealed that parental concern of "stranger danger" was often based on media coverage of a single case of abduction and that letting a child travel alone is an indicator of neglectful or irresponsible parenthood.[48] This finding was also documented when a well-publicized series of attempted child abductions in a small urban area caused some parents to tighten their children's spatial ranges.[32] In this case, some parents revoked their children's permission to walk to and from school without an adult. It has also been suggested that travel mode to school, parental concerns of traffic danger, and concerns about the risks of criminal danger are interrelated.[86] Parents who drive their children to school may be attempting to protect their children from traffic danger, to which they are contributing. Increased traffic danger may lead to fewer people cycling, walking, or generally out and about in a neighborhood. This in turn may lead to less familiarity with neighbors and increased fear of stranger danger. As a result, other parents may fear that their child will become a victim of crime and feel it is necessary to drive their children to school, further increasing traffic volume and once again contributing to traffic safety fears.

Policy

Distance from a child's residence to school is the strongest correlate and most-frequently cited barrier to ATS.[9] Students with shorter bike and walk times to school are simply more likely to walk or bike to and from school.[33, 62] Some of this correlation may be attributable to self selection, since some parents were found to consider their child's travel mode to school when selecting their residence.[18] But, nonetheless, the unequivocal finding that students who live closer to their schools are more likely to do ATS has implications for school siting policies.

Nationwide since World War II, the number of schools has decreased by 70 percent while the average size of school sites has grown fivefold.[62] Fewer schools on larger sites, usually on the periphery of urbanized areas, mean that fewer students live close enough to walk or bike. Nationally, active commuting to school decreased from 1969 to 2001 as distances to school increased.[8] In South Carolina, Kouri[30] found that students are four times more likely to walk to schools built prior to 1983, the year when the South Carolina Department of Education imposed minimum acreage requirements for all new schools. Kouri also found that schools built after 1983 were 60 percent larger than the minimum state requirements and 41 percent larger than schools built prior to 1983. Schools built during times of acreage standards were also three times as likely to provide hazard busing, a program that offers bus service to students who live within walking distance of school but cannot safely do so.

Minimum acreage requirements or guidelines are frequently recognized as a major cause for the trend of larger schools sited away from residential locations and the corresponding drop in the ability of students to actively commute to school.[62, 87, 88] Numerous other policies, as well as a few general factors, have also been identified as contributors to this trend: funding formulas that favor new school construction over renovation of existing schools;[62, 87] insufficient funding for maintenance of existing schools;[87] a lack of coordination, and sometimes even conflicts, between land use planning and school planning;[30, 87, 89] a lack of coordination between different government agencies;[87, 89] conflicting interests between different government departments;[89] a failure to recognize long-term costs, such as busing and security, associated with larger schools located on the fringe of developed areas;[89] exemptions made to school districts from state and/or local planning or zoning laws;[87, 88] building codes that make it infeasible to upgrade or renovate older schools;[87] influence from developers;[87] minimum parking requirements;[88] neighborhood concern regarding the vehicular traffic that local schools generate;[89] a perception that smaller schools cannot provide adequate academic opportunities;[62] and competitive land markets.[89] School choice policies that allow students to live far away from the school they attend may also reduce the number of students able to safely walk or bike to school.[18]

It appears that school siting stakeholders have recognized the benefits (e.g., lower costs, community cohesion, and the ability for students to walk to school[90]) of small neighborhood schools within easy and safe walking or biking distance of students' homes. The Council of Educational Facility Planners International and the Environmental

Protection Agency (EPA) recently released a report[91] explaining why and how communities should build or maintain existing schools in accordance with smart growth principles. The National Trust for Historic Preservation has collected several case studies of school districts that have overcome obstacles to maintain and update existing neighborhood schools.[87] In Florida, state legislation was recently passed to address the need for multimodal planning, coordinated school siting, and the establishment of safe routes to school.[89] A study that examined the relationship among these three interconnected areas found that, when implemented in conjunction with one another, they hold great potential to increase active transportation and reduce single occupancy vehicle trips to school.[89] This, however, was found to require a great deal of interdepartmental coordination, including input from state departments of transportation, community affairs, education, and health; local governments; school boards; and other public and private organizations.

School walk zones are another policy that may actually contribute to auto congestion at schools, especially suburban schools. In Hillsborough County, Florida, Steiner[92] used a geographic information system (GIS) to analyze the relationship among elementary school attendance zones (the area around a school from which students are drawn), walk zones (a 2-mile straight line buffer around schools, where Florida statues specify that students will not be bused unless hazardous walking conditions exist), and connected network zones (a 2-mile street network buffer around schools, where students could more realistically be expected to walk). Steiner found that for schools with small attendance zones, primarily located in urban areas, 80 percent of schools had attendance zones that were completely covered by the walk zone but only 25 percent that were completely covered by the connected network zone. For elementary schools with midsized and large attendance zones, usually located in suburban or rural areas, very few attendance zones were completely covered by walk zones, and none were completely covered by connected network zones. This research also found that the majority of the residential parcels in school attendance zones were located within the walk zone, but a smaller percentage was located within the connected network zone. In addition to demonstrating that fewer students can be expected to walk to schools located in non-urban areas, this research suggested that 2-mile straight line walk zones may actually result in parents driving their child to school. Because walk zones are likely to include areas that are outside the connected network zones, some students who reside in a walk zone may in reality live farther than a 2-mile walk to school. Furthermore, a 2-mile walk zone may be too large to begin with. Other research has found that 1 or 1 1/2 miles appears to be the maximum distance that students will generally walk to school.[33, 34] The effects of these factors can perhaps be seen in the results of a College Station, Texas, survey,[17] which found that the majority of students within a school's 2-mile walk zone commuted to and from school by car. Because of these factors, it may be more accurate to call walk zones "parent responsibility zones."[92]

Unfortunately, traffic congestion at school may not be easily solved by providing busing to more students. A study of students living outside a suburban North Carolina county's school district walk zone (in this case, 1 mile from school) indicated that distance had no effect on whether students were driven to school or rode the school bus.[21] Other factors, such as parental perception of commute mode safety, were found to influence the commute mode decision. Given this finding, schools that wish to relieve auto congestion but have few students residing within walking distance would be well advised to work toward improving parent perceptions of school bus safety. The school bus is, in fact, the safest school commute mode.[71]

Other school policies that may affect the prevalence of active commuting to school, such as minimum grade or age requirements for walking to school, were not addressed in current research.[9] These policies may also be important factors contributing to the decision to do ATS. A 1999 CDC survey found that 7 percent of parents reported an opposing school policy as a barrier to their child walking or biking to school.[12] In a similar 2001 CDC survey, 6 percent of parents reported school policy as a barrier to their child walking to school.[13] In this survey, parents who reported school policy as a barrier to ATS were less likely to have children who walked or biked.

Transportation demand management (TDM) policies that affect parental commutes, such as flexible work times or telecommuting, could also have an impact on the prevalence of active commuting to school. Mothers who work full time were found to be less likely to walk their child to or from school, and mothers who travel to work were less likely to walk their child home from school.[20] Such TDM policies, however, could also lead to more congestion at schools. Mothers and fathers with a flexible work schedule were more likely to drive their child to school. This suggests that to effectively reduce congestion, any TDM policies affecting parental commutes should be complemented by programs intended to encourage active transport to school, such as SRTS.

Administrative requirements inherent in SRTS programs may also discourage their implementation, and therefore act as a barrier to ATS. The City of Bellevue, Washington, temporarily discontinued its SRTS program after two years because schools were too busy to take on new programs.[88] The city is currently looking for funds to re-establish the program. In a British study, 25 percent of schools chosen to receive free assistance from a school travel coordinator declined because of the increased workload it would require [93]. At the state and local level, the federal requirements of SAFETEA-LU make obtaining funding for SRTS projects difficult. Title 23 and the government-wide Common Rule on grant management place a costly administrative burden on funding recipients – a burden that is often disproportionately high in comparison to the relatively small cost of a SRTS project.[6] This presents a social justice issue, as the communities with the greatest need are often those least capable of negotiating the funding requirements.[6]

(4) SRTS EVALUATIONS

Increased bicycle, pedestrian, and traffic safety; increased numbers of children walking and bicycling to and from schools; decreased traffic congestion around schools; improved childhood health outcomes; and increased community security are possible outcomes of SRTS programs.[6] There are, however, no outcome-based SRTS evaluations on the national level.[5] This is attributed to the newness of the program.

The body of published SRTS evaluations consists of various studies of California's SRTS program,[45, 94-97] evaluations of Florida's WalkSafe™ program,[98-100] and a crash-based analysis of legacy SRTS programs (SRTS programs that were implemented prior to 2005).[7] Additionally, several evaluations of walking school buses (WSBs) – an activity that is sometimes a component of a SRTS program – have been published.[101-106] Actions are currently being taken to establish a system to evaluate government-funded SRTS programs.[5]

California

The California legislature created a state-level SRTS program in 1999 to address the decline in numbers of children walking or bicycling to school and the potential risk of injury for those who do. It created competitive grants for roadway improvement projects designed to reduce child injuries and fatalities near schools and increase walking and bicycling activity among students at elementary, middle, and high schools. Five types of infrastructure projects were funded: sidewalk improvements, traffic calming devices, traffic signal installation, pedestrian and bicycle crossing improvements, and bicycle path and facility construction. Initially, funding was only available for construction projects. Now, however, funds can be used for traffic safety education and awareness to complement infrastructure improvements.[97]

Staunton et al.[45] evaluated schools taking part in the Marin County, California, SRTS program. The program included classroom education, walking and bike days, mapping of routes, walking school buses and bike trains, newsletters, and infrastructure improvements where funds were available. Six public schools that took part in the program were surveyed during the 2000-2001 school year and seven in the 2001-2002 school year. From fall 2000 to spring 2002, researchers observed a 64 percent increase in the number of children walking, a 114 percent increase in the number of students biking, a 91 percent increase in the number of students carpooling, and a 39 percent decrease in the number of children arriving by private car carrying only one student. The validity of this report is questionable, however, because of a student “show of hands” to determine travel mode, inexperienced researchers recording data, and only two schools participating in surveys in both school years. Two private schools that participated in the program were also surveyed and showed limited success, with a 1 percent increase in walking, a 1 percent decrease in bicycling, a 5 percent increase in carpooling, and a 4 percent decrease in drive alone transport. The authors attribute this to the fact that private schools draw students from a larger geographic area. Additionally, children from wealthier families may be more likely to attend private schools, and several studies have found higher income to be associated with lower rates of ATS.[8, 18, 29, 37, 38, 44, 46]

In a separate evaluation of California SRTS programs, Boarnet et al.[96] surveyed 1,244 parents of third through fifth graders in ten California SRTS schools before and after implementation of SRTS projects that were completed between the spring of 2002 and fall of 2003. The survey found that while rates of walking and bicycling declined overall, students who passed a SRTS infrastructure improvement on their trip to or from school were more likely to show an increase in walking or biking to school than students who did not pass by an improvement. Increases were associated with sidewalk improvements and traffic control projects (traffic signals), but not crossing improvements.

An evaluation of the same ten California SRTS schools, using a different methodology, also found sidewalk improvements and traffic control projects to be the most successful infrastructure improvements.[95] Researchers observed areas around SRTS projects before and after construction. They recorded the number of pedestrians and bicyclists; pedestrian, bicyclist, and auto interactions; and auto speeds. Success was measured by comparing expected vs. actual outcomes (e.g., installing a crosswalk was expected to result in an increase in drivers yielding to pedestrians). All successful projects – five of ten – were sidewalk gap closures and replacement of four-way stop signs with traffic signals. Crosswalk and crosswalk signal improvements, as well as bicycle path improvements, were found to have limited or no immediate and measurable success. This study also found that the majority of parents at all schools noticed the construction project, thought it would increase safety, and thought it was important. No correlation was found between parents who noticed the project and/or thought it was important and whose children walked or biked to school.

In a report to the California state legislature, Orenstein et al.[94] evaluated the effects of SRTS programs on active commuting and child safety and performed a cost-benefit comparison. Data were obtained from a representative sample of 125 projects affecting 350 schools that received state SRTS funding. The effects on ATS varied across schools and data collection methods. Direct observation showed an increase of 20 percent to 200 percent in child pedestrians and bicyclists, while parent surveys reported an increase of about 10 percent. These increases came during a time of overall decline in ATS. Students whose routes passed a SRTS project were more than three times as likely to begin walking or biking to school than students whose route did not pass a project.

The same study found the overall annual rate of collisions (that resulted in an injury or death) involving child pedestrians or bicyclists in SRTS school areas declined by 13 percent between pre-intervention and post-intervention periods.[94, 97] This decline was no different than the decline in pedestrian and bicyclist injuries in control areas (nearby areas that were unlikely to be affected by the SRTS infrastructure improvements) during the same time period. The authors stated, however, that it was likely that rates of student walking and biking to school decreased in control areas and increased in SRTS areas from pre- to post-intervention periods. In this case, SRTS areas would have seen a net increase in pedestrian and bicyclist safety. Researchers estimated this safety benefit to range from no net change to a 49 percent decrease in the collision rate among children (with estimates of increased pedestrians and bicyclists ranging from zero to 100 percent). To account for hard-to-measure safety factors such as near-misses, personal perceptions of safety, amounts of vehicle traffic, and vehicle and pedestrian behaviors, researchers requested feedback from agencies responsible for implementing the SRTS programs. In general, the agencies strongly felt that the SRTS program had succeeded in improving safety for the schoolchildren and for other neighborhood residents. Only two of 114 sets of responses were not favorable overall.[94]

This evaluation also included a cost-benefit comparison. The cost for each collision prevented by a SRTS project ranged from $40,397 to $282,779. The cost range depended on the increased rate of active travel used in the model (10 percent to 100 percent increase). These costs were calculated by using the total SRTS program costs and Caltrans figures for the value of injuries and deaths avoided. The cost per injury reduced was based on one year of collision avoidance. These costs per collision reduced were greater than those of other road safety improvement programs. This estimate, however, did not account for other potential benefits of the program, such as decreased traffic congestion and air quality near schools, increased safety for adult pedestrians in the vicinity, and increases in physical activity among students. The authors also noted that children are the most vulnerable road users and are at particularly high risk of traffic collisions.[94]

Florida

Pedestrian specialists at the University of Miami/Jackson Memorial Medical Center developed a WalkSafe pilot program in response to high rates of child pedestrian collisions in Miami-Dade County, Florida. This elementary school-based pedestrian safety program used videos, workbooks, and simulation activities to teach K through fifth graders about pedestrian safety. The program was shown to improve students' pedestrian safety knowledge as measured by a pre- and post-test.[99] Students at two schools who completed the WalkSafe program scored significantly higher on post-tests than students at two control schools that did not complete the WalkSafe program. These improvements were still evident in a test conducted three months after the post-test. Children in grades – three through five scored significantly higher than children in grades K through two.

The WalkSafe program was modified on the basis of feedback from elementary school teachers and implemented throughout a school district in Miami-Dade County. As in the pilot program, pre- and post-test of pedestrian safety knowledge showed significant improvements, and these improvements were retained three months after the post test.[98] Additionally, observations of pedestrian crossing behavior pre-, post-, and three months after implementation indicated a sustained increase in positive crossing behaviors.

The WalkSafe program was also evaluated as part of a comprehensive pedestrian safety program implemented in Miami-Dade County.[100] In addition to WalkSafe, this program consisted of 15 pedestrian safety campaigns, including pedestrian safety posters, pedestrian safety workshops for older adults, and public service announcements. This comprehensive program was attributed with reducing pedestrian crashes in Miami-Dade county by 13.3 percent in comparison to an adjacent county, and 8.5 percent in comparison to the state of Florida and six other metropolitan counties within Florida. For children younger than 13, pedestrian crashes were reduced by 18.5 percent in comparison to the adjacent county, but no significant change was observed in relation to the state or the other six metropolitan counties. The authors attributed this to the possibility of less exposure (i.e., walking) in control areas and/or a lack of time for the benefits of the

WalkSafe Program to take effect. The study used the year of 2003 as the "after" period. The WalkSafe program was not initiated until late 2003.

Since the WalkSafe program was implemented throughout Miami-Dade County, trauma centers in the county have seen a reduction in child pedestrians hit by cars. A total of 98 pedestrians under the age of 13 were admitted in 2002/2003, and only 41 were admitted in 2007/2008, a 58 percent decrease.[107] It is unclear, however, to what extent pedestrian safety programs such as WalkSafe contributed to this reduction.

Legacy SRTS programs

Legacy SRTS programs are programs that were implemented prior to 2005, when federal funding and guidelines were established for SRTS programs. The evaluation of legacy SRTS programs was found to present many obstacles.[7] Legacy SRTS programs were difficult to locate, were difficult to define, varied widely in scope, and offered very little evaluation data. Blomberg et al.[7] determined that it was unfeasible to carry out a definitive crash-based assessment of these programs. However, they did conduct an analysis to bound any effects that legacy SRTS programs might have had on pedestrian and bicycle safety. They hypothesized that SRTS programs could affect safety in one of three ways: 1) they could have no impact on safety and there would be no observable change in crash involvement rates for pedestrians and bicyclists; 2) SRTS programs could reduce pedestrian and bicyclist crash involvement through safety interventions; or 3) the programs could result in an increase in crashes because they generated additional exposure to traffic risks.

Blomberg and colleagues used annual pedestrian and bicycle crash involvements derived from state crash data obtained from NHTSA's National Center for Statistics and Analysis. Crash data were collected for three states in which the greatest number of data on legacy SRTS projects existed. Within these three states, pedestrian and bike crash rate trends for various locations, time, and age groups were compared to baseline 1996 rates. In all three states, the number of crash-involved elementary school children during the school trip declined significantly, both statewide and at SRTS focus sites (the city or county in which a SRTS project was located). SRTS focus sites showed a greater reduction than states as a whole, but this was not significant. Over the same period, pedestrian and bicyclist crash involvement of other ages, as well as the involvement of four- to 12-year olds as automobile passengers during the school trip, showed no consistent patterns. These findings provided no support for the third hypothesis: that SRTS programs could result in more crashes because of the generation of increased exposure. Therefore legacy SRTS were considered to be at least benign with respect to crash involvement. Because of the imprecise spatial and temporal resolution of the study, these findings should be interpreted with discretion.

Walking School Bus

The walking school bus (WSB) – sometimes a component of SRTS programs – consists of an adult chaperone that walks with children along a specified route to or from school, picking up or dropping off children along the way. The adult monitors children, providing regular encouragement of proper pedestrian skills.[101] WSBs have been evaluated in the U.S., England, and New Zealand.

An inner-city Seattle public school that implemented three WSB routes saw a 25 percent increase in children walking to school. The baseline rate was 19 percent. Six months after the program began, the rate had risen to 26 percent.[101] Almost the entire increase was attributed to walking with an adult. Two nearby control schools saw a reduction in students walking to school over the same period. During the study period, however, only minor pedestrian safety behavior improvements were reported. In addition, this WSB program was attributed with helping to forge the first functioning parent-teacher association (PTA) at the school, which had been divided across multiple ethnic, cultural, and linguistic lines.[102] Parents from immigrant cultures saw themselves as 'experts' at walking for transport, volunteered as chaperones, had a reason to interact with school staff, and soon formed the core of the PTA. This indicated that walking to school with neighbor children can promote a sense of community and trust among families.

Additional benefits of WSBs have been reported internationally. At a primary school in Auckland, New Zealand, children who participated in a WSB program walked to or from school an average of 6.7 trips per week. This resulted in an estimated 19.5 fewer cars outside the school at the start or end of each school day.[103] In Hertfordshire, England, 22 schools with a total of 26 WSBs reported an average of ten children per route, 62 percent of whom previously traveled to or from school by car.[106] These schools reported a 65 percent overall success rate for achieving various school-defined objectives (e.g., relieving traffic congestion at the school entrance or improving children's road safety skills). WSBs, especially those with signs marking "bus stops," are also reported to help communicate to the community the school's commitment to walking and pedestrian safety.[103, 106]

Parents involved in WSB programs most frequently cited personal benefits in the amount of time saved, the removal of the "hassle" of driving and finding a parking space, and knowing that children were safe. Parents saw their children benefiting from the healthy aspects of exercise, mixing with other children, and the independence of walking.[103] Not all feedback was positive, however, as some participants reported time loss and negative social outcomes.[106] WSBs have also been criticized as a form of social control, since they are dependent upon parental surveillance and are subject to adult-imposed rules.[103] However, interviews with WSB participants in Christchurch, New Zealand, indicated that in addition to many social benefits, the program also encouraged children's independent mobility.[105] Finally, it has also been reported that WSBs are difficult to maintain, primarily because of lack of volunteers, coordination difficulties, persistent fears of traffic safety, and insufficient ongoing support from the school.[104, 106] Among the proposed solutions to these problems were the provision of promotional materials, maintaining a small and simple program, safety training for adult chaperones, and school-provided incentives for participation.[104]

National Program Evaluations

Under SAFETEA-LU's SRTS program guidance, a recommendation was made that states evaluate their SRTS programs. However, no explicit requirement was made.[5] Recently, the NCSRTS has worked on developing a framework for evaluations. It has developed standardized data collection forms to gather national-level data on the number of children walking and bicycling to school and parental attitudes toward these transportation modes. State and local SRTS programs can access their own data to generate reports. As of May 1, 2008, data from 34 states had been either entered through the online system or processed by the NCSRTS. More than 17,000 parent surveys and 3,400 student surveys (representing approximately 63,000 students) from about 230 schools were in the database.[5] The use of these data collection instruments is not required by the FHWA but strongly encouraged, and some states require SRTS programs that apply or receive funding to report data through these instruments.

The NCSRTS also conducts Web-based evaluation training sessions for SRTS state coordinators and has developed evaluation guidance for local SRTS programs. The guidance includes a six-step process to assist local programs in developing and implementing evaluation plans. These steps involve identifying local objectives and determining what, how, and when to measure.[5]

The NCSRTS also received funding to evaluate program strategies. As of 2008, it was in the process of assembling an expert panel that will use information from its tracking database to identify specific strategies for evaluation. The panel is to provide the FHWA with three to six evaluation reports of specific SRTS strategies each year, beginning with a six- and 12-month report for the fiscal year ending in September 2009. These reports will evaluate the four other SRTS E's (education, encouragement, enforcement, and engineering) at the local level.[5]

These planned evaluations will focus on measuring ATS participation and safety outcomes. They will not address other SRTS objectives, such as health and environmental benefits. The NCSRTS has engaged in initial discussions with the CDC and the EPA about developing health and environmental outcome measures.[5] There is also a movement in Congress to include these measures in the federal transportation funding package that will succeed SAFETEA-LU in 2009.

(5) SRTS RESOURCES

Two additional studies have been carried out to provide resources to support SRTS programs. Falb et al.[108] developed a technique to estimate the portion of students at a school that could reasonably walk or bike there and Watson and Dannenberg[109] estimated the total number of people and land area that SRTS programs could potentially benefit.

Falb et al.[108] completed a study to estimate the portion of students (grade K- 9) who lived within a reasonable and safe walking distance to neighborhood public schools. The denominator of this portion was the total school enrollment from 1999-2000. The numerator came from the year 2000 U.S. census data and was an estimate of the number of children living within a school's pedestrian catchment area, or the area in which students could be expected to walk to school. A total of eight pedestrian catchment areas were used to provide varying definitions of a reasonable and safe walking distance. Pedestrian catchment areas were drawn in a GIS by using four different buffers around the school's entrance, each at a 1- and 0.5-mile distance: a straight line buffer, a street network buffer, a street network buffer using only streets with speed limits equal to or less than 35 mph, and a street network buffer using only streets with speed limits equal to or less than 25 mph. So for a given pedestrian catchment area and grade group, the estimated portion of children who could walk to school was the number of children in a given age group (e.g., ages five to seven) living within the catchment areas divided by the number of children enrolled in the corresponding grades for that school (e.g., grades K through two).

Estimates of students who could reasonably and safely walk to school ranged from 1 percent to 51 percent, depending on the catchment area and grade level. Evaluation of the use of age-appropriate pedestrian catchment areas showed that 6 percent of elementary school students, 11 percent of middle school students, and 6 percent of high school students could reasonably be expected to walk to school. Given these estimates as context, the findings of a 2000 caregiver survey[27] that only 4.2 percent of Georgia children ages five to 15 walked or biked at least three days a week appears reasonable.

Recognizing that SRTS infrastructure improvements may provide benefits to area residents and not just school children, Watson and Dannenberg[109] attempted to calculate the area of land and number of people that may be affected nationally by SRTS improvement projects. Researchers used a GIS to draw half-mile straight line buffers around public schools to delineate areas of potential impact. They found that in census-defined large urban areas, 39 percent of the land could be affected by SRTS programs. This portion was 26.5 percent in small urban areas and 1 percent or less in non-urban areas. Assuming an even population distribution among urban areas, 65 million Americans living in urban areas could be positively affected by SRTS improvements. This estimate is likely low, as populations are generally more concentrated around schools. No estimate of rural population impacts were provided because of the very uneven population distribution. In a sub-analysis of the state of Georgia, however, more detailed census-block data were used to determine that 20 percent of the state's 8.1 million people live within an area of potential impact: 26 percent of the urban area population, 7 percent of the metropolitan area population, and 11 percent of the rural population.

❖ Conclusion

In the U.S., SRTS programs emerged, grew in number and scope, and were formalized into a government structure all within the past 12 years. Despite their short existence, SRTS issues were found to be covered extensively by research projects and reports. This body of literature may be used to support or inform SRTS programs in various ways. Figures of students who walk and bike provide a baseline understanding of the current rate and overall trend of ATS. Studies that examined the correlates of ATS, placed within a conceptual framework, are useful to understand what factors likely contribute to or inhibit the practice of ATS. Reports that highlighted the various barriers to ATS provide more in-depth insight into how ATS is affected by issues such as traffic, crime, and various policies. Evaluations of SRTS programs highlight the effectiveness of the overall program, as well as individual program elements. Evaluations also offer examples as to how other SRTS programs could be evaluated. And, finally, novel research could provide useful resources and information to SRTS programs. The review of these topics is meant to provide a solid foundation of knowledge on which to build a successful SRTS program.

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Table 2: *U.S. ATS Figures***:** Lists portion of students using Active Transport to School (ATS) over indicated region and year. percent ATS column is total portion of children walking, biking, or using some other form of active commuting (e.g., scooter).

Region	Year	Population	n	Commute	Frequency	Measurement	percent ATS	percent Walk	percent Bike	Primary Author, Publication Date
U.S.	2004	Age 5-18	1,588	AM/PM	At least once a week	Parent survey	17	17	NA	Martin 2005
U.S.	2001	Age 5-18	14,553	AM	Survey day	Travel diary	12.9	12.1	0.8	McDonald 2007
U.S.	2001	Age 5-13	6,508	AM	Survey day	Travel diary	12	12	NA	McDonald 2008
U.S.	1999	Age 5-18	749	AM	At least once a week	Parent survey	25	19	6	Dellinger 2002
U.S.	1996	Grade 4-12	1,395	AM/PM	Usual	Parent survey	14	11.4	2.6	Fulton 2005
U.S.	1995	Age 5-18	9,898	AM	Survey day	Travel diary	11.7	10.6	1.1	McDonald 2007
U.S.	1990	Age 5-18	4,824	AM	Survey day	Parent survey	19.2	18.2	1	McDonald 2007
U.S.	1983	Age 5-18	1,670	AM	Survey day	Parent survey	15	14.5	0.5	McDonald 2007
U.S.	1977	Age 5-18	4,608	AM	Survey day	Parent survey	23.5	22.5	1	McDonald 2007
U.S.	1969	Age 5-18	6,000	AM	Survey day	Parent survey	40.7	NA	NA	McDonald 2007
State of NC	2001	Grade 6-8	2,151	AM	At least once a week	Child survey	12.1	9.4	4.1	Evenson 2003
		Grade 9-12	2,297				6.4	4.9	2.8	
State of GA	2000	Age 5-15	1,656	AM	>2 days/week	Parent Survey	4.2	4.2	NA	Bricker 2002
Communities in AZ, MD, MN, LA, CA, and SC)	2007*	Grade 6 girls	1,596	AM	At least once in three days	Physical activity recall	14	14	NA	Saksvig 2007
				PM			18	18	NA	
Communities in AZ, MD, MN, LA, CA, and SC)	2002	Grade 6 & 8 girls	480	AM	At least once a week	Child survey	42.3	NA	NA	Evenson 2006
10 CA communities	2006*	Grade 3-5	1,244	AM	Usual	Parent survey	21	NA	NA	McMillan 2006
College Station, TX (Figures only represent students within a 2-mile walk zone of school)	2007*	Grade 5-6	84	AM	Usual	Parent survey	29.5	11.6	17.9	Folzenlogen 2007
				PM			38.2	18.7	19.5	
				AM/PM			36	19.8	16.2	
		Grade 7-8	102	AM			38.2	20.6	17.6	
				PM			53	35.6	17.4	
				AM/PM			47.1	31.4	15.7	
Lane County, OR	2007	Elementary school Children	1,197	AM	>2 days a week	Parent Survey	14.4	NA	NA	Yang 2008
				PM			15.4	NA	NA	
King County, WA	2006*	Age 5-18	259	AM/PM	5 days a week	Parent survey	18.1	NA	NA	Kerr 2006
					At least once a week		25.1	NA	NA	

Table 2: *U.S. ATS Figures***:** Lists portion of students using Active Transport to School (ATS) over indicated region and year. percent ATS column is total portion of children walking, biking, or using some other form of active commuting (e.g., scooter).

Region	Year	Population	n	Commute	Frequency	Measurement	percent ATS	percent Walk	percent Bike	Primary Author, Publication Date
Columbia, SC	2005*	Grade 5	219	AM/PM	5 or more trips a week	Child survey	5	NA	NA	Sirard 2005b
					1-4 trips a week		11	NA	NA	
Wake County, NC	2005*	Elementary	800	AM	Not reported	Parent survey	5	NA	NA	Rhoulac 2005
				PM			2.7	NA	NA	
		Middle		AM			6	NA	NA	
				PM			5	NA	NA	
Rural NE	2005*	Age 10	320	AM	All school trips over one week period	Child survey	24.7	17.3	5.3	Heelan 2005
				PM			41.9	34.2	5.3	
				AM/PM			33.3	25.7	5.3	
2 small cities in OR	2004	Grade 6-8	287	AM	Primary mode	Parent Survey	15	9.8	5.2	Schlossberg 2006
				PM	Primary Mode		25.1	19.5	5.6	
				AM/PM	Ever		46	30	16	
Columbia, SC	2002	Elementary schools	8 schools, 3,911 students	AM	All school trips over one week period	Direct Observation	5	NA	NA	Sirard 2005
				PM			5	NA	NA	
				AM/PM			5	NA	NA	
Gainesville, FL	2000/ 2001	Grade K-12	709	AM/PM	Survey day	Travel diary	7.9	4.5	3.9	Ewing 2004
Alameda County, CA	2000	Age 5-18	614	AM	2 consecutive survey days	Travel diary	19	NA	NA	McDonald 2007b
San Francisco Bay Area, CA	2000	<18	4352	AM	Weekday	Travel diary	18.7	16.2	2.5	Yarlagadda 2008
				PM			15.4	12.9	2.5	
SC Lowcountry	1998/ 1999	Elementary – High Schools built pre-1983	200 Schools	PM	Usual	Principal survey	16	NA	NA	Kouri 1999
		Elementary – High Schools built post-1983					4	NA	NA	
Southern CA	1990	Grade 4-5	924	AM	>3 days in past week	Child survey	20	NA	NA	Rosenberg 2006

* Indicates no date of data specified; year of publication is listed in place.

Table 3: *Urban Form Factors*: Built environment features that have been tested for an association with the use of Active Transportation to School (ATS). The second column (Assoc. w/ATS) indicates whether a significant positive (+), significant negative (-), or insignificant (None) association was found between the variable and the use of ATS.

Urban Form Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
Access, easy to walk/bike to transit stop	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Avg. block size	None	GIS/Govt. data	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Bike lane density (in 2-mile walk zone)	+	GIS/Govt. data	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	Only significant for walkers
Bike lanes/paved shoulders, portion of street miles w/	None	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Bike lanes within ¼ mile of home (length)	None	GIS/Govt. data	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Bike or walking trails (Y/N)	+	Child Survey	Grade 6/8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Crossing, major road	-	GIS/Govt. data	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Crossing, major road	-	GIS/Govt. data	Age 6/7, 9/10, 13/14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Crossing, major road	None	GIS/Govt. data	Grade 6-8, Oregon	287	2004	Schlossberg 2006	
Crossing, motorway	None	GIS/Govt. data	Age 6/7, 9/10, 13/14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Crossing, railroad	None	GIS/Govt. data	Grade 6-8, Oregon	287	2004	Schlossberg 2006	
Crossing, side street	None	GIS/Govt. data	Age 6/7, 9/10, 13/14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Dead-end density (1/8-mile buffer around route)	-	GIS/Govt. data	Grade 6-8, Oregon	287	2004	Schlossberg 2006	
Destinations within walking distance of home	None	Child Survey	Grade 6/8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Destinations, access to stores	None	Child Survey	Age 5, urban England	275	2007*	Mota 2007	
Destinations, access to transit	None	Child Survey	Age 5, urban England	275	2007*	Mota 2007	
Destinations, stores within 20-min. walk	+	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Distance	-	Child Survey	Age 15-17, Ireland	4,013	2003-05	Nelson 2008	
Distance	-	Parent Survey	Age 4-12, Brisbane, Australia	318	2008*	Yeung 2008	
Distance	-	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
Distance	-	Parent Survey	Age 5-18, U.S.	14,553	2001	McDonald 2007	
Distance	-	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Distance	-	Parent Survey	Age 6/7, 9/10, London	2,086	1998*	diGuiseppi 1998	
Distance	-	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Distance (.5-1 mile, referent is 1-2 miles)	None	Travel Diary	Age 5-18, U.S.	14,553	2001	McDonald 2008b	
Distance (<0.5 mile, referent is >1 mile)	+	Travel Diary	Age 5-18, U.S.	14,553	2001	McDonald 2008b	
Distance (<1 mile)	+	Parent Survey	Elementary schools, CA	16	2007*	McMillan 2007	
Distance (<1 mile)	+	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Distance (<1 mile)	+	GIS/Govt. data	Grade 6-8, Oregon	287	2004	Schlossberg 2006	
Distance (route <800m)	+	GIS/Govt. data	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Distance (straight-line)	-	GIS/Govt. data	Age 6/7, 9/10, 13/14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Distance (straight line)	-	GIS/Govt. data	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	Only significant for walkers
Distance (street network)	-	GIS/Govt. data	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	

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Urban Form Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
Distance (street network)	-	GIS/Govt. data	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Distance (time)	-	Travel Diary	Age 5-13, U.S.	6508	2001	McDonald 2008	
Distance (time)	-	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Distance (walkable)	+	Parent Survey	Elem. school children, Lane County, OR	1,197	2007	Yang 2008	
Downtown school location	None	Parent Survey	Elem. school children, Lane County, OR	1,197	2007	Yang 2008	
Employment within ¼ mile	None	GIS/Govt. data	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Gridded streets (referent is cul-de-sac)	+	GIS/Govt. data	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Intersection density	None	GIS/Govt. data	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Intersection density (1/8-mile buffer around route)	+	GIS/Govt. data	Grade 6-8, Oregon	287	2004	Schlossberg 2006	
Intersection density (in 2-mile walk zone)	None	GIS/Govt. data	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Job mix in TAZ	None	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Jobs-resident balance in TAZ	None	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Land use mix	None	GIS/Govt. data	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Land use mix (within ¼ mile of home)	None	GIS/Govt. data	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Land use mix (in 2-mile walk zone)	+	GIS/Govt. data	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Land use mix, access	+	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Land use mix, diversity	None	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Land use mix, entropy	+	GIS/Govt. data	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	Only significant for distances >1 mile
Land use mix, portion of streets w/land use mix	+	Observation	Elementary schools, CA	16	2007*	McMillan 2007	
Length of street segments (200m school buffer)	None	GIS/Govt. data	Age 6/7, 9/10, 13/14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Many recreation facilities in neighborhood	None	Child Survey	Age 5, urban England	275	2007*	Mota 2007	
Overall (residents & Jobs) density in TAZ	None	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Pedestrian-oriented FAR in TAZ	None	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Population density	+	Govt. data	Age 15-17, Ireland	4,013	2003-05	Nelson 2008	
Population density	+	Travel Diary	Age 5-13, U.S.	6508	2001	McDonald 2008	
Population density	+	Travel Diary	Age 5-18, U.S.	14,553	2001	McDonald 2008b	
Population density	None	GIS/Govt. data	Age 6/7, 9/10, 13/14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Population/residential density	+	GIS/Govt. data	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Population/residential density	+	GIS/Govt. data	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Population/residential density	None	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Population/residential density (in 2-mile walk zone)	+	GIS/Govt. data	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Regional accessibility of TAZ	None	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Route along major road	None	GIS/Govt. data	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Route directness	-	GIS/Govt. data	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	Only significant for age 10-12

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Urban Form Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
Route directness	None	GIS/Govt. data	Grade 6-8, Oregon	287	2004	Schlossberg 2006	
School constructed before 1983	+	School District	Schools, SC Lowcountry	200	1998/99	Kouri 1999	
Sidewalk density (in 2-mile walk zone)	-/+	GIS/Govt. data	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	- for walkers, + for bikers
Sidewalks (Avg. coverage in TAZ)	+	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Sidewalks (Avg. width in TAZ)	None	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Sidewalks in neighborhood	None	Child Survey	Grade 6/8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Sidewalks near school	None	Observation	Elementary schools, CA	16	2007*	McMillan 2007	
Sidewalks on most streets	+	Child survey	Grade 6 girls, AZ, MD, MN, LA, CA, SC	1,596	2007*	Saksvig 2007	
Sidewalks, portion of street miles w/	None	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Sidewalks, presence of	+	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Street centerline density of TAZ	None	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Street connectivity	+	Child Survey	Age 5, urban England	275	2007*	Mota 2007	
Street connectivity	+	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Street connectivity	None	GIS/Govt. data	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Street length within ¼ mile of home	None	GIS/Govt. data	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Topography (altitude change)	None	GIS/Govt. data	Age 6/7, 9/10, 13/14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Topography (steep road along route)	-	GIS/Govt. data	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	Only significant for age 5/6
Trees in neighborhood	None	Child Survey	Grade 6/8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Trees, greenery	+	GIS/Govt. data	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Trees, portion of street miles in TAZ w/	None	GIS/Govt. data	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Urbanization, suburb/small town (referent is rural)	+	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Urbanization, urban (referent is rural)	+	Parent Survey	Age 5-18, U.S.	14,553	2001	McDonald 2007	
Urbanization, urban (referent is rural)	+	Child Survey	Age 9, 13, 16, Quebec, Canada	3,613	1999	Pabayo 2008	
Urbanization, urban (referent is rural)	+	Survey	Grade 8, 11, Queensland, Australia	1,033	2005*	Schofield 2005	
Urbanization, urban (referent is rural)	-	Parent Survey	Age 14-16, Philippines	691	1998-99	Tudor-Locke 2003	Only significant for girls
Urbanization, urban (referent is rural)	None	Parent Survey	Age 5-15, GA	1,656	2000	Bricker 2002	
Urbanization, urban (referent is rural)	None	GIS/Govt. data	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Urbanization, urban (referent is suburban)	None	Unspecified	Elem. Schools, Columbia, SC	8	2002	Sirard 2005	
Walkability, individual	+	GIS/Govt. data	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Walkability, neighborhood	+	GIS/Govt. data	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Walking/cycling facilities	+	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
walking/cycling infrastructure	None	Child Survey	Age 5, urban England	275	2007*	Mota 2007	
Well-lit streets	None	Child Survey	Grade 6/8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Windows facing street	+	Observation	Elementary schools, CA	16	2007*	McMillan 2007	

* No date of study specified; year of publication is listed in place.

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Mediating Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
Aesthetics	+	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Child care, after-school	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Child perceives heavy traffic	None	Child Survey	Age 10-12, Melbourne, Australia	656	2001	Timperio 2006	
Child perceives parents perceive heavy traffic	None	Child Survey	Age 10-12, Melbourne, Australia	656	2001	Timperio 2006	
Child perceives parents perceive roads not safe	None	Child Survey	Age 10-12, Melbourne, Australia	656	2001	Timperio 2006	
Child perceives parents worried about strangers	None	Child Survey	Age 10-12, Melbourne, Australia	656	2001	Timperio 2006	
Child Perceives places to walk in neighborhood	+	Child survey	Grade 6 girls, AZ, MD, MN, LA, CA, SC	1,596	2007*	Saksvig 2007	
Child perceives roads not safe	None	Child Survey	Age 10-12, Melbourne, Australia	656	2001	Timperio 2006	
Child thinks it's safe to play in neighborhood	-	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Company car in household	None	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Concern, abduction	-	Parent Survey	Age 6, 7, 9, 10, London	2,086	1998*	diGuiseppi 1998	
Concern, after-school schedule	-	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, available outside shelter	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Concern, bike storage	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, child's personal safety	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Concern, convenience	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, crime	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, distance too great	-	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, general crime/safety/distance	-	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Concern, lack of adult company	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Concern, lack of child company	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Concern, manned crossings	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Concern, no sidewalks or bike paths	-	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, not enough time	-	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, parking	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, pollution	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Concern, road safety	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Concern, school bag weight	-	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, school bag weight	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Concern, sidewalk/bike path close to traffic	-	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, strangers	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Concern, traffic	-	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Concern, traffic	-	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, traffic speed	-	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	

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Mediating Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
Concern, traveling alone	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Concern, walking alone	-	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Concern, weather	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Crime	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Crime safety	None	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Crime, too much	None	Child Survey	Age 5, urban England	275	2007*	Mota 2007	
Day care attendance	None	Parent Survey	Age 6, 7, 9, 10, 13, 14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Driver's license owned by student	-	Parent survey	Age 5-18, U.S.	14,553	2001	McDonald 2008b	
Driver's license owned by student	-	Parent Survey	Age 5-18, U.S.	14,553	2001	McDonald 2007	
Driver's license owned by student	None	Parent survey	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Driving is more convenient	-	Parent Survey	Elementary schools, CA	16	2007*	McMillan 2007	
Driving is more convenient	-	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Extracurricular activities	None	Child Survey	Grade 9-12, NC	2,297	2001	Evenson 2003	
Extracurricular activities, after-school sport/exercise	None	Child Survey	Age 14-16, Philippines	1,518	1998-99	Tudor-Locke 2003	
Interesting things to look at in neighborhood	None	Child Survey	Age 5, urban England	275	2007*	Mota 2007	
Interesting things to look at in neighborhood	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Interesting things to look at while walking	+	Child survey	Grade 6 girls, AZ, MD, MN, LA, CA, SC	1,596	2007*	Saksvig 2007	
Mother's commute time	None	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Many people physically active in neighborhood	None	Child Survey	Age 5, urban England	275	2007*	Mota 2007	
No adult home after school	+	Child Survey	Grade 9-12, NC	2,297	2001	Evenson 2003	
No adult home after school	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
No. of cars	-	Parent Survey	Elem. school children Lane County, OR	1,197	2007	Yang 2008	
No. of cars	-	Parent Survey	Age 14-16, Philippines	1,518	1998-99	Tudor-Locke 2003	
No. of cars	-	Parent Survey	Age 6, 7, 9, 10, London	2,086	1998*	diGuiseppi 1998	
No. of cars	None	Parent Survey	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
No. of cars	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
No. of cars	None	Parent Survey	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
No. of cars	None	Parent Survey	Grade 6-8, OR	287	2004	Schlossberg 2006	
No. of cars (>1 car in household)	-	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
No. of cars (>1 car in household)	-	Parent Survey	Age 6, 7, 9, 10, 13, 14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
No. of cars (>1 car in household)	None	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
No. of cars (>1 car in household)	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
No. of cars (>1 car in household)	None	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
No. of cars (Per driver in household)	None	Parent Survey	Elementary schools, CA	16	2007*	McMillan 2007	
No. of cars (Per driver in household)	None	Parent Survey	Age 5-13, U.S.	6508	2001	McDonald 2008	

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Mediating Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
No. of cars (Per driver in household)	None	Parent Survey	Age 5-18, U.S.	14,553	2001	McDonald 2007	
No. of cars (Per member of household)	-	Parent Survey	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
No. of drivers in household	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2008	
No. of drivers in household	None	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Other children playing in neighborhood	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Parent drives to work	-	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
Parent has flexible schedule	None	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Parent employment, both parents working	None	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Parent employment, father goes to work	None	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Parent employment, father works full time	None	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Parent employment, mother goes to work	-	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	Only significant for Walk w/mom
Parent employment, mother works full time	-	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	Only significant for Walk w/mom
Parent perceives barrier of crime	None	Parent Survey	Age 5-18, U.S.	1,588	2004	Martin 2005	
Parent perceives barrier of distance	-	Parent Survey	Age 5-18, U.S.	1,588	2004	Martin 2005	
Parent perceives barrier of school policy	-	Parent Survey	Age 5-18, U.S.	1,588	2004	Martin 2005	
Parent perceives barrier of traffic	-	Parent Survey	Age 5-18, U.S.	1,588	2004	Martin 2005	
Parent perceives barrier of weather	+	Parent Survey	Age 5-18, U.S.	1,588	2004	Martin 2005	
Parent perceives few other children around	-	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Parent perceives heavy traffic	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Parent perceives limited public transport	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Parent perceives need to cross several roads	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Parent perceives no lights/crossings	-	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Parent perceives roads to school as unsafe	-	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
Parent perceives safe neighborhood	None	Child Survey	Grade 6 girls, AZ, MD, MN, LA, CA, SC	1,596	2007*	Saksvig 2007	
Parent perception of pedestrian safety	None	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Parent thinks route to school is safe	None	Parent Survey	Age 6, 7, 9, 10, 13, 14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Parking problem at school	+	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Pedestrians are easily seen by others in neighborhood	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Perceived bad smells in neighborhood	-	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Perceived garbage or litter in area	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Safe to ride a bike	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Safe to walk and Jog	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Scary dogs in neighborhood	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	

Table 4: *Mediating Factors*: Variables thought to directly influence a parent's decision for their child's travel mode to/from school. These variables have been tested for association with the use of Active Transportation to School (ATS). The second column (Assoc. w/ATS) indicates whether a significant positive (+), significant negative (-), or insignificant (None) association was found.

Mediating Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
School attendance, Ind. School (referent is pub. school)	-	Parent Survey	Age 6, 7, 9, 10, London	2,086	1998*	diGuiseppi 1998	
School attendance, neighborhood (referent is alt. school)	+	Parent Survey	Elem. school children Lane County, OR	1,197	2007	Yang 2008	
School attendance, Priv. School (referent is pub. school)	-	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
School enrollment level	None	School District	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Traffic Safety	None	Parent Survey	Elementary schools, CA	16	2007*	McMillan 2007	
Traffic, too much to walk	None	Child Survey	Age 5, urban England	275	2007*	Mota 2007	
Traffic, too much to walk	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Unsafe Neighborhood	-	Parent Survey	Elementary schools, CA	16	2007*	McMillan 2007	
Unsafe Neighborhood	None	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Walkable neighborhood	+	Parent Survey	Elem. school children Lane County, OR	1,197	2007	Yang 2008	
Weather/temperature	None	Direct Observation	Schools, Columbia, SC	8	2002	Sirard 2005	

* No date of study specified; year of publication is listed in place.

Table 5: *Moderating Factors*: Variables thought to indirectly influence a parent's decision for their child's travel mode to/from school. These variables have been tested for association with the use of Active Transportation to School (ATS). The second column (Assoc. w/ATS) indicates whether a significant positive (+), significant negative (-), or insignificant (None) association was found.

Moderating Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
Age	+	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
Age	+	Parent survey	Age 5-13, U.S.	6508	2001	McDonald 2008	
Age	+	Parent survey	Age 5-18, U.S.	14,553	2001	McDonald 2008b	Not significant for Hispanics
Age	+	Parent Survey	Age 6, 7, 9, 10, 13, 14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Age	+	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	Only significant for walking alone
Age	-	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	Only significant for walking w/mom
Age	-	Child Survey	Age 14-16, Philippines	1,518	1998-99	Tudor-Locke 2003	
Age	-	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Age	-	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Age	-	Child Survey	Grade 6-12, NC	4,448	2001	Evenson 2003	
Age	-	Child Survey	Age 9, 13, 16, Quebec, Canada	3,613	1999	Pabayo 2008	
Age	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Age	None	Parent Survey	Age 4-12, Brisbane, Australia	318	2008*	Yeung 2008	
Age	None	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Age	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Age	None	Parent Survey	Age 5-15, GA	1,656	2000	Bricker 2002	
Age	None	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Age	None	Parent Survey	Grade 6-8, OR	287	2004	Schlossberg 2006	
Age (until driver's license received)	+	Parent survey	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Age, 5-10 (referent is 11-18)	-	Parent Survey	Age 5-18, U.S.	14,553	2001	McDonald 2007	
Age, 5-6 (referent is 10-12)	+	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Age, grade 11 (referent is grade 8)	-	Child Survey	Grade 8, 11, Central Queensland, Australia	1,033	2005*	Schofield 2005	
Age, grade 7-8 (referent is grade 5-6)	+	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	Only significant for walkers
Age, high school (referent is all other schools)	None	School District	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Age, parent	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Age, parent	None	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
BMI, parent	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Car-centeredness	+	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Child does not enjoy PA	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Child enjoys being active	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Child enjoys PA	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Child has no energy	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	

Table 5: *Moderating Factors*: Variables thought to indirectly influence a parent's decision for their child's travel mode to/from school. These variables have been tested for association with the use of Active Transportation to School (ATS). The second column (Assoc. w/ATS) indicates whether a significant positive (+), significant negative (-), or insignificant (None) association was found.

Moderating Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
Child has time for PA	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Child has transportation for PA	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Child is unwilling to walk/bike to school	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Child level of independence	+	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
Child not keen on walking	None	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
Child screen time (Video/computer time)	None	Child Survey	Age 5, urban England	275	2007*	Mota 2007	
Child screen time (Video/computer time)	None	Child Survey	Age 10, rural NE	320	2005*	Heelan 2005	
Child worried about strangers	None	Child Survey	Age 10-12, Melbourne, Australia	656	2001	Timperio 2006	
Concern, effects of driving (environmental, safety)	+	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Concern, environment	None	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Culture (French/German speaking)	None	Parent Survey	Age 6, 7, 9, 10, 13, 14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Education, mother	None	Parent Survey	Age 6, 7, 9, 10, 13, 14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Education, parent	-	Parent Survey	Age 5, urban England	275	2007*	Mota 2007	
Education, parent	-	Child Survey	Grade 9-12, NC	2,297	2001	Evenson 2003	
Education, parent	None	Parent Survey	Elem. school children Lane County, OR	1,197	2007	Yang 2008	
Education, parent	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Education, parent	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Education, parent	None	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Education, parent	None	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Education, parent	None	Child Survey	Grade 6-8, NC	2,151	2001	Evenson 2003	
Employment, both parents working	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Employment, ft/shift work/unemployed (referent is pt)	None	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Employment, full-time houseperson (referent is pt)	+	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Employment, mother's employment (no/pt/ft)	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Employment, parent currently working	None	Child Survey	Age 14-16, Philippines	1,518	1998-99	Tudor-Locke 2003	
Employment, parent employed outside home	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Employment, parent works at least pt	None	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Employment, parent's occupation status	-	Parent Survey	Age 5, urban England	275	2007*	Mota 2007	
Employment, unemployed	+	Parent Survey	Elem. school children Lane County, OR	1,197	2007	Yang 2008	
Employment, unemployed	None	Census	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Family approval of walking to school	+	Parent Survey	Elementary schools, CA	16	2007*	McMillan 2007	
Family approval of walking to school	+	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Foreign-born parent (Canada)	-	Child Survey	Age 9, 13, 16, Quebec, Canada	3,613	1999	Pabayo 2008	
Foreign-born parent (U.S.A)	+	Parent Survey	Elementary schools, CA	16	2007*	McMillan 2007	
Foreign-born parent (U.S.A)	None	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	

Table 5: *Moderating Factors*: Variables thought to indirectly influence a parent's decision for their child's travel mode to/from school. These variables have been tested for association with the use of Active Transportation to School (ATS). The second column (Assoc. w/ATS) indicates whether a significant positive (+), significant negative (-), or insignificant (None) association was found.

Moderating Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
Foreign-born parent (U.S.A)	None	Census	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Gender, Male	+	Child Survey	Age 15-17, Ireland	4,013	2003-05	Nelson 2008	
Gender, Male	+	Child Survey	Grade 4-5, southern CA	924	1990	Rosenberg 2006	
Gender, Male	+	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Gender, Male	+	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	Only significant for bikers
Gender, Male	+	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Gender, Male	+	Parent Survey	Age 5-18, U.S.	14,553	2001	McDonald 2007	
Gender, Male	+	Parent Survey	Grade 6-8, OR	287	2004	Schlossberg 2006	
Gender, Male	+	Child Survey	Grade 6-12, NC	4,448	2001	Evenson 2003	
Gender, Male	+	Child Survey	Grade 8, 11, Central Queensland, Australia	1,033	2005*	Schofield 2005	
Gender, Male	+	Survey	Grade 8, 11, Central Queensland, Australia	1,033	2005*	Schofield 2005	
Gender, Male	+	Child Survey	Age 9, 13, 16, Quebec, Canada	3,613	1999	Pabayo 2008	
Gender (male)	+	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	Only significant for walking alone
Gender (male)	-	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	Only significant for walking w/mom
Gender, Male	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Gender, Male	None	Parent Survey	Age 4-12, Brisbane, Australia	318	2008*	Yeung 2008	
Gender, Male	None	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Gender, Male	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Gender, Male	None	Parent survey	Age 5-13, U.S.	6508	2001	McDonald 2008	
Gender, Male	None	Parent Survey	Age 5-15, GA	1,656	2000	Bricker 2002	
Gender, Male	None	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Gender, Male	None	Parent Survey	Age 6, 7, 9, 10, 13, 14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Gender, parent	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Gender, parent	None	Parent Survey	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Height	+	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Height	None	Parent Survey	Age 4-12, Brisbane, Australia	318	2008*	Yeung 2008	
Homeowner	None	Parent Survey	Elem. school children Lane County, OR	1,197	2007	Yang 2008	
Income	-	Parent Survey	Elem. school children Lane County, OR	1,197	2007	Yang 2008	
Income	-	Parent Survey	Age 14-16, Philippines	1,518	1998-99	Tudor-Locke 2003	
Income	-	Parent Survey	Elementary schools, CA	16	2007*	McMillan 2007	
Income	-	Parent survey	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Income	-	Child Survey	Age 9, 13, 16, Quebec, Canada	3,613	1999	Pabayo 2008	
Income	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	

Table 5: *Moderating Factors*: Variables thought to indirectly influence a parent's decision for their child's travel mode to/from school. These variables have been tested for association with the use of Active Transportation to School (ATS). The second column (Assoc. w/ATS) indicates whether a significant positive (+), significant negative (-), or insignificant (None) association was found.

Moderating Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
Income	None	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Income	None	Parent survey	Age 5-13, U.S.	6508	2001	McDonald 2008	
Income	None	Parent survey	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Income	None	Parent Survey	Grade 6-8, OR	287	2004	Schlossberg 2006	
Income	None	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Income, <30k/year	+	Parent Survey	Age 5-18, U.S.	14,553	2001	McDonald 2007	
Income, >60k/year	-	Parent survey	Age 5-18, U.S.	14,553	2001	McDonald 2008b	Only significant for whites
Income, below poverty line	None	Census	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Income, neighborhood	None	GIS/Govt. data	Age 5-18, King County, WA	259	2006*	Kerr 2006	
Income, on public assistance	None	Census	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Intended on child walking when chose residence	+	Parent Survey	Elem. school children Lane County, OR	1,197	2007	Yang 2008	
live in same house as 1995	None	Census	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Male responsible for taking child to school	+	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
Nationality	None	Parent Survey	Age 6, 7, 9, 10, 13, 14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Neighborhood disadvantage	+	Parent Survey	Age 5-18, U.S.	14,553	2001	McDonald 2008b	Only significant for Hispanics
Neighborhood social control/cohesion	+	Parent Survey	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
No. of household members	None	Parent Survey	Grade K-12 school trips, Gainesville, FL	709	2000-01	Ewing 2004	
Non-English speaker at home	None	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
Outside commitments	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Parent allows unsupervised play	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Parent believes PA is important	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Parent perceives child as too overweight for PA	+	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Parent provides support for PA	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Parent time spent walking	None	Parent Survey	Grade 3-5, 10 CA communities	1,244	2006*	McMillan 2006	
Parental Restrictions	None	Parent Survey	Age 6, 7, 9, 10, 13, 14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Parents allow biking alone	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Parents allow use of public transit alone	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Parents allow walking alone	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	
Parents prefer ATS	+	Parent Survey	Elem. school children, Brisbane, Australia	197	2007	Yang 2008	
Parents value interaction on trip to school	+	Parent Survey	Elementary schools, CA	16	2007*	McMillan 2007	
Parents value PA	+	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Parents value the health benefits of walking	+	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
Parents walked to primary school	+	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
Participation in school sponsored sports teams	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	

Table 5: *Moderating Factors*: Variables thought to indirectly influence a parent's decision for their child's travel mode to/from school. These variables have been tested for association with the use of Active Transportation to School (ATS). The second column (Assoc. w/ATS) indicates whether a significant positive (+), significant negative (-), or insignificant (None) association was found.

Moderating Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
PE class 1-4 days a week (referent is no PE)	+	Child Survey	Grade 9-12, NC	2,297	2001	Evenson 2003	
Race/ethnicity	None	Child Survey	Grade 6 girls, AZ, MD, MN, LA, CA, SC	1,596	2007*	Saksvig 2007	
Race/ethnicity	None	Parent Survey	Elem. school children Lane County, OR	1,197	2007	Yang 2008	
Race/ethnicity	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Race/ethnicity	None	Parent Survey	Age 5-15, GA	1,656	2000	Bricker 2002	
Race/ethnicity	None	Parent Survey	Grade 6-8, OR	287	2004	Schlossberg 2006	
Race/ethnicity, African American	+	Parent Survey	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Race/ethnicity, African American	None	Parent Survey	Age 5-13, U.S.	6508	2001	McDonald 2008	
Race/ethnicity, African American (referent is white)	+	Child Survey	Grade 6-12, NC	4,448	2001	Evenson 2003	
Race/ethnicity, Asian	-	Parent Survey	Age 5-13, U.S.	6508	2001	McDonald 2008	
Race/ethnicity, Asian	+	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	Only significant for walking alone
Race/ethnicity, Asian/pacific Islander	None	Census	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Race/ethnicity, Caucasian	-	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	Only significant for Walking w/mom
Race/ethnicity, Latino	None	Parent Survey	Age 5-13, U.S.	6508	2001	McDonald 2008	
Race/ethnicity, Latino/Hispanic	None	Census	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Race/ethnicity, Multi-racial	-	Parent Survey	Age 5-13, U.S.	6508	2001	McDonald 2008	
Race/ethnicity, non-white	+	Parent Survey	Age 5-18, U.S.	14,553	2001	McDonald 2007	
Race/ethnicity, composition within ¼ mile of home	None	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Screen time (TV/Movie watching)	None	Child Survey	Age 10, rural NE	320	2005*	Heelan 2005	
SES level, school area	None	Unspecified	Schools, Columbia, SC	8	2002	Sirard 2005	
SES level, school area	None	Govt. data	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Siblings, no. of children in household	+	Parent Survey	Elementary schools, CA	16	2007*	McMillan 2007	
Siblings, no. of children in household	+	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	
Siblings, only child	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Siblings, presence of	+	Parent Survey	Age 5-13, U.S.	6508	2001	McDonald 2008	
Siblings, presence of	None	Parent Survey	Age 5-7, urban England	4,180	1996	Black 2001	
Siblings, presence of	None	Travel diary	<18, San Francisco Bay Area, CA	4,352	2000	Yarlagadda 2008	
Single parent (Lives in female headed household)	None	Census	Age 5-18, Alameda County, CA	614	2000	McDonald 2007b	
Single parent (parent not currently married)	None	Parent Survey	Age 5-12, NSW, Australia	812	2002	Merom 2006	
Single-parent (lives with one parent)	None	Parent Survey	Age 6, 7, 9, 10, 13, 14, Switzerland	1,031	2004-05	Bringolf-Isler 2008	
Single-parent family	None	Parent Survey	Age 5, 6, 10-12, Melbourne, Australia	885	2001	Timperio 2006	
Single-parent, no. of parents living at home	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Single-parent, parent not currently married	+	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
Sports equipment at home	None	Child Survey	Grade 6, 8 girls, AZ, MD, MN, LA, CA, SC	480	2002	Evenson 2006	

Table 5: *Moderating Factors*: Variables thought to indirectly influence a parent's decision for their child's travel mode to/from school. These variables have been tested for association with the use of Active Transportation to School (ATS). The second column (Assoc. w/ATS) indicates whether a significant positive (+), significant negative (-), or insignificant (None) association was found.

Moderating Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
Taking part in any in school sport/exercise	None	Child Survey	Age 14-16, Philippines	691	1998-99	Tudor-Locke 2003	
TV ownership	-	Parent Survey	Age 14-16, Philippines	1,518	1998-99	Tudor-Locke 2003	

* No date of study specified; year of publication is listed in place.

Table 6: *Physical Health Outcomes*: Physical health variables thought to be influenced by the use of active transportation. These variables have been tested for association with the use of Active Transportation to School (ATS). The second column (Assoc. w/ATS) indicates whether a significant positive (+), significant negative (-), or insignificant (None) association was found.

Health Outcome Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
BMI	-	Direct Observation	Grade 4/5, southern CA	924	1990	Rosenberg 2006	Significant for boys only
BMI	-	Child Survey	Grade 6-8, NC	2,151	2001	Evenson 2003	
BMI	None	Direct Observation	Age 14-16, Philippines	1,518	1998-99	Tudor-Locke 2003	
BMI	None	Parent Survey	Age 4-12, Brisbane, Australia	318	2008*	Yeung 2008	
BMI	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
BMI	None	Direct Observation	Grade 5, Columbia, SC	219	2005*	Sirard 2005b	
BMI	None	Direct Observation	Grade 6 girls in AZ, MD, MN, LA, CA, SC	1,596	2007*	Saksvig 2007	
BMI	None	Child Survey	Grade 9-12, NC	2,297	2001	Evenson 2003	
BMI change	None	Direct Observation	Grade 4/5, southern CA	924	1990	Rosenberg 2006	
BMI change (increase)	+	Direct Observation	Age 10, rural NE	320	2005*	Heelan 2005	Significant for overweight only
Cardiovascular Fitness	+	Fitness test	Age 9-15, Odense, Denmark	919	1998-99	Cooper 2006	Significant for bicycle commuters only
Kcal expended	+	Accelerometer	Age 14-16, Philippines	1,518	1998-99	Tudor-Locke 2003	
Overweight	None	Direct Observation	Age 5-6,10-12, Melbourne, Australia	885	2001	Timperio 2006	
Overweight	None	Direct Observation	Grade 4/5,southern CA	924	1990	Rosenberg 2006	
Overweight	None	Direct Observation	Grade 5, Columbia, SC	219	2005*	Sirard 2005b	
PA (after school)	+	Accelerometer	Age 10-11, Cyprus	247	2007	Loucaides 2008	Significant for overweight only
PA (after school)	+	Accelerometer	Grade 5, Columbia, SC	219	2005*	Sirard 2005b	Significant for regular ATS users only
PA (after school)	None	Accelerometer	Age 10, rural NE	320	2005*	Heelan 2005	
PA (before school)	+	Accelerometer	Age 10, rural NE	320	2005*	Heelan 2005	
PA (before school)	+	Accelerometer	Age 10-11, Cyprus	247	2007	Loucaides 2008	
PA (before school)	+	Accelerometer	Grade 5, Columbia, SC	219	2005*	Sirard 2005b	Significant for regular ATS users only
PA (during school)	None	Accelerometer	Age 10, rural NE	320	2005*	Heelan 2005	
PA (during school)	None	Accelerometer	Grade 5, Columbia, SC	219	2005*	Sirard 2005b	
PA (evenings)	None	Accelerometer	Grade 5, Columbia, SC	219	2005*	Sirard 2005b	
PA (hard activity)	None	Accelerometer	Age 10, rural NE	320	2005*	Heelan 2005	
PA (light activity)	None	Accelerometer	Age 10, rural NE	320	2005*	Heelan 2005	
PA (meet 3 PA guidelines)	+	Parent Survey	Age 7-13, Russia	1,094	1998	Tudor-Locke 2002	
PA (moderate)	+	PA recall survey	Adolescents, Queensland, Australia	1,033	2005*	Schofield 2005	
PA (moderate)	+	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	Significant for regular ATS users only
PA (moderately active)	+	PA Recall	Grade 8, 11, Central Queensland, Australia	1,033	2005*	Schofield 2005	
PA (MVPA)	+	Accelerometer	Grade 6 girls in AZ, MD, MN, LA, CA, SC	1,596	2007*	Saksvig 2007	
PA (MVPA, 3 METs)	+	Accelerometer	Grade 6 girls in AZ, MD, MN, LA, CA, SC	1,596	2007*	Saksvig 2007	
PA (overall)	+	Accelerometer	Age 9/10, Odense, Denmark	323	1997-98	Cooper 2005	Significant for bicycle commuters only
PA (overall)	+	Accelerometer	Grade 5, Columbia, SC	219	2005*	Sirard 2005b	Significant for regular ATS users only

Table 6: *Physical Health Outcomes*: Physical health variables thought to be influenced by the use of active transportation. These variables have been tested for association with the use of Active Transportation to School (ATS). The second column (Assoc. w/ATS) indicates whether a significant positive (+), significant negative (-), or insignificant (None) association was found.

Health Outcome Variable	Assoc. w/ATS	Measurement	Population	n	Year	Primary Author, Publication Date	Notes
PA (overall)	+	Accelerometer	Grade 6 girls in AZ, MD, MN, LA, CA, SC	1,596	2007*	Saksvig 2007	Significant for to and from school only
PA (overall)	None	Accelerometer	Age 10, rural NE	320	2005*	Heelan 2005	
PA (overall)	None	Accelerometer	Age 5, urban England	275	2007*	Metcalf 2004	
PA (overall)	None	Parent Survey	Grade 1-7, Brisbane, Australia	164	2004*	Ziviani 2004	
PA (overall)	None	Accelerometer	Grade 4/5, southern CA	924	1990	Rosenberg 2006	
PA (overall)	None	Child Survey	Grade 6-12, NC	4,448	2001	Evenson 2003	
PA (overall, moderate)	+	Accelerometer	Age 10, rural NE	320	2005*	Heelan 2005	
PA (overall, vigorous)	None	Parent Survey	Grade 4-12, U.S.	1,395	1996	Fulton 2005	
PA (weekdays)	+	Accelerometer	Age 10-11, Cyprus	247	2007	Loucaides 2008	Significant for overweight only
PA (weekdays)	+	Accelerometer	Grade 5, Columbia, SC	219	2005*	Sirard 2005b	Significant for regular ATS users only
PA (weekdays, MVPA)	+	Accelerometer	Age 10, Bristol, England	114	2002	Cooper 2003	
PA (weekdays, MVPA)	+	Accelerometer	Age 13-14, Edinburgh, U.K.	92	2004	Alexander 2005	
PA (weekends)	None	Accelerometer	Age 10, Bristol, England	114	2002	Cooper 2003	
PA (weekends)	None	Accelerometer	Grade 5, Columbia, SC	219	2005*	Sirard 2005b	
Sedentary activity	None	Accelerometer	Age 10, rural NE	320	2005*	Heelan 2005	
Skinfold change	None	Direct Observation	Grade 4/5, southern CA	924	1990	Rosenberg 2006	
Skinfolds	-	Direct Observation	Grade 4/5, southern CA	924	1990	Rosenberg 2006	Significant for boys only
Skinfolds	None	Direct Observation	Age 10, rural NE	320	2005*	Heelan 2005	
Weight	None	Parent Survey	Age 4-12, Brisbane, Australia	318	2008*	Yeung 2008	
Weight	None	Parent Survey	Grade 5-8, College Station, TX	186	2007*	Folzenlogen 2007	

* No date of study specified; year of publication is listed in place.

Appendix B

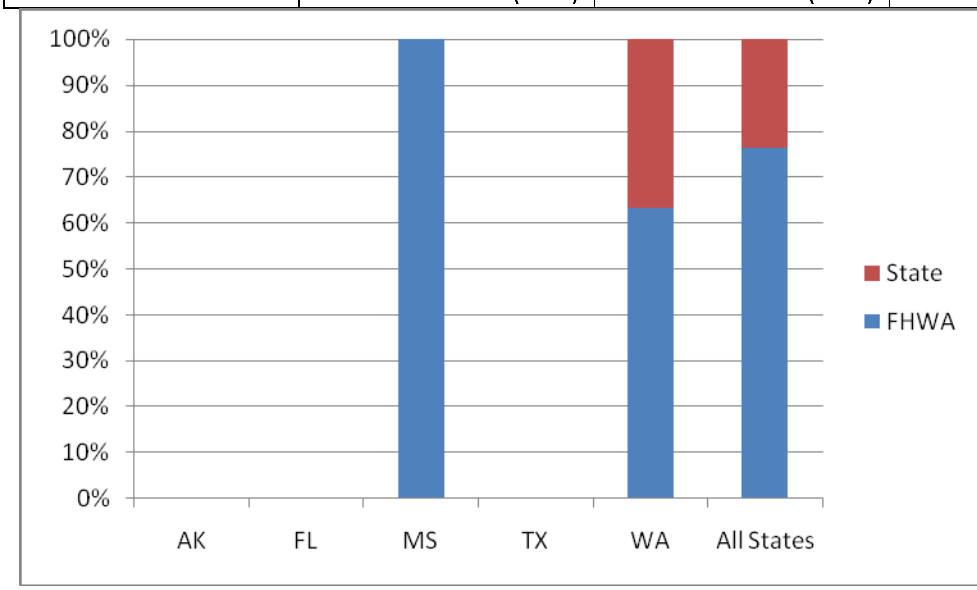
Pooled Fund Project Data Tallies

Contents

Tally 1) Number of projects in each state, by funding source

A total of 76 SRTS projects were funded in Washington and Mississippi. In Mississippi, all 27 SRTS projects were funded at least in part with money from the FHWA. In Washington, 31 projects were funded with FHWA money and the remaining 18 with state funds.

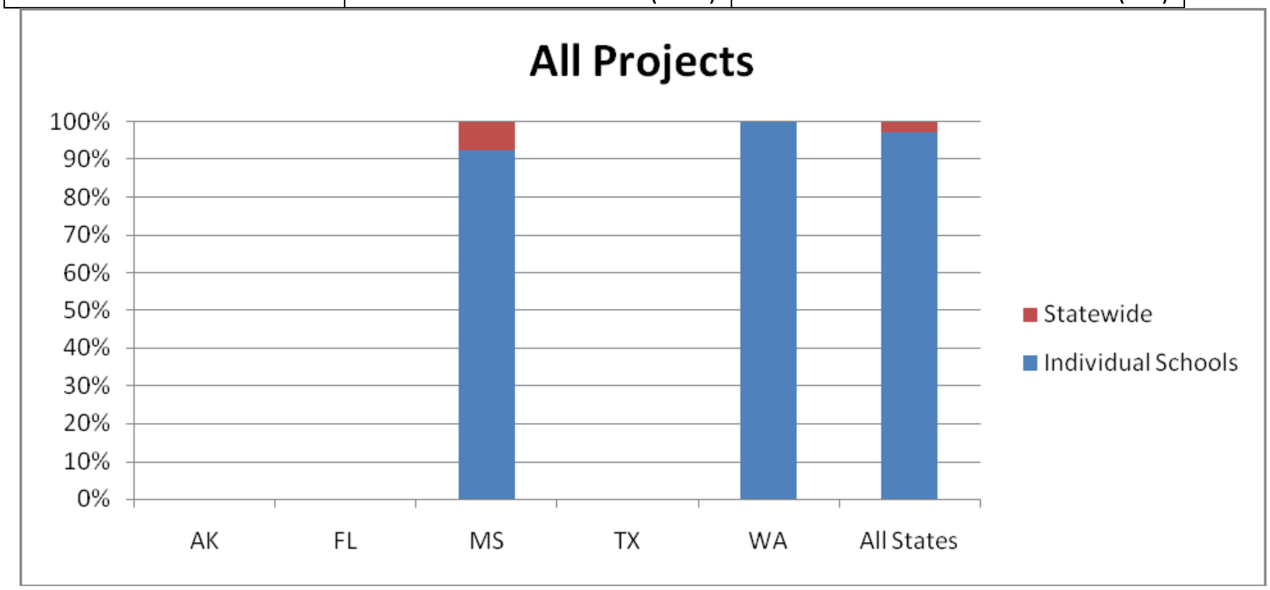
	FHWA	State	Total
AK			
FL			
MS	27 (100%)	0 (0%)	27 (100%)
TX			
WA	31 (63%)	18 (37%)	49 (100%)
All States	58 (76%)	18 (24%)	76 (100%)



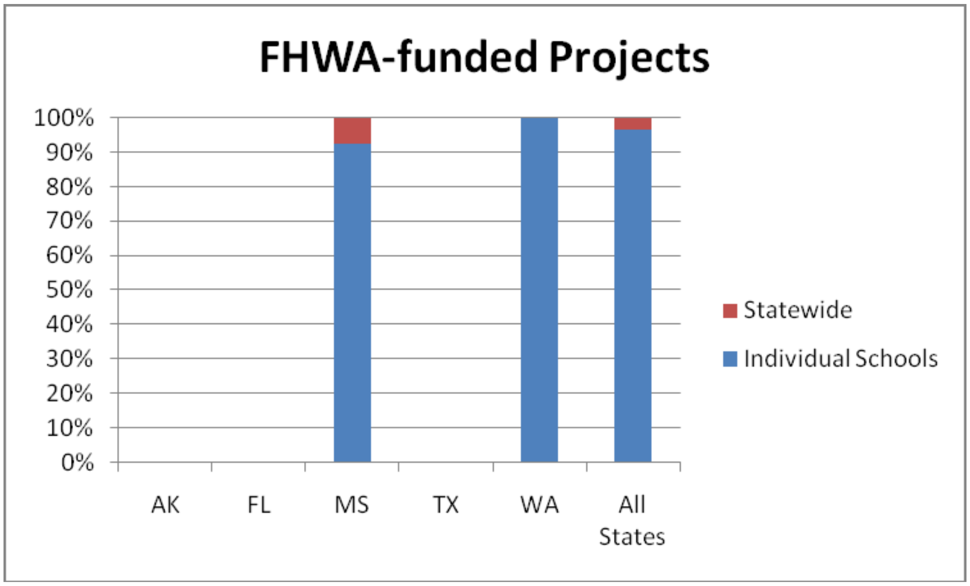
Tally 2) Projects by geographic impact

In Washington, all projects affect one or more specific schools. In Mississippi, two projects have a statewide impact while the remainder target specific schools.

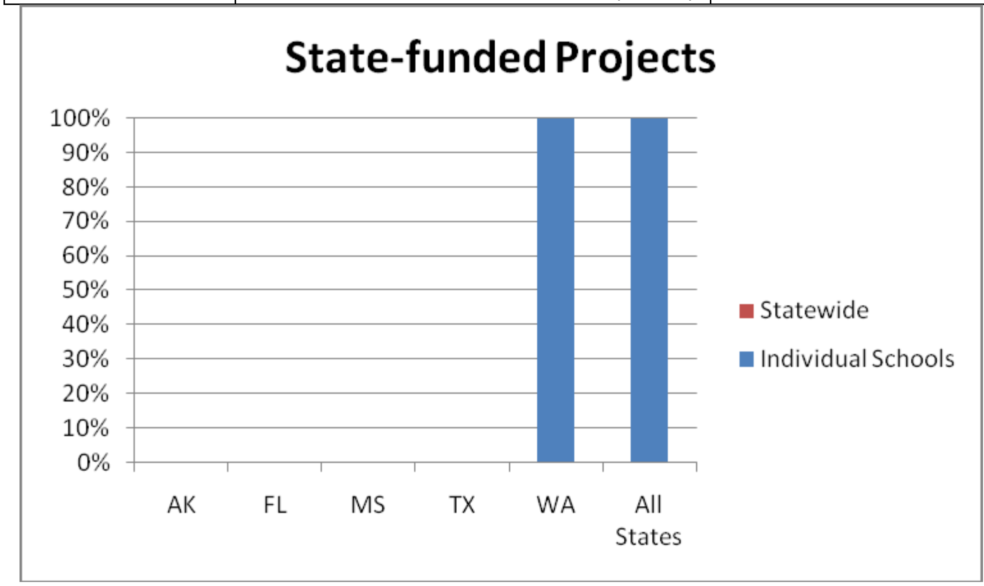
All Projects	Individual Schools	Statewide
AK		
FL		
MS	25 (93%)	2 (7%)
TX		
WA	49 (100%)	0 (0%)
All States	74 (97%)	2 (3%)



FHWA funded	Individual Schools	Statewide
AK		
FL		
MS	25 (93%)	2 (7%)
TX		
WA	31 (100%)	0 (0%)
All States	56 (97%)	2 (3%)



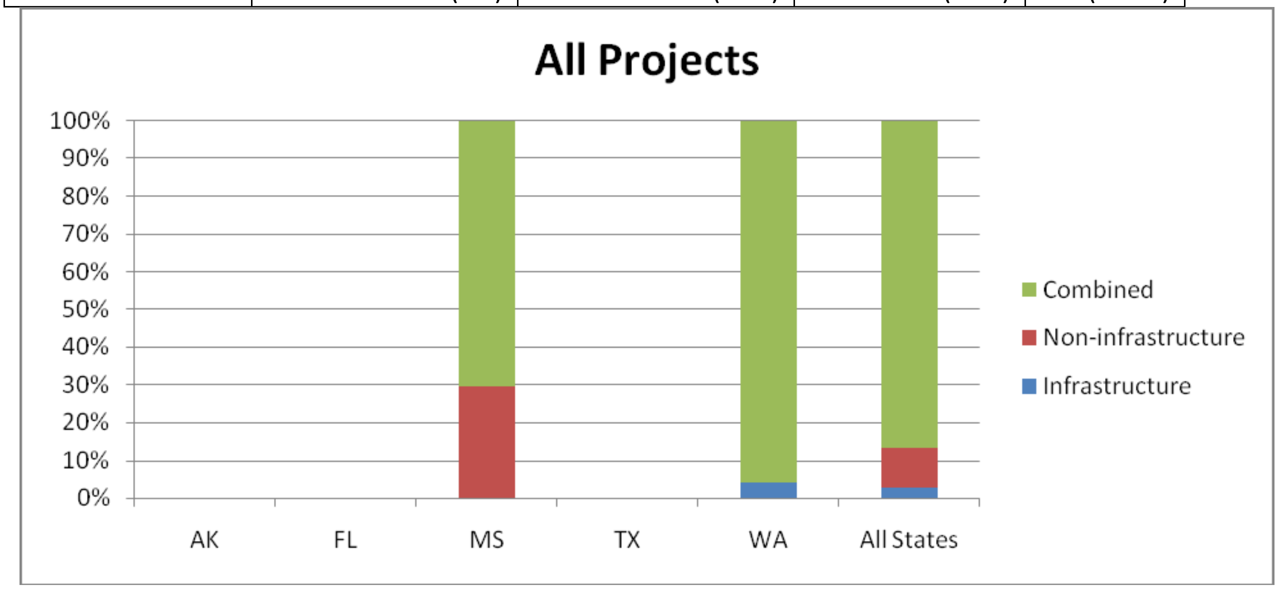
State funded	Individual Schools	Statewide
AK		
FL		
MS	N/A	N/A
TX		
WA	18 (100%)	0 (0%)
All States	18 (100%)	0 (0%)



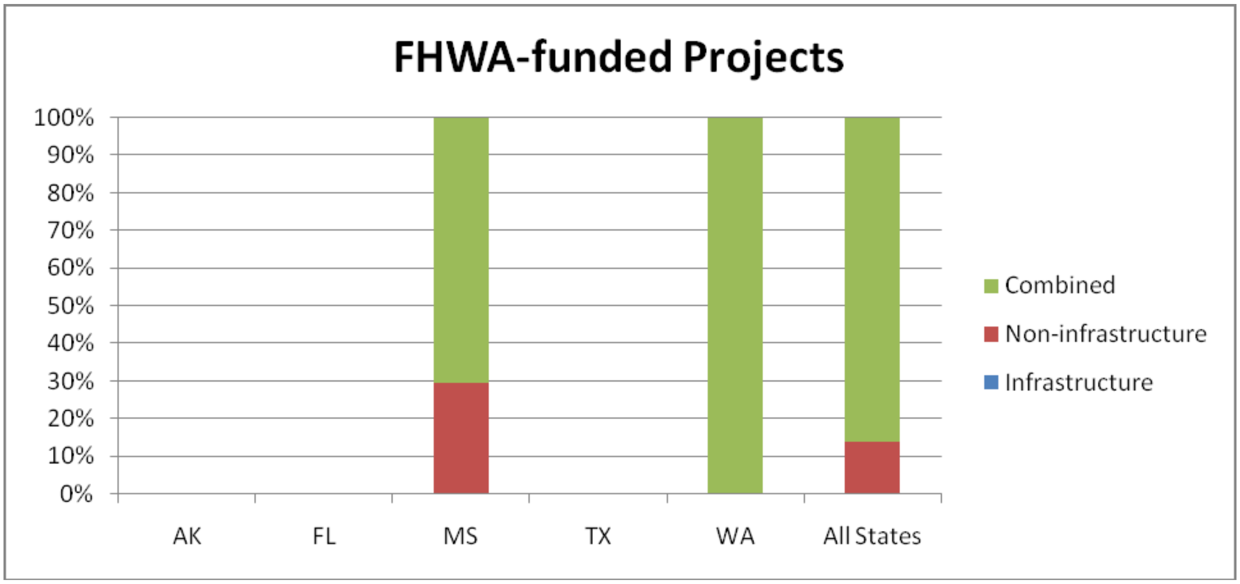
Tally 3) Number of each type of project

In both Mississippi and Washington, the majority of projects were combined (projects that featured both infrastructure and non-infrastructure components). In Mississippi, non-infrastructure projects were also funded. In Washington, Infrastructure projects were also funded with state money.

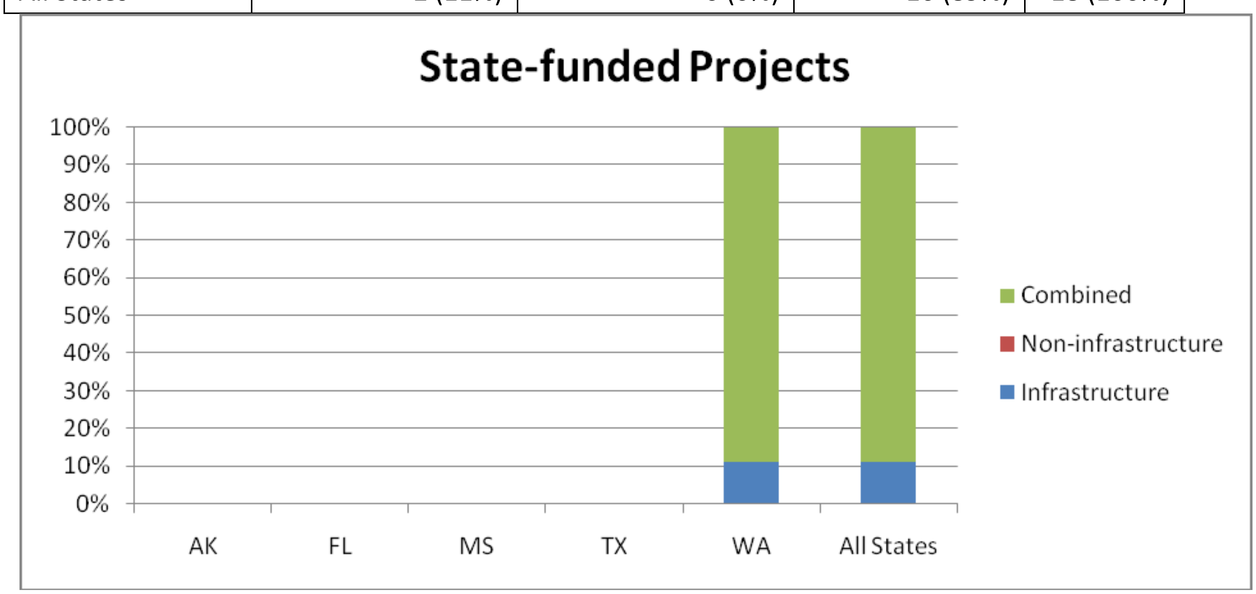
ALL Projects	Infrastructure	Non-infrastructure	Combined	Total
Alaska				
Florida				
Mississippi	0 (0%)	8 (30%)	19 (70%)	27 (100%)
Texas				
Washington	2 (4%)	0 (0%)	47 (96%)	49 (100%)
All States	2 (3%)	8 (10%)	66 (87%)	76 (100%)



FHWA Projects	Infrastructure	Non-infrastructure	Combined	Total
Alaska				
Florida				
Mississippi	0 (0%)	8 (30%)	19 (70%)	27 (100%)
Texas				
Washington	0 (0%)	0 (0%)	31 (100%)	31 (100%)
All States	0 (0%)	8 (14%)	50 (86%)	58 (100%)



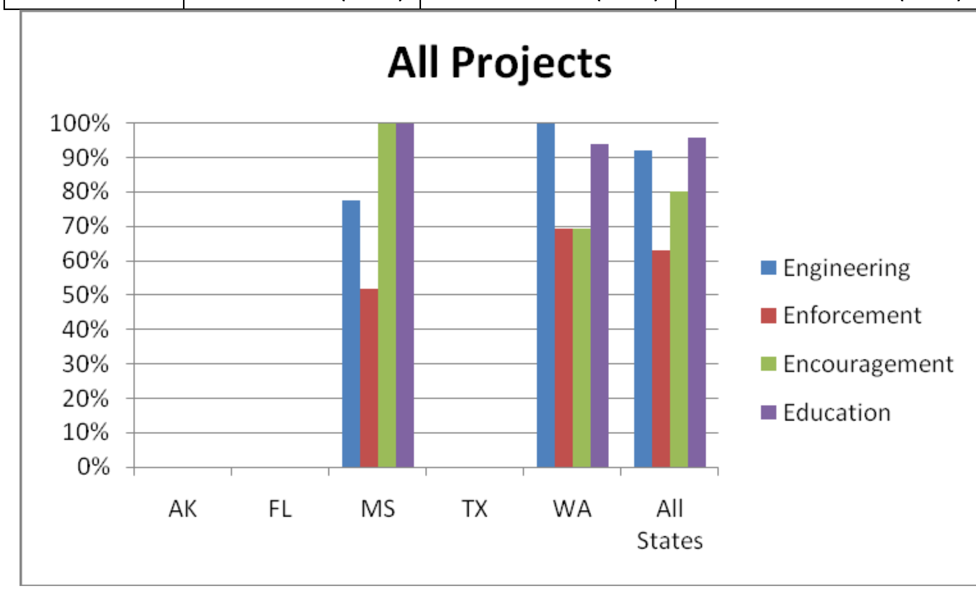
State Projects	Infrastructure	Non-infrastructure	Combined	Total
Alaska				
Florida				
Mississippi	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Texas				
Washington	2 (11%)	0 (0%)	16 (89%)	18 (100%)
All States	2 (11%)	0 (0%)	16 (89%)	18 (100%)



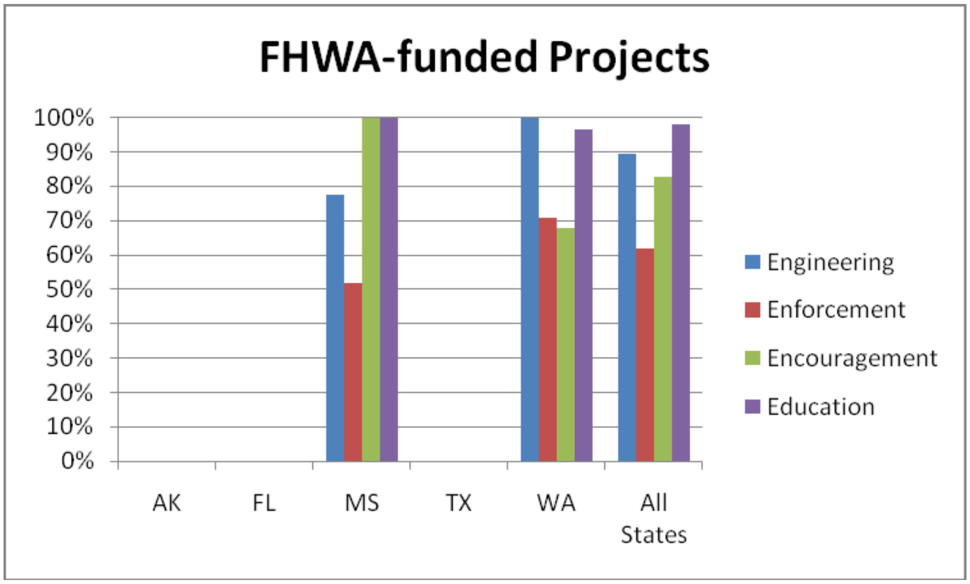
Tally 4) Number of projects that addressed each of the 4 Es

In Mississippi, Encouragement and Education were addressed in all 27 projects. All projects in Washington addressed engineering and more than 9 out of 10 addressed education. There appears to be no major difference between the Es addressed through FHWA- or State-funded projects in Washington.

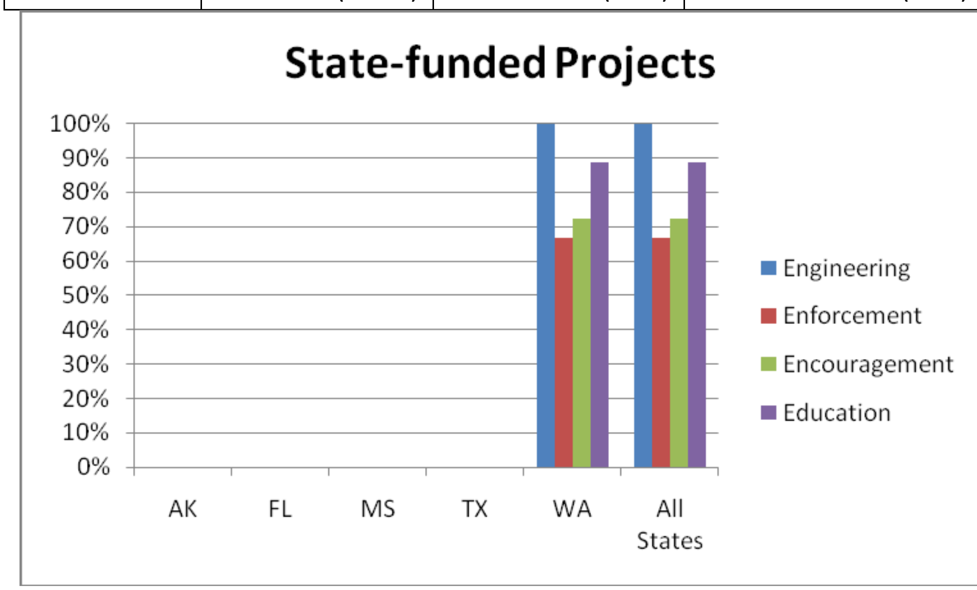
All Projects	Engineering	Enforcement	Encouragement	Education
AK				
FL				
MS	21 (78%)	14 (52%)	27 (100%)	27 (100%)
TX				
WA	49 (100%)	34 (69%)	34 (69%)	46 (94%)
All States	70 (92%)	48 (63%)	61 (80%)	73 (96%)



FHWA Projects	Engineering	Enforcement	Encouragement	Education
AK				
FL				
MS	21 (78%)	14 (52%)	27 (100%)	27 (100%)
TX				
WA	31 (100%)	22 (71%)	21 (68%)	30 (97%)
All States	52 (90%)	36 (62%)	48 (83%)	57 (98%)



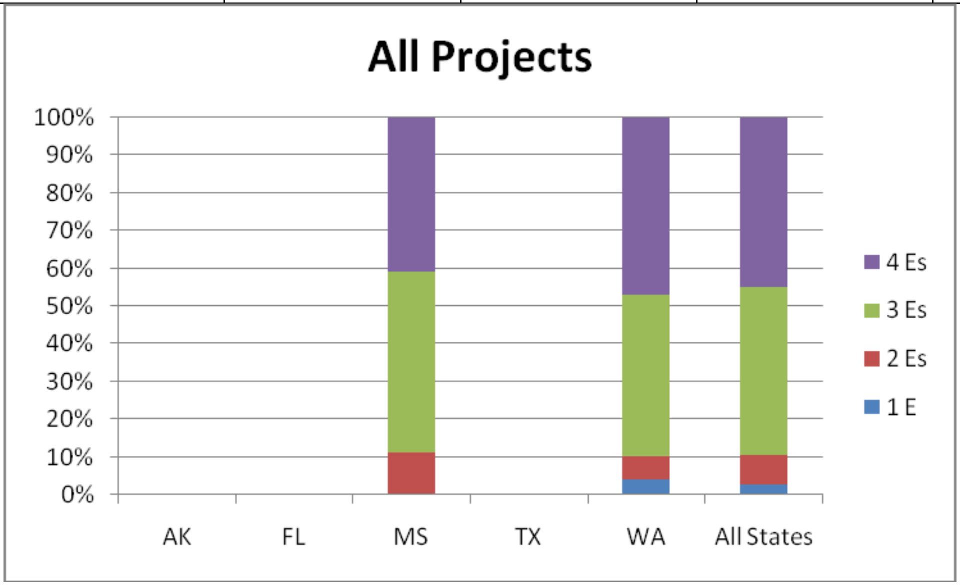
State Projects	Engineering	Enforcement	Encouragement	Education
AK				
FL				
MS	N/A	N/A	N/A	N/A
TX				
WA	18 (100%)	12 (67%)	13 (72%)	16 (89%)
All States	18 (100%)	12 (67%)	13 (72%)	16 (89%)



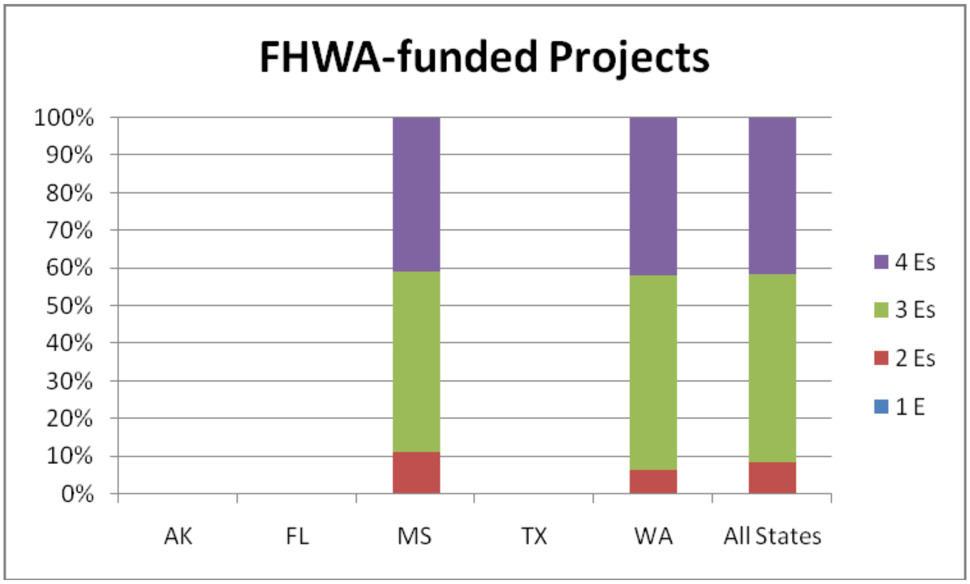
Tally 5) Number of Es addressed by projects

In both states, most projects addressed 3 or 4 Es. About 10% of projects addressed only two or fewer Es. All FHWA-funded projects addressed at least two Es.

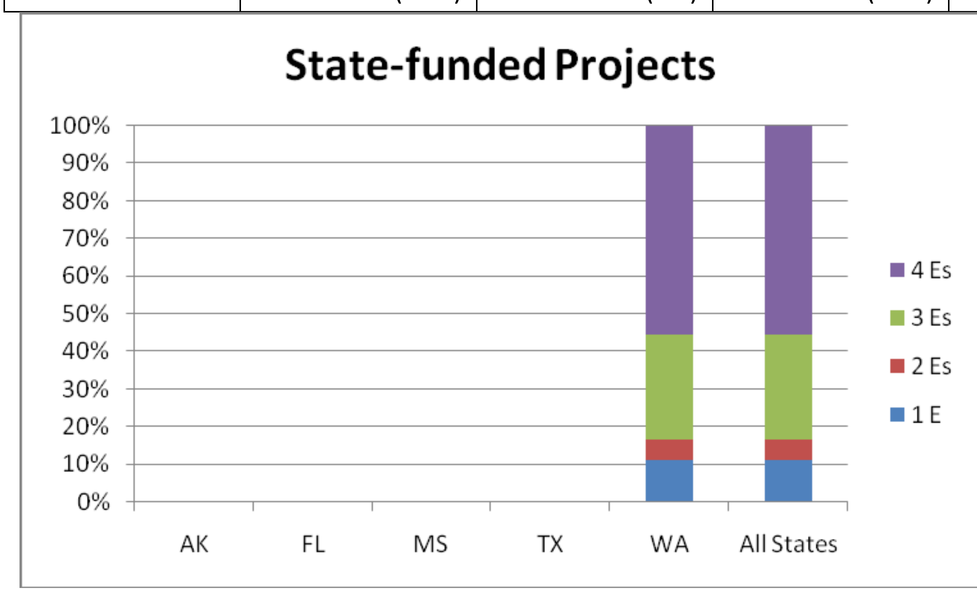
All Projects	1 E	2 Es	3 Es	4 Es
AK				
FL				
MS	0 (0%)	3 (11%)	13 (48%)	11 (41%)
TX				
WA	2 (4%)	3 (6%)	21 (43%)	23 (47%)
All States	2 (2%)	6 (8%)	34 (45%)	34 (45%)



FHWA Projects	1 E	2 Es	3 Es	4 Es
AK				
FL				
MS	0 (0%)	3 (11%)	13 (48%)	11 (41%)
TX				
WA	0 (0%)	2 (6%)	16 (52%)	13 (42%)
All States	0 (0%)	5 (9%)	29 (50%)	24 (41%)



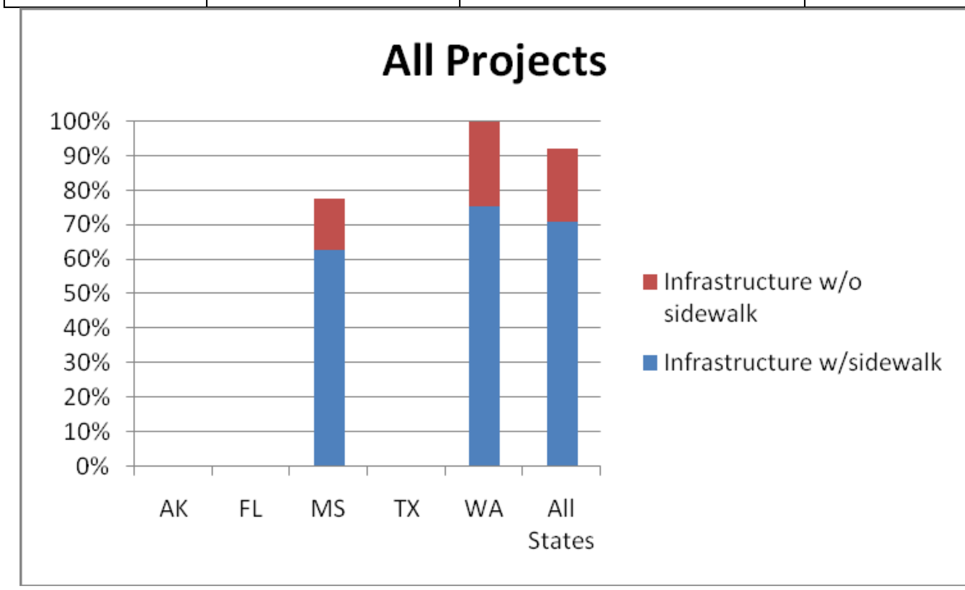
State Projects	1 E	2 Es	3 Es	4 Es
AK				
FL				
MS	N/A	N/A	N/A	N/A
TX				
WA	2 (11%)	1 (6%)	5 (28%)	10 (55%)
All States	2 (11%)	1 (6%)	5 (28%)	10 (55%)



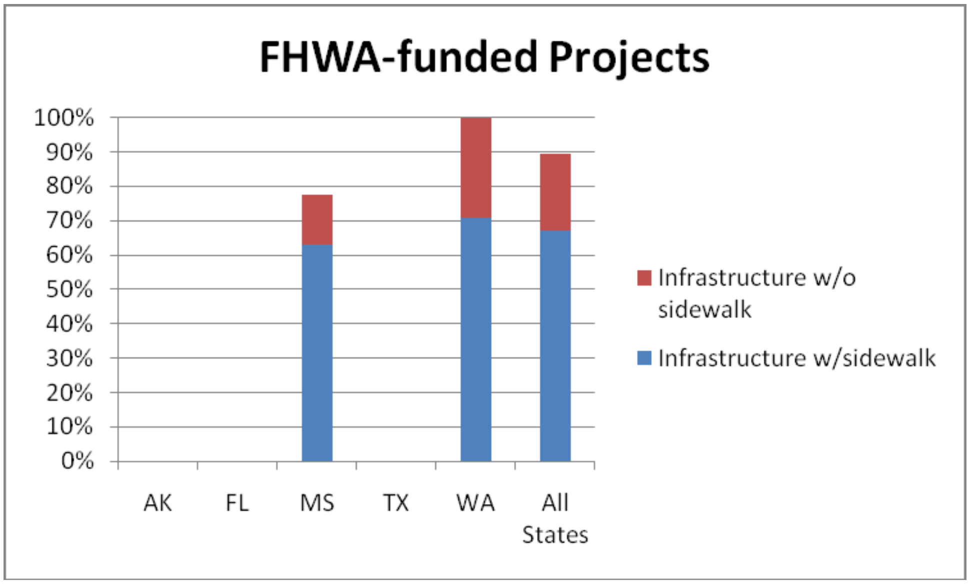
Tally 6) Number of projects featuring a sidewalk improvement

In both states, the majority of projects with an engineering component featured sidewalk construction or renovation. This was the trend for both FHWA- and State-funded projects.

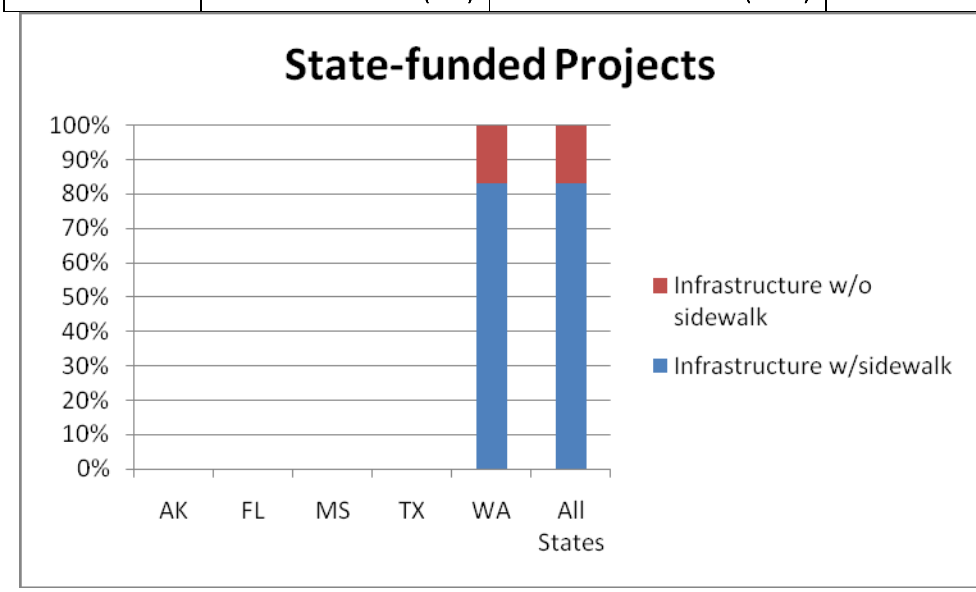
All Projects	Non-Infrastructure	Infrastructure w/sidewalk	Infrastructure w/o sidewalk
AK			
FL			
MS	6 (22%)	17 (63%)	4 (15%)
TX			
WA	0 (0%)	37 (76%)	12 (24%)
All States	6 (8%)	54 (71%)	16 (21%)



FHWA Projects	Non-Infrastructure	Infrastructure w/sidewalk	Infrastructure w/o sidewalk
AK			
FL			
MS	6 (22%)	17 (63%)	4 (15%)
TX			
WA	0 (0%)	22 (71%)	9 (29%)
All States	6 (10%)	39 (67%)	13 (23%)



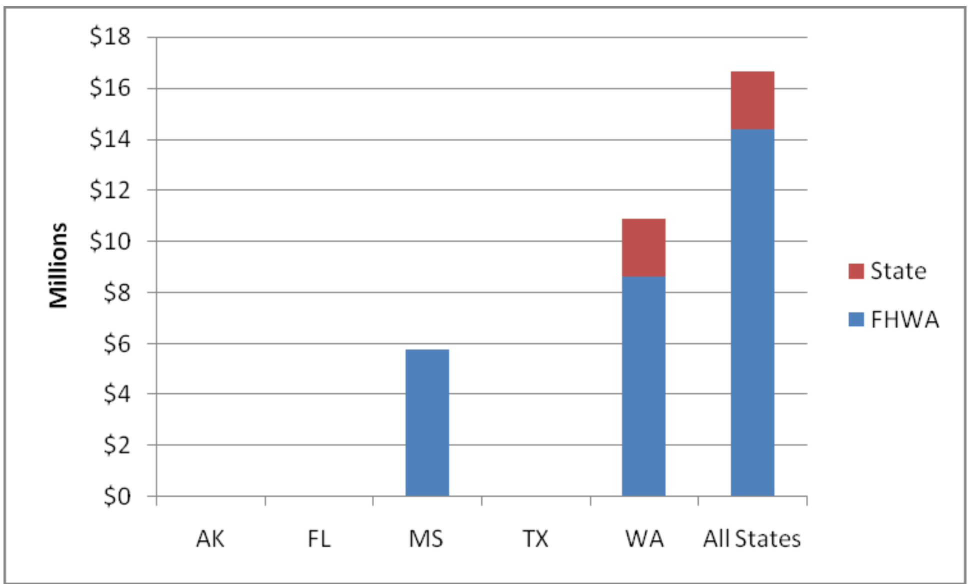
State Projects	Non-Infrastructure	Infrastructure w/sidewalk	Infrastructure w/o sidewalk
AK			
FL			
MS	N/A	N/A	N/A
TX			
WA	0 (0%)	15 (83%)	3 (17%)
All States	0 (0%)	15 (83%)	3 (17%)



Tally 7) Total grant money awarded

More than $16 million in grant money was awarded to SRTS projects in Mississippi and Washington. In Mississippi all projects were funded at least in part with FHWA money. In Washington, state-funded projects accounted for about 20% of the SRTS grant money awarded.

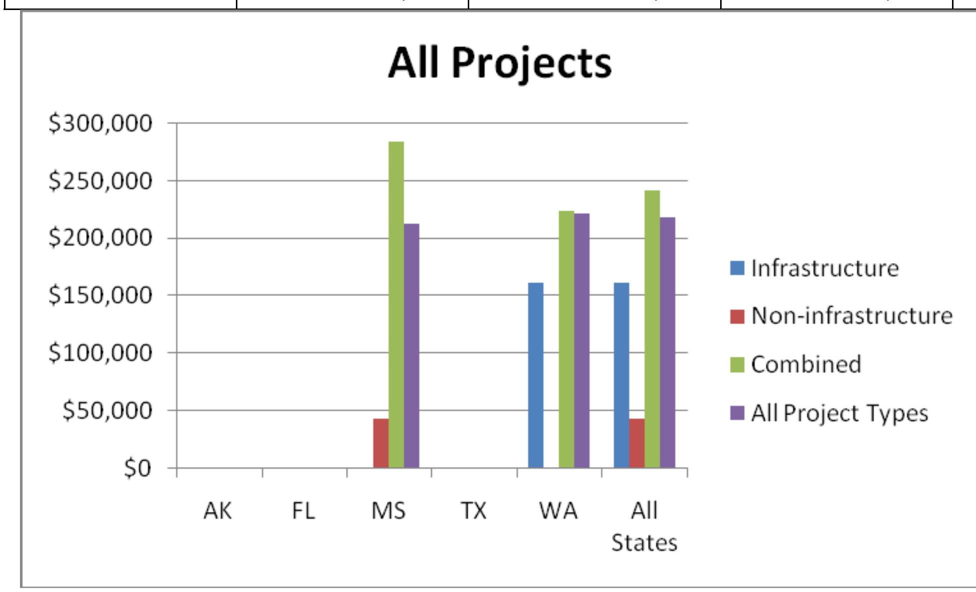
	FHWA-funded projects	State-funded projects	Total awarded
AK			
FL			
MS	$5,751,614	$0	$5,751,614
TX			
WA	$8,619,289	$2,256,959	$10,876,248
All States	$14,370,903	$2,256,959	$16,627,862



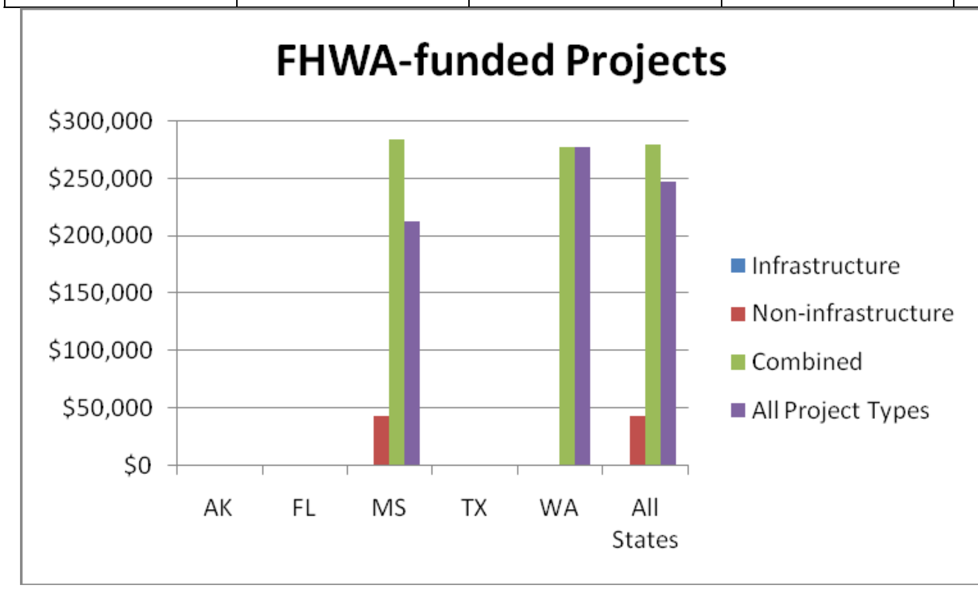
Tally 8) Average grant money awarded per project, by project type

On average, combined projects were awarded more grant money than strictly infrastructure or non-infrastructure projects. The average awards for non-infrastructure projects were much less than projects that featured an infrastructure component. On average, FHWA-funded projects received much more grant money than State-funded projects.

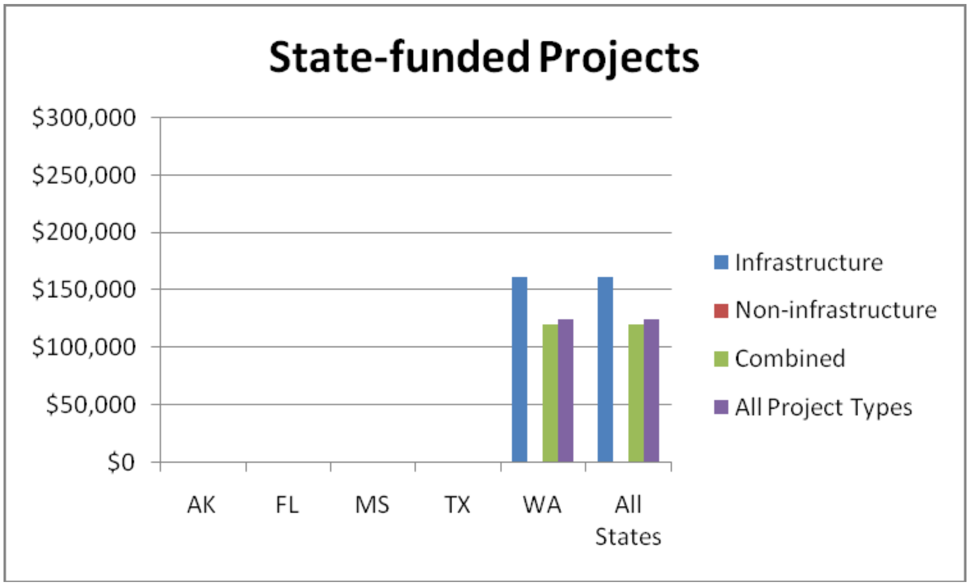
All Projects	Infrastructure	Non-infrastructure	Combined	All Project Types
AK				
FL				
MS	$0	$43,844	$284,256	$213,023
TX				
WA	$161,939	$0	$224,519	$221,964
All States	$161,939	$43,844	$241,716	$218,788



FHWA Projects	Infrastructure	Non-infrastructure	Combined	All Project Types
AK				
FL				
MS	$0	$43,844	$284,256	$213,023
TX				
WA	$0	$0	$278,042	$278,042
All States	$0	$43,844	$280,403	$247,774



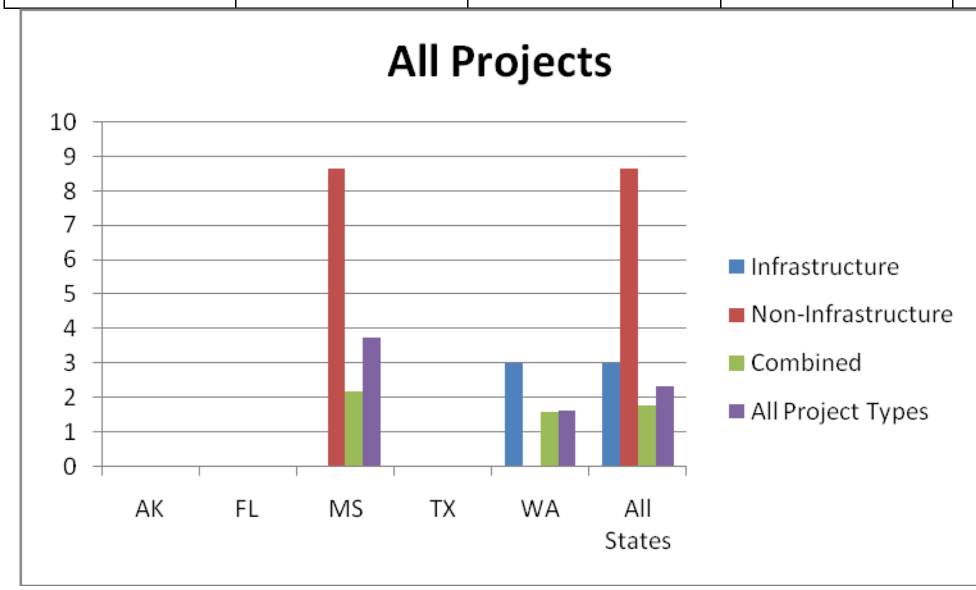
State Projects	Infrastructure	Non-infrastructure	Combined	All Project Types
AK				
FL				
MS	N/A	N/A	N/A	N/A
TX				
WA	$161,939	$0	$120,818	$125,387
All States	$161,939	$0	$120,818	$125,387


State-funded Projects
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$0
AK
FL
MS
TX
WA
All States
Infrastructure
Non-infrastructure
Combined
All Project Types

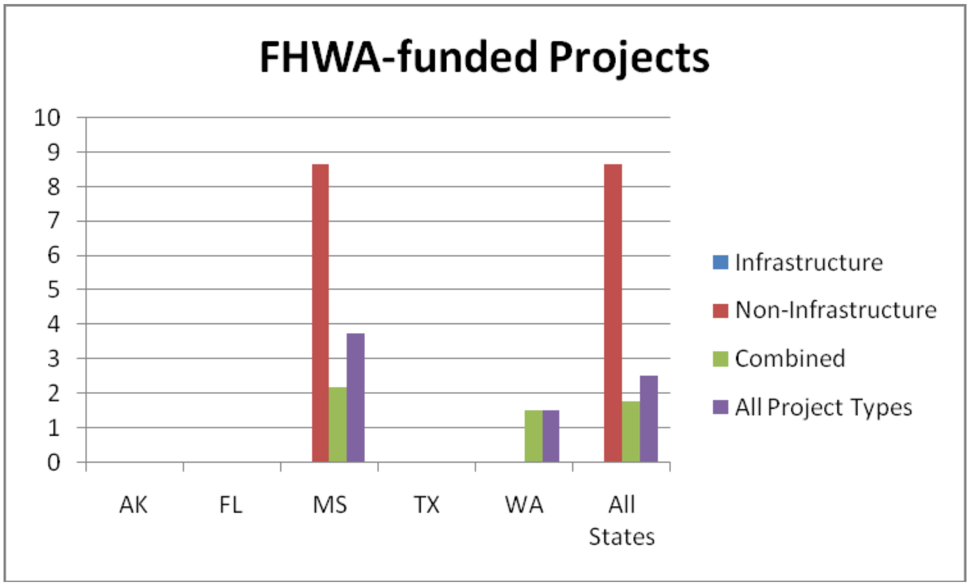
Tally 9) Average number of schools impacted per project, by school type (excludes schools that may be impacted by statewide projects)

On Average, non-infrastructure projects impacted more schools than projects that featured an infrastructure component. Across both states, non-infrastructure projects impacted an average of 8.67 schools. Combined projects impacted an average of 1.77 schools and infrastructure projects impacted an average of 3 schools.

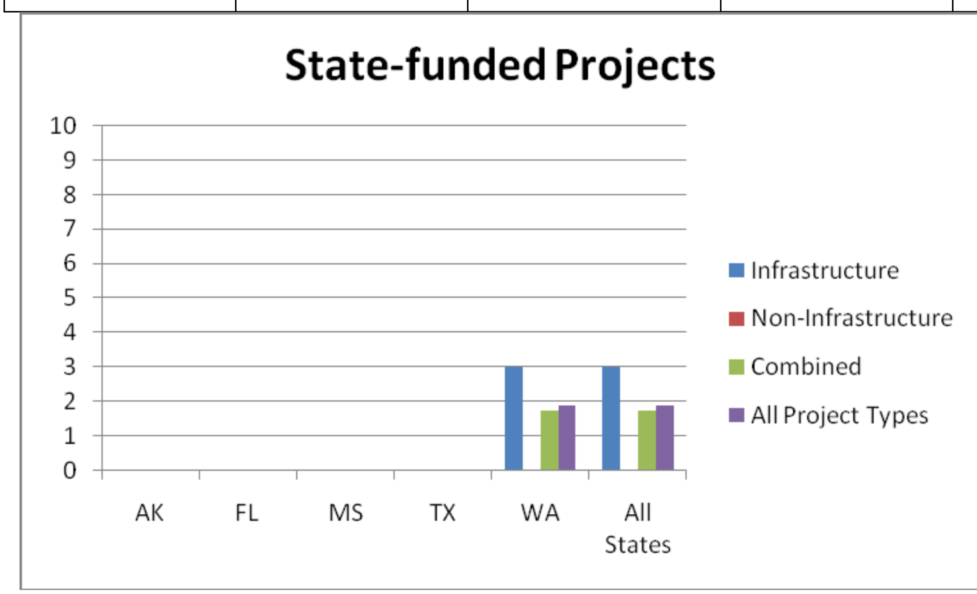
All Projects	Infrastructure	Non-Infrastructure	Combined	All Project Types
AK				
FL				
MS	0	8.67	2.21	3.76
TX				
WA	3	0	1.6	1.65
All States	3	8.67	1.77	2.36



FHWA projects	Infrastructure	Non-Infrastructure	Combined	All Project Types
AK				
FL				
MS	0	8.67	2.21	3.76
TX				
WA	0	0	1.52	1.52
All States	0	8.67	1.78	2.52



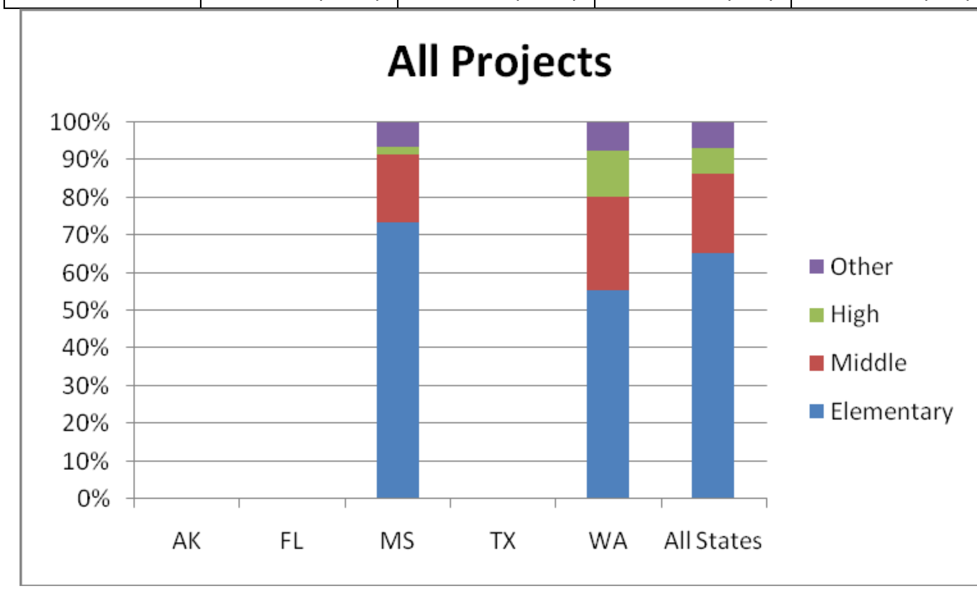
State Projects	Infrastructure	Non-Infrastructure	Combined	All Project Types
AK				
FL				
MS	N/A	N/A	N/A	N/A
TX				
WA	3	0	1.75	1.89
All States	3	0	1.75	1.89



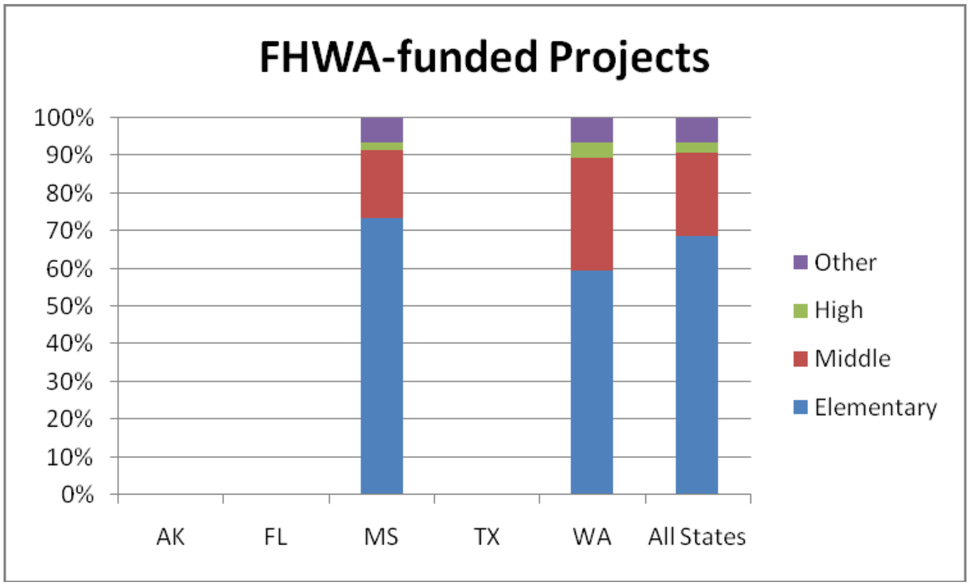
Tally 10) number of schools impacted by School type (excludes schools that may be impacted by statewide projects)

Elementary schools were most commonly impacted by SRTS projects. Middle schools were impacted less frequently, and only a small portion of schools impacted were high schools. In Washington, state-funded SRTS programs impacted a larger portion of High Schools than FHWA-funded programs.

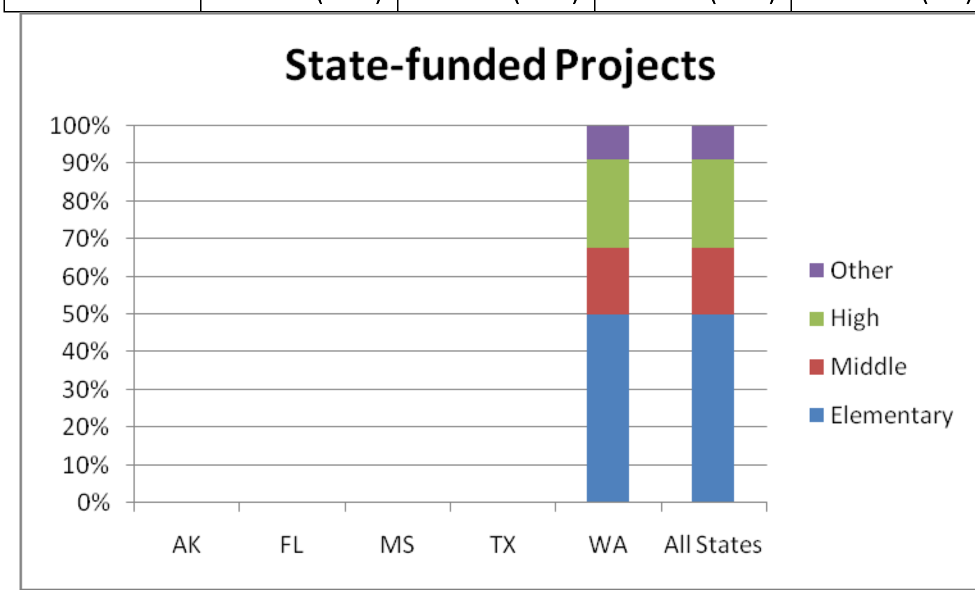
All Projects	Elementary	Middle	High	Other	Total
AK					
FL					
MS	69 (73%)	17 (18%)	2 (2%)	6 (7%)	94 (100%)
TX					
WA	45 (56%)	20 (25%)	10 (12%)	6 (7%)	81 (100%)
All States	114 (65%)	37 (21%)	12 (7%)	12 (7%)	175 (100%)



FHWA Projects	Elementary	Middle	High	Other	Total
AK					
FL					
MS	69 (73%)	17 (18%)	2 (2%)	6 (7%)	94 (100%)
TX					
WA	28 (60%)	14 (30%)	2 (4%)	3 (6%)	47 (100%)
All States	97 (69%)	31 (22%)	4 (3%)	9 (6%)	141 (100%)



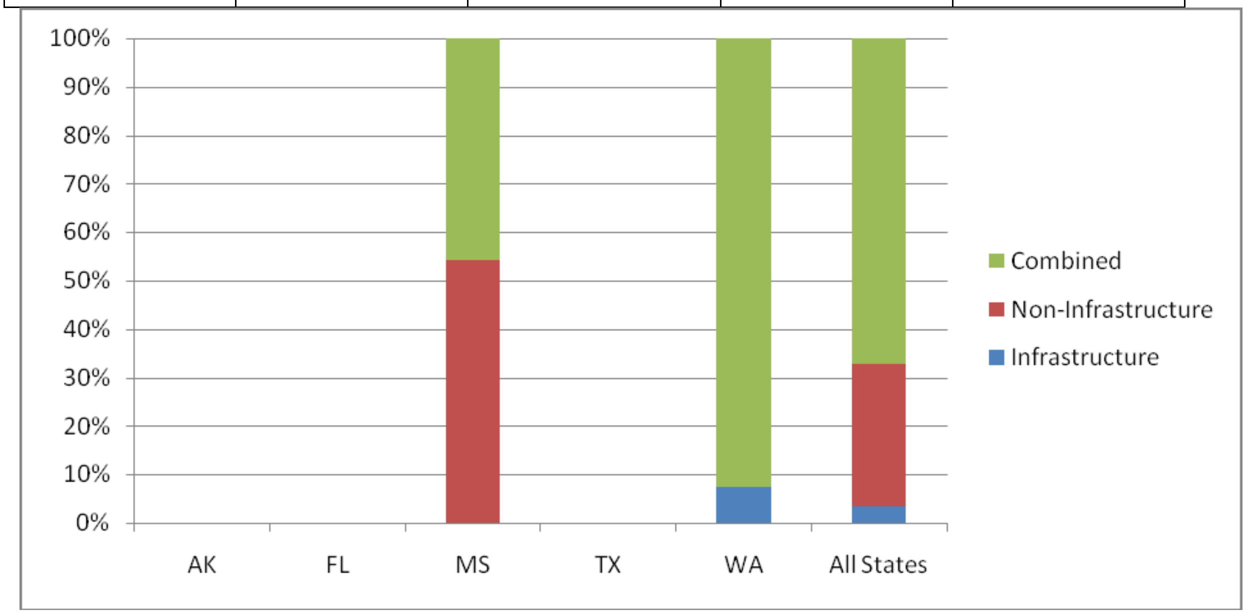
State Projects	Elementary	Middle	High	Other	Total
AK					
FL					
MS	N/A	N/A	N/A	N/A	N/A
TX					
WA	17 (50%)	6 (18%)	8 (23%)	3 (9%)	34 (100%)
All States	17 (50%)	6 (18%)	8 (23%)	3 (9%)	34 (100%)



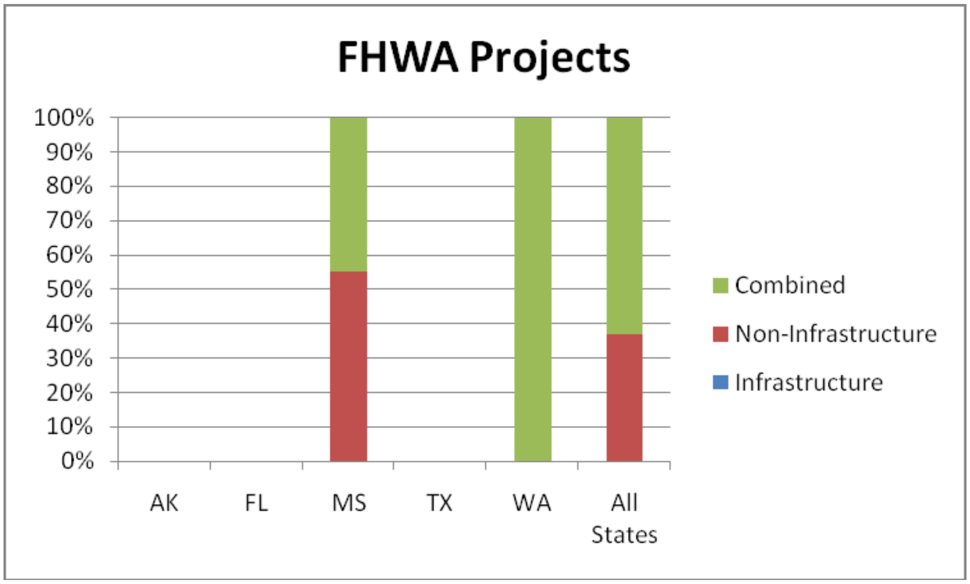
Tally 11) Number of schools impacted by project type (excludes schools that may be impacted by statewide projects)

In Mississippi, non-infrastructure projects accounted for 30% of all projects but impacted more than half of all SRTS schools. In Washington, the distribution of project types more closely matches the distribution of schools impacted by each project type.

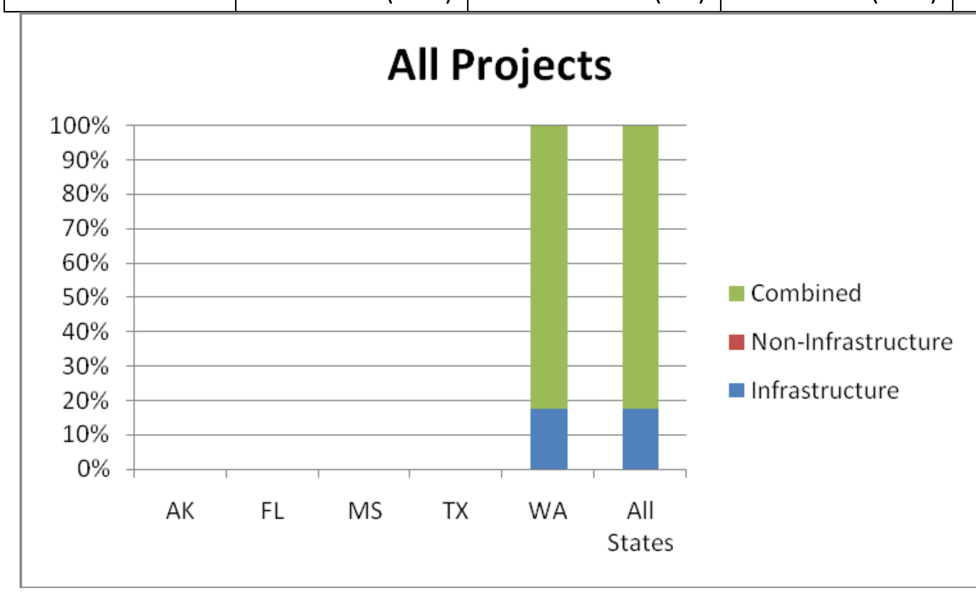
All Projects	Infrastructure	Non-Infrastructure	Combined	Total
AK				
FL				
MS	0 (0%)	52 (55%)	42 (45%)	94 (100%)
TX				
WA	6 (7%)	0 (0%)	75 (93%)	81 (100%)
All States	6 (0%)	52 (37%)	117 (63%)	175 (100%)



FHWA Projects	Infrastructure	Non-Infrastructure	Combined	Total
AK				
FL				
MS	0 (0%)	52 (55%)	42 (45%)	94 (100%)
TX				
WA	0 (0%)	0 (0%)	47 (100%)	47 (100%)
All States	0 (0%)	52 (37%)	89 (63%)	141 (100%)



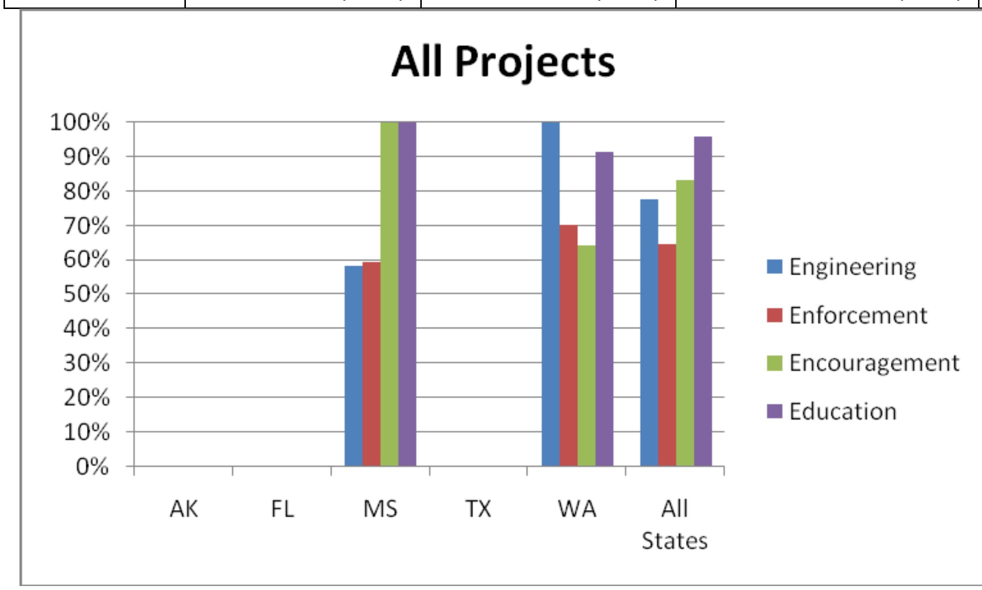
State Projects	Infrastructure	Non-Infrastructure	Combined	Total
AK				
FL				
MS	N/A	N/A	N/A	N/A
TX				
WA	6 (18%)	0 (0%)	28 (82%)	34 (100%)
All States	6 (18%)	0 (0%)	28 (82%)	34 (100%)



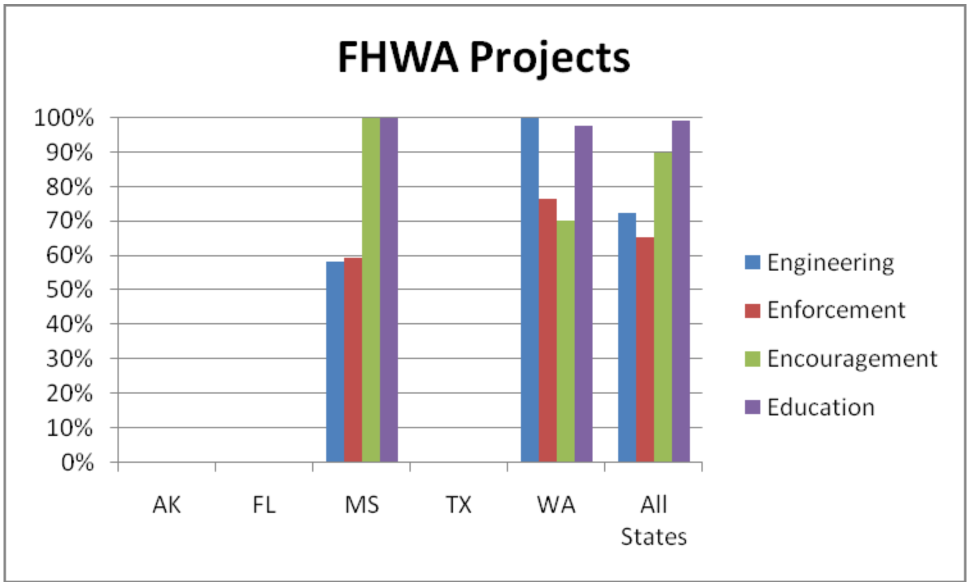
Tally 12) Number of schools impacted by each of the 4 Es (excludes schools that may be impacted by statewide projects)

In both states, each E has impacted more than half of all SRTS schools. In Washington, all SRTS schools have had an engineering component and more than 9 out of 10 have had an education component. In Mississippi, all SRTS schools have been impacted by encouragement and education components.

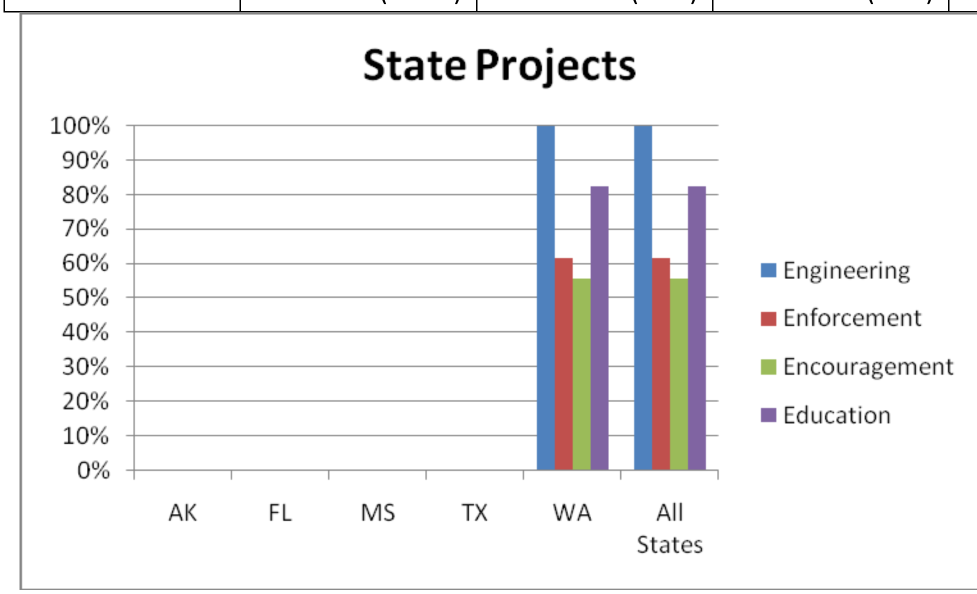
All Projects	Engineering	Enforcement	Encouragement	Education
AK				
FL				
MS	55 (59%)	56 (60%)	94 (100%)	94 (100%)
TX				
WA	81 (100%)	57 (70%)	52 (64%)	74 (91%)
All States	136 (78%)	113 (65%)	146 (83%)	168 (96%)



FHWA Projects	Engineering	Enforcement	Encouragement	Education
AK				
FL				
MS	55 (59%)	56 (60%)	94 (100%)	94 (100%)
TX				
WA	47 (100%)	36 (77%)	33 (70%)	46 (98%)
All States	102 (72%)	92 (65%)	127 (90%)	140 (99%)



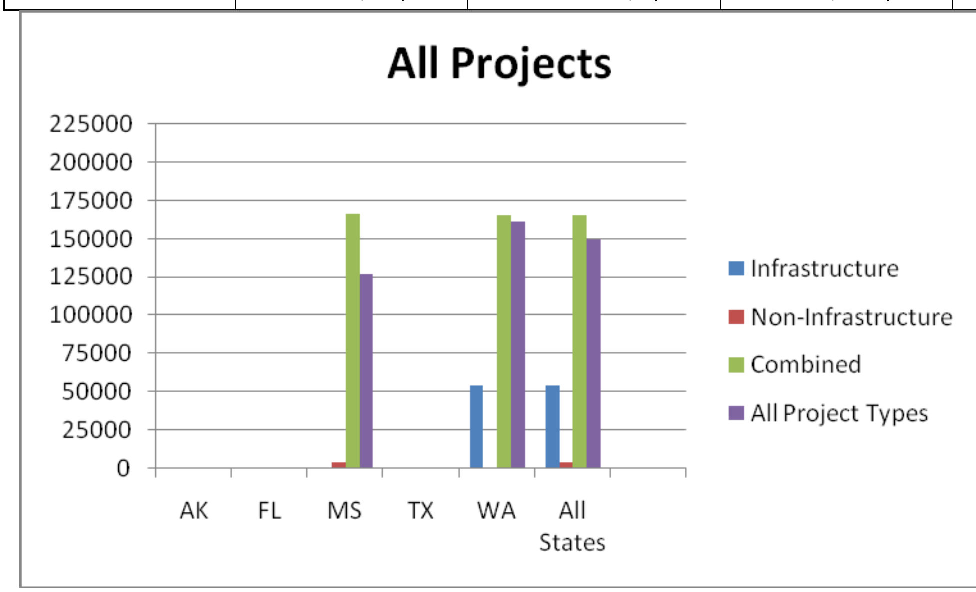
State Projects	Engineering	Enforcement	Encouragement	Education
AK				
FL				
MS	N/A	N/A	N/A	N/A
TX				
WA	34 (100%)	21 (62%)	19 (56%)	28 (82%)
All States	34 (100%)	21 (62%)	19 (56%)	28 (82%)



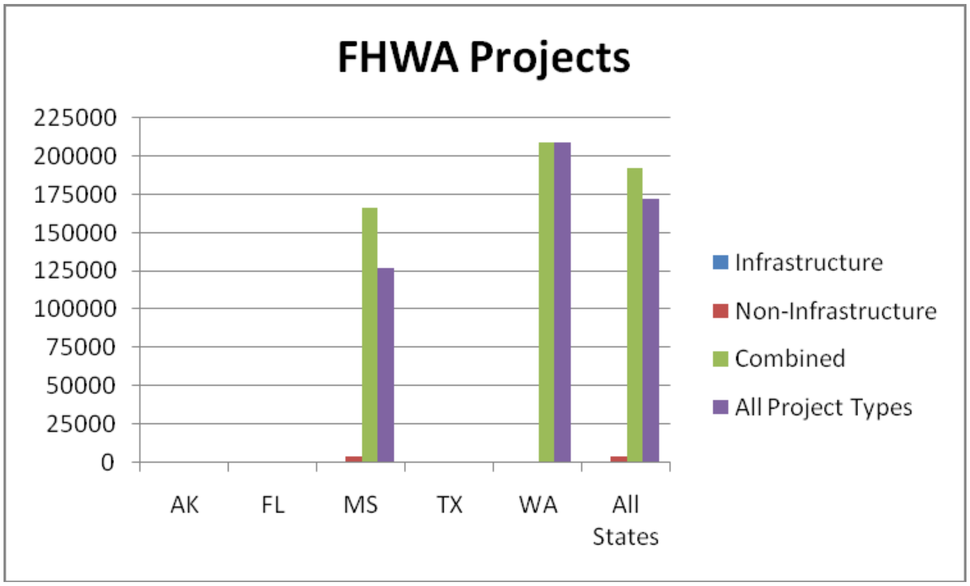
Tally 13) Average grant awarded per school affected, by type of project (excludes schools that may be impacted by statewide projects)

Combined projects were awarded an average of more grant money per school than projects that featured only infrastructure or non-infrastructure components. Non-Infrastructure projects were awarded the least grant money per school impacted. In Washington, the average grant money awarded per school impacted was substantially higher for FHWA-funded projects than for state-funded projects.

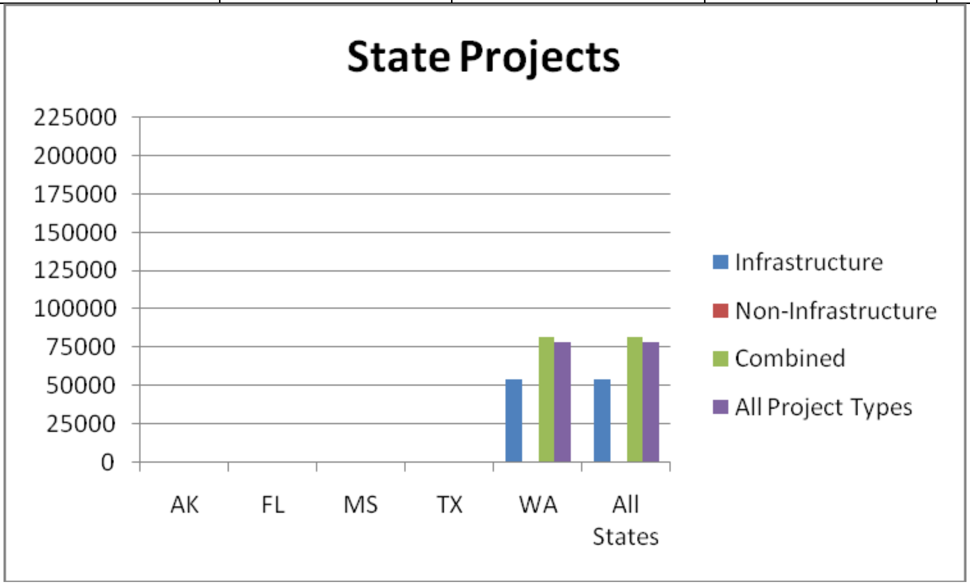
All Projects	Infrastructure	Non-Infrastructure	Combined	All Project Types
AK				
FL				
MS	N/A	$3,875	$166,069	$127,142
TX				
WA	$53,980	N/A	$165,701	$161,141
All States	$53,980	$3,875	$165,807	$149,655



FHWA Projects	Infrastructure	Non-Infrastructure	Combined	All Project Types
AK				
FL				
MS	N/A	$3,875	$166,069	$127,142
TX				
WA	N/A	N/A	$209,101	$209,101
All States	$0	$3,875	$192,749	$172,512



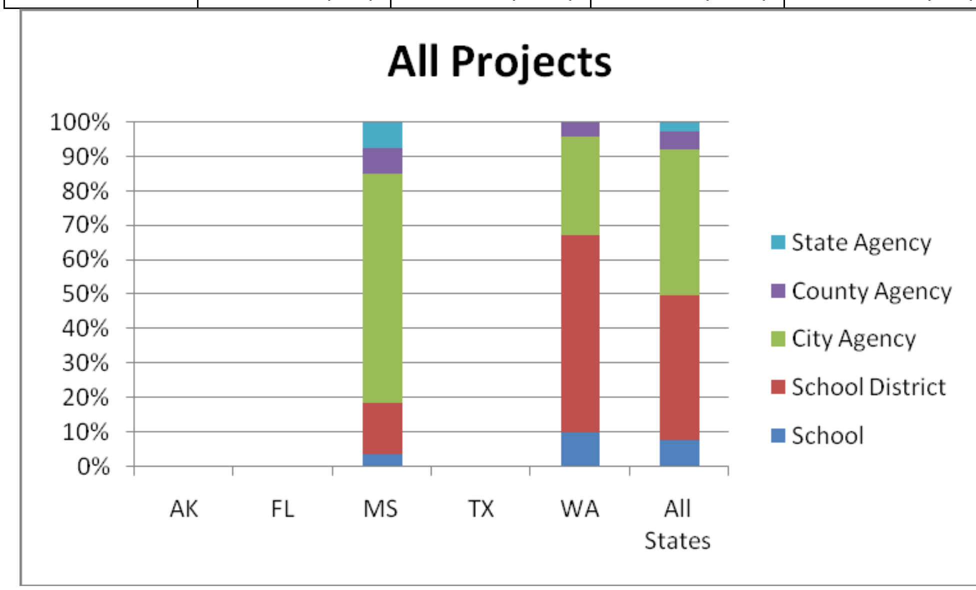
State Projects	Infrastructure	Non-Infrastructure	Combined	All Project Types
AK				
FL				
MS	N/A	N/A	N/A	N/A
TX				
WA	$53,980	$0	$81,613	$78,542
All States	$53,980	$0	$81,613	$78,542



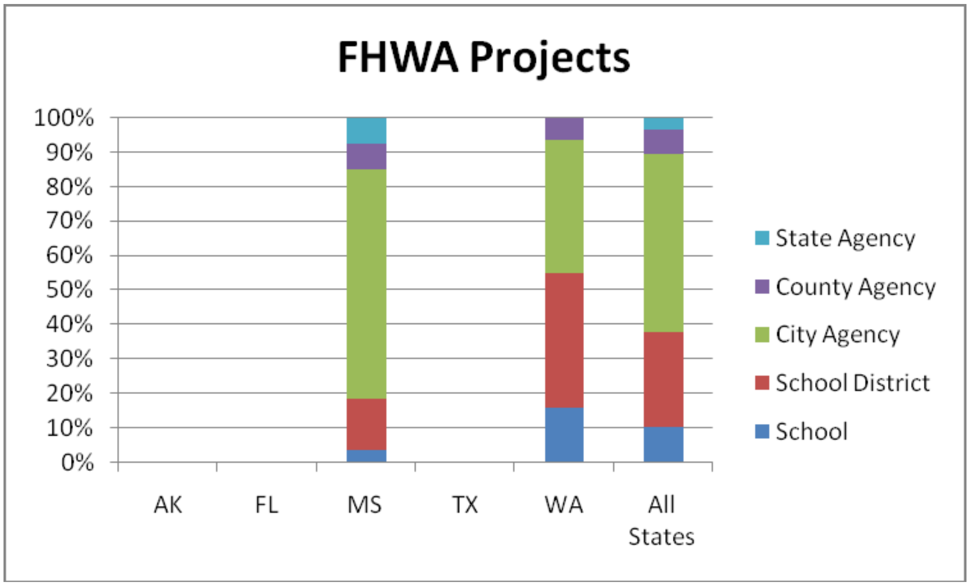
Tally 14) Number of projects by agency type

In Mississippi, most grants were awarded to city agencies. In Washington, most grants were awarded to school districts. In both states, cities and school districts were the most common grant recipients. Few individual schools, county agencies, or state agencies were awarded grants. Washington State awarded no grants to state agencies and individual schools only received state-funded grants.

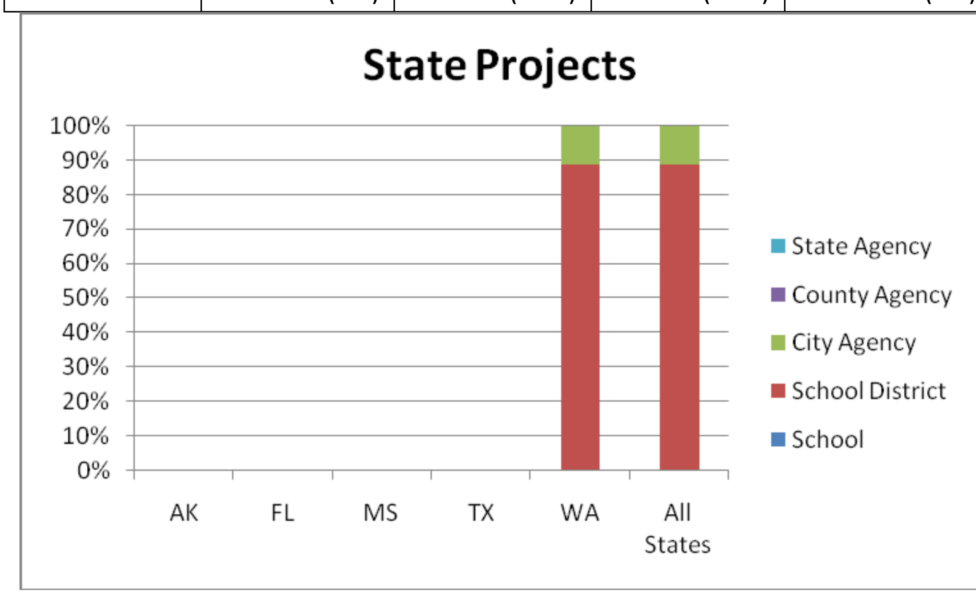
All Projects	School	School District	City Agency	County Agency	State Agency
AK					
FL					
MS	1 (4%)	4 (15%)	18 (67%)	2 (7%)	2 (7%)
TX					
WA	5 (10%)	28 (57%)	14 (29%)	2 (4%)	0 (0%)
All States	6 (8%)	32 (42%)	32 (42%)	4 (5%)	2 (3%)



FHWA Projects	School	School district	City	County Agency	State Agency
AK					
FL					
MS	1 (4%)	4 (15%)	18 (67%)	2 (7%)	2 (7%)
TX					
WA	5 (16%)	12 (39%)	12 (39%)	2 (7%)	0 (0%)
All States	6 (10%)	16 (28%)	30 (52%)	4 (7%)	2 (3%)



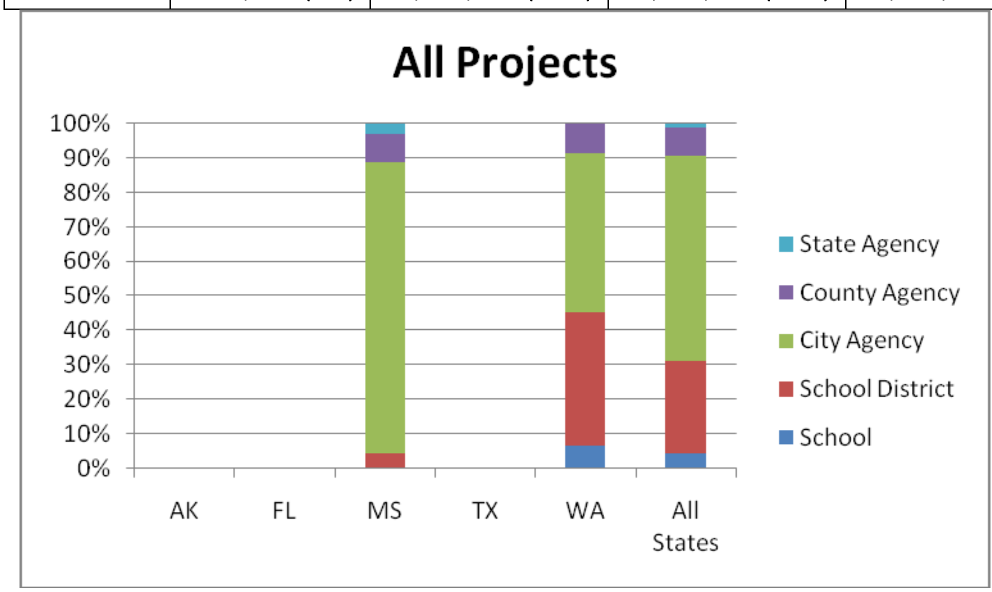
State Projects	School	School district	City	County Agency	State Agency
AK					
FL					
MS	N/A	N/A	N/A	N/A	N/A
TX					
WA	0 (0%)	16 (89%)	2 (11%)	0 (0%)	0 (0%)
All States	0 (0%)	16 (89%)	2 (11%)	0 (0%)	0 (0%)



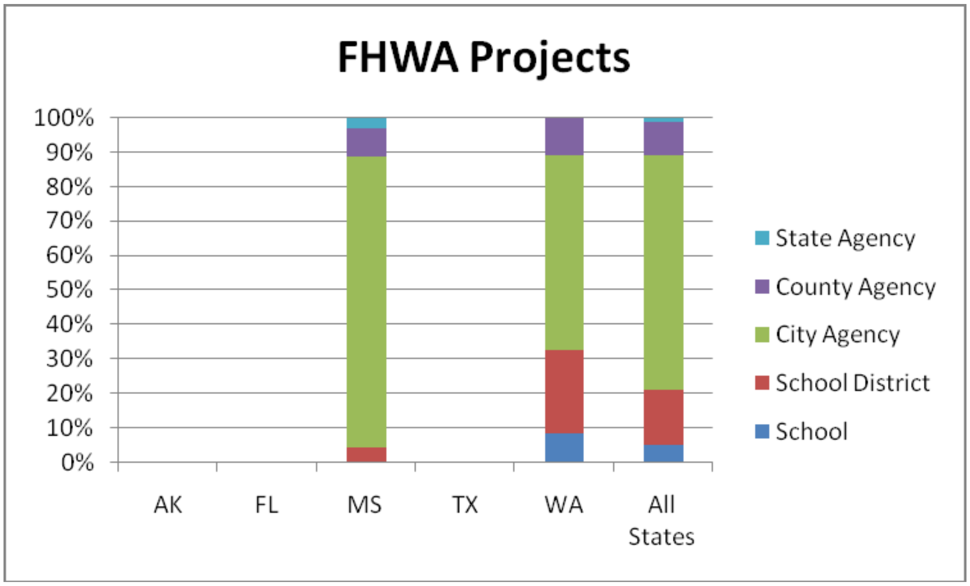
Tally 15) Total grant money awarded to each agency type

The amount of grant money awarded to each agency type roughly mirrors the amount of projects each agency type was responsible for. In Mississippi, most grant money went to cities or city agencies. In Washington, cities and school districts received most of the SRTS grant money awarded.

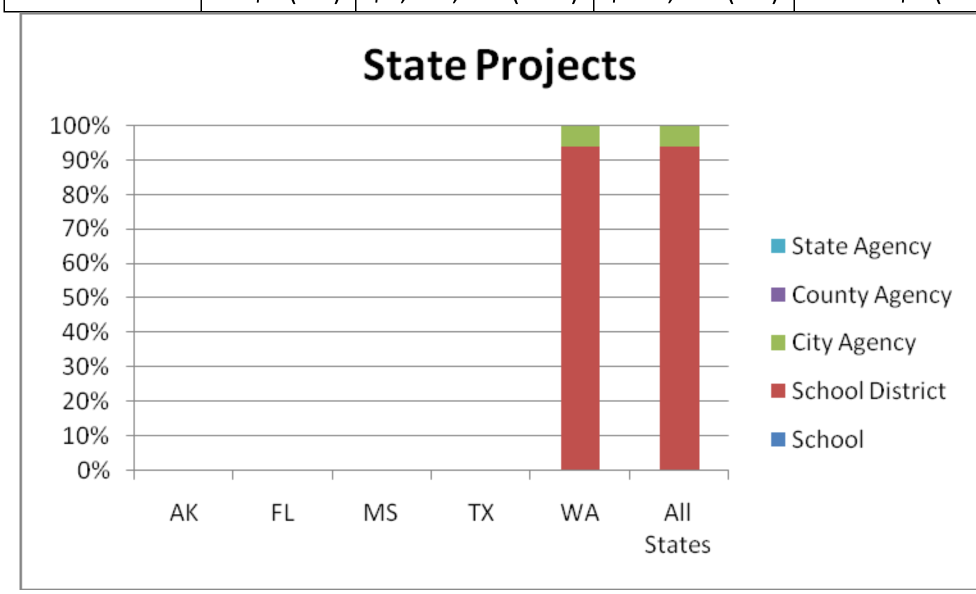
All Projects	School	School District	City Agency	County Agency	State Agency
AK					
FL					
MS	$30,348 (1%)	$231,257 (4%)	$4,854,709 (84%)	$465,300 (8%)	$170,000 (3%)
TX					
WA	$729,901 (7%)	$4,200,550 (39%)	$5,020,797 (46%)	$925,000 (9%)	$0 (0%)
All States	$760,249 (5%)	$4,431,807 (27%)	$9,875,506 (59%)	$1,390,300 (8%)	$170,000 (1%)



FHWA Projects	School	School District	City Agency	County Agency	State Agency
AK					
FL					
MS	$30,348 (1%)	$231,257 (4%)	$4,854,709 (84%)	$465,300 (8%)	$170,000 (3%)
TX					
WA	$729,901 (9%)	$2,079,491 (24%)	$4,884,897 (57%)	$925,000 (11%)	$0 (0%)
All States	$760,249 (5%)	$2,310,748 (16%)	$9,739,606 (68%)	$1,390,300 (10%)	$170,000 (1%)



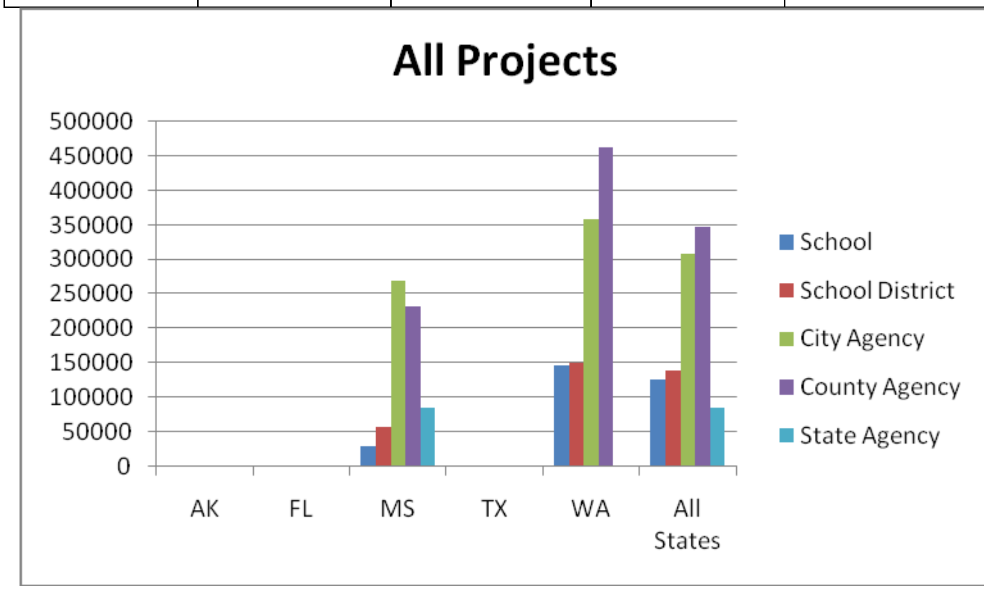
State Projects	School	School District	City Agency	County Agency	State Agency
AK					
FL					
MS	N/A	N/A	N/A	N/A	N/A
TX					
WA	$0 (0%)	$2,121,059 (94%)	$135,900 (6%)	$0 (0%)	$0 (0%)
All States	$0 (0%)	$2,121,059 (94%)	$135,900 (6%)	$0 (0%)	$0 (0%)



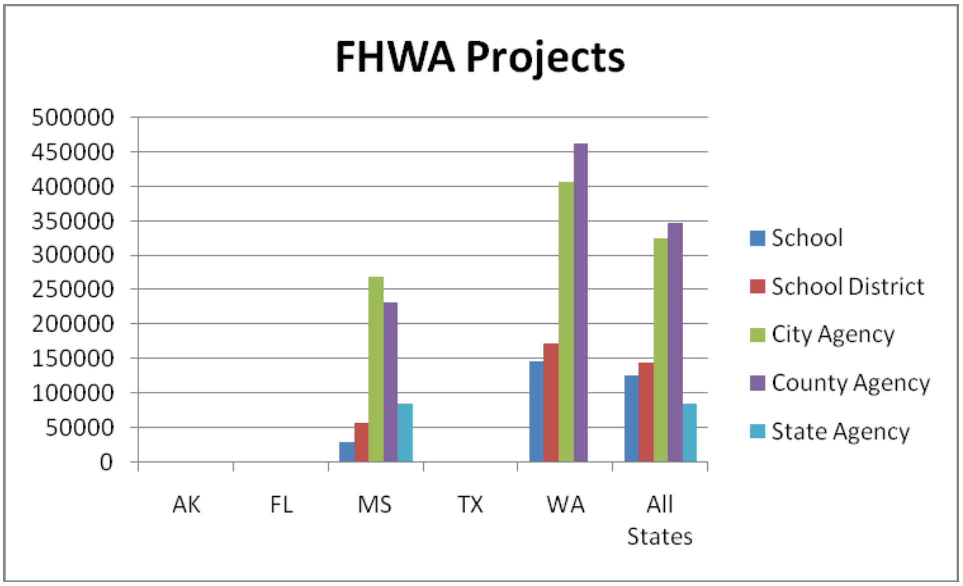
Tally 16) Average grant money awarded per project by agency type

In both states, city and county agencies received greater amounts of grant money per project than other agencies. In Washington, city agencies received much more funding per project for projects funded by the FHWA.

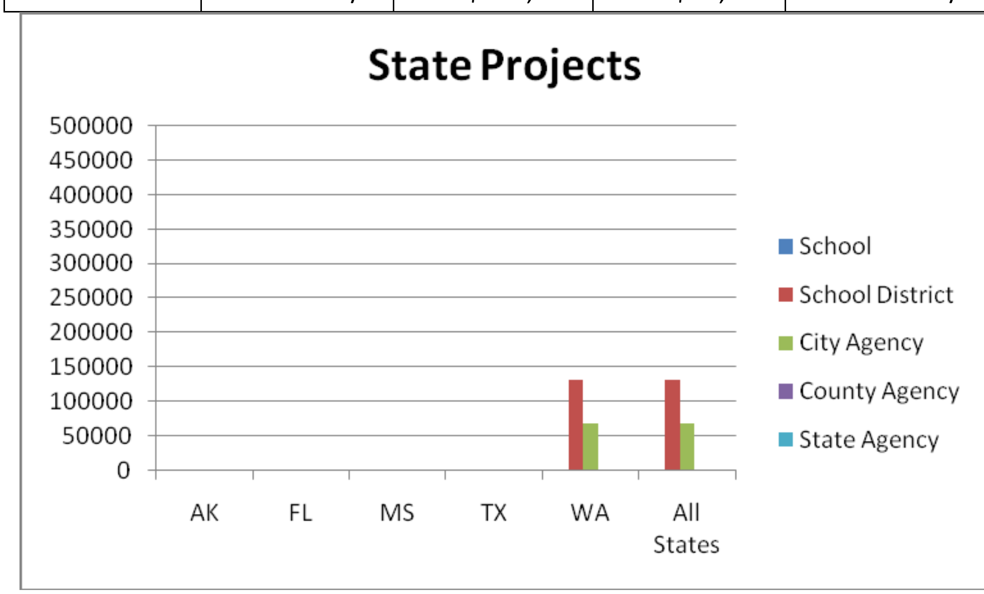
All Projects	School	School District	City Agency	County Agency	State Agency
AK					
FL					
MS	$30,348	$57,814	$269,706	$232,650	$85,000
TX					
WA	$145,980	$150,020	$358,628	$462,500	N/A
All States	$126,708	$138,494	$308,610	$347,575	$85,000



FHWA Projects	School	School District	City Agency	County Agency	State Agency
AK					
FL					
MS	$30,348	$57,814	$269,706	$232,650	$85,000
TX					
WA	$145,980	$173,291	$407,075	$462,500	N/A
All States	$126,708	$144,422	$324,654	$347,575	$85,000



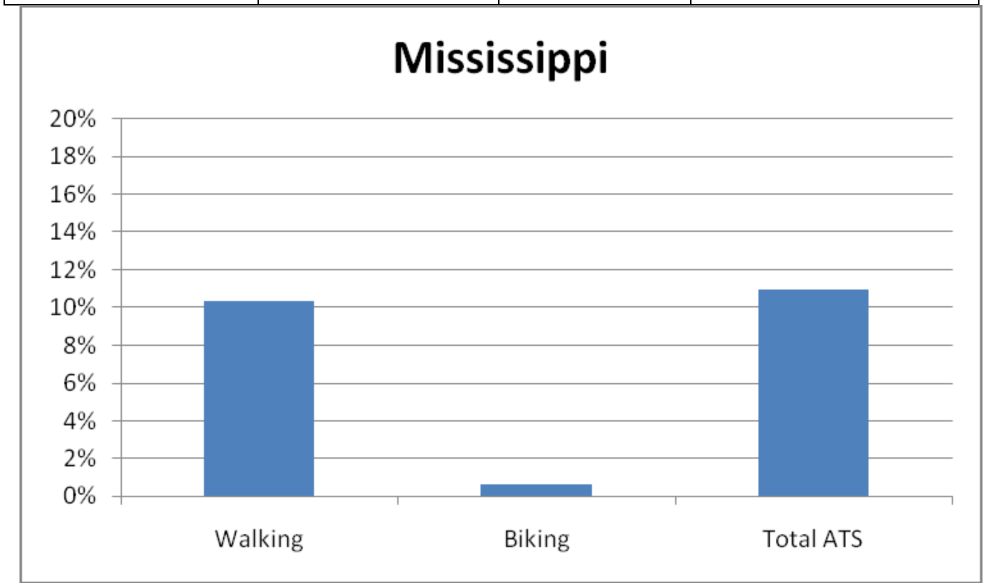
State Projects	School	School District	City Agency	County Agency	State Agency
AK					
FL					
MS	N/A	N/A	N/A	N/A	N/A
TX					
WA	N/A	$132,566	$67,950	N/A	N/A
All States	N/A	$132,566	$67,950	N/A	N/A



Tally 17) Pre-project rates of active transportation to school (ATS) for 71 schools in Mississippi

In Mississippi, 23 SRTS projects recorded the number of students walking or biking to school out of the total student population at 71 schools. The overall rate of ATS for these 71 schools was almost 11%. Walking accounted for almost all of the ATS.

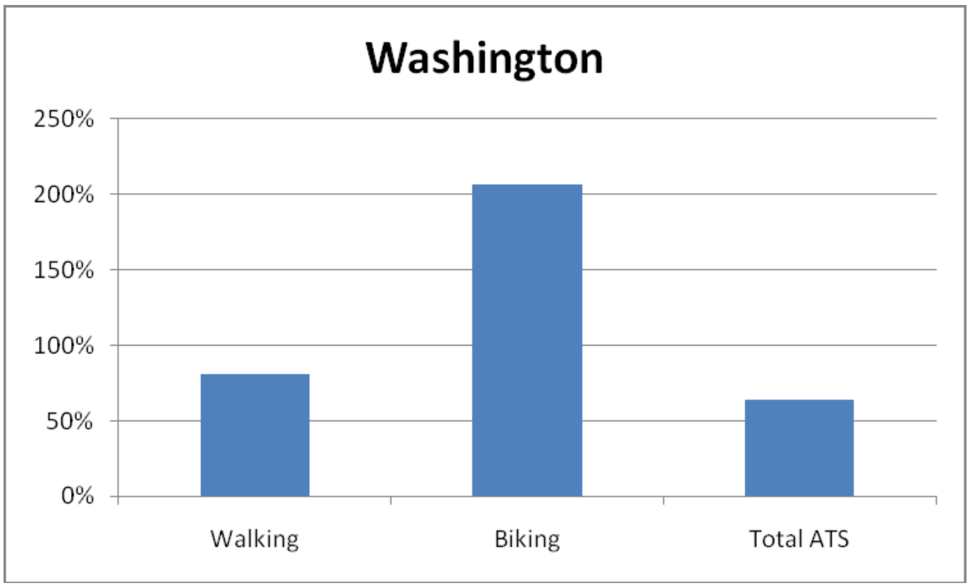
	Walking	Biking	Total ATS
Mississippi	10.36%	0.61%	10.97%



Tally 18) Average Rates of change in students walking, biking or using active transportation to school (ATS) for various schools in Washington state

In Washington, counts of students walking, biking, or using ATS were recorded before and after a SRTS projects. These counts were recorded for various projects impacting various schools. Although the absolute numbers of students biking to school before and after a project were generally lower than students walking, the average rate of change for bicyclists were much greater than walkers.

	Projects reporting data	Schools reporting data	Percent change
Walking	12	19	81%
Biking	8	14	207%
Total ATS	14	22	64%



Appendix C

National and State Databases of Possible Interest

Memorandum

To: Transportation Pooled Fund Statewide Mobility Assessment Study Members
From: Orion Stewart
Date: November 13, 2008
RE: National and State databases of possible interest

This document summarizes general information on existing national and state databases that may be of interest to the TPF study. Active commuting to school research as well as health, education, and transportation agency websites were searched. Databases were included if they contained information relevant to the project. The following databases were identified:

Database	Extent	Relevancy to TPF	Page
BRFSS: Behavioral Risk Factor Surveillance System	National by state	Low	C-2
YRBSS: Youth Risk Behavior Surveillance System	National, selected states and localities	Medium	C-3
NCSRTS Data	Local programs nationwide	High	C-4
iwalk International Walk to School Event Participants	National by state	Medium	C-5
NHTS: National Household Transportation Survey	National, selected states and localities	High	C-6
HealthStyles Survey	National	Medium	C-7
Surface Transportation Policy Project Poll	National	High	C-8
Omnibus Household Survey	National	Low	C-9
National Survey of Pedestrian and Bicyclist Attitudes and Behaviors	National	High	C-10
U.S. Census	National and local	Low	C-11
School Health Profile	State: all	Medium	C-12
Healthy Youth Survey	State: WA	High	C-13
OSPI Bus Ridership Data	State: WA	Medium	C-14
Texas WIC Data	State: TX	High	C-15
SPAN: School Physical Activity and Nutrition Project	State: TX	Low	C-16

The most SRTS-appropriate database is from the NCSRTS (p. 4). Unfortunately, it relies on voluntary data submission and records exist for few programs or schools. Similarly, iwalk maintains a database of schools that have voluntarily registered for walk to school events (p. 5). The National Survey of Pedestrian and Bicyclist Attitudes and Behaviors (p. 10), HealthStyles Survey (p. 7), and Surface Transportation Policy Project Poll (p. 8) have explored the prevalence and barriers to active commuting to school. National figures on commute mode to school can be derived from the NHTS (p. 6). The School Health Profile (p. 12) contains information on school health programs, and some states may have data on SRTS programs. Other state surveys focus on health risks (SPAN, p. 16) and occasionally include information relevant to SRTS (YRBSS, p. 3; Healthy Youth Survey, p. 13). Detailed bus ridership data is available in Washington (OSPI, p. 14) and likely other states. Other datasets contain health (BRFSS, p. 2) or transportation (U.S. census, p. 11; Omnibus Household Survey, p. 9) information, but only for adults. Finally, an evaluation of the Texas SRTS program was recently funded and may be provide a useful source of data in the future (p. 15).

BRFSS: Behavioral Risk Factor Surveillance System

The BRFSS is the world's largest ongoing health survey. It tracks health conditions and risks. Surveys are administered to people aged 18 and over, however, some questions are asked about children in the household under the age of 18. Nationally, none of these questions are related to travel to school behaviors or physical activity. States, however, may add questions to the survey and it is possible that some state-added questions may be related to travel to school.

Website: http://www.cdc.gov/brfss/index.htm
Extent: all 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam
Agencies: CDC
Date of survey: data are collected monthly since 1984
Age range: 18 and over, although some questions are asked about any children under the age of 18 in the household]
N: 23,684 (Washington State)
Survey topics: health conditions and risk behaviors such as alcohol consumption, cancer prevalence, anxiety and depression, etc.
Instrument(s): telephone survey consisting of three sections 1) core component, 2) optional modules, and state-added questions. Core questionnaire available at http://www.cdc.gov/brfss/questionnaires/english.htm. A list of state BRFSS coordinators is available at http://apps.nccd.cdc.gov/BRFSSCoordinators/coordinator.asp. These contacts may have information on which questions were added by each state.
Data availability: online at http://www.cdc.gov/brfss/technical_infodata/surveydata.htm
Questions related to walking to school: none found
Notes:

YRBSS: Youth Risk Behavior Surveillance System

The YRBSS is similar to the BRFSS, only administered to children in grades 9-12 and in some areas, grades 6- 8. Questions are related to health and risk behavior. The national survey includes questions on physical activity but not travel to school. States may add questions. In 2001, North Carolina asked about travel to school. It is possible that other states may have added similar questions. Not all states have data for all years of the survey, and no nationally representative data are available for grades 6-8.

Website: http://www.cdc.gov/HealthyYouth/yrbs/
Extent: National school-based survey as well as state, territorial, tribal, and local surveys. National, state, territory, and local YRBS data come from separate samples of schools and students, therefore national YRBS data are not the aggregate of the state YRBS data and state, territory, and local YRBS data are not subsets of the national YRBS data set. National, state, territory, and local YRBSs all follow the same survey methodology and use the same core questionnaire. No nationally representative data are available for grades 6-8.
Agencies: CDC as well as various state, territorial, and local education and health agencies and tribal governments
Date of survey: odd numbered years: 1991 – 2007
Age range: public and private school students in grades 6-8 (middle school survey) and 9-12 (high school survey). **N:** 15,240 (2003 high school survey)
Survey topics: behaviors that contribute to unintentional injuries and violence; tobacco use; alcohol and other drug use; sexual behaviors that contribute to unintended pregnancy and STDs, including HIV infection; unhealthy dietary behaviors; and physical inactivity—plus overweight and asthma
Instrument(s): Paper and pencil questionnaire, 2009 form available at http://www.cdc.gov/HealthyYouth/yrbs/questionnaire_rationale.htm
Data availability: The national YRBS data files are available on the CDC's YRBSS website. State and local data files may be available through the jurisdiction or by contacting the CDC using this form or email cdc-info@cdc.gov.
Questions related to walking to school: None, however states may add questions to the survey and in 2001 North Carolina added items to measure walking and bicycling to school (see Evenson, K., S. Huston, B. McMillen, P. Bors, and D. Ward. 2003. Statewide prevalence and correlates of walking and biking to school. *Arch. Pediatric Adolesc. Med.* 157 (9):887-892.). It is possible that other states have added similar questions that have not been analyzed in published research.
Notes: For the high school survey, Alaska provided weighted data for 1995, 1999, 2003, and 2007 and unweighted data for 2005. Florida provided unweighted data for 1991, 1993, 1997, and 1999 and weighted data for 2001, 2003, 2005, and 2007. Mississippi provided weighted data for 1993, 1995, 1997, 1999, 2001, 2003, and 2007 and unweighted data for 2005. Texas provided unweighted data for 1991, 1993, and 1999 and unweighted data for 2001, 2003, 2005, and 2007. Washington State provided unweighted data for 1991 and 1999. Weighted results mean that the overall response rate was at least 60% and results are representative of all students attending public schools in each state. Unweighted data represent only the students who completed the survey.

National Center for Safe Routes to School (NCSRTS) Data

The NCSRTS is the clearinghouse for the federally funded SRTS program. It collects voluntary data from various local programs. These data are detailed and specific to SRTS concerns. Unfortunately, since there is no evaluation requirement for funded programs, data submission is entirely voluntary and only a limited number of programs have contributed data. The University of Washington Urban Form Lab currently has data from about 175 schools accounting for 20 programs in Alaska, Florida, Texas, and Washington.

Website: http://www.saferoutesinfo.org/data/
Extent: Voluntary data from local SRTS programs nationwide. Data can be evaluated on various spatial and programmatic levels.
Agencies: National Center for Safe Routes to School (NCSRTS)
Date of survey: Ongoing. No dates of when data were collected from SRTS programs, only dates of when student commute mode counts were taken and information on whether this was before/during/after program implementation.
Age range: K-9+
N: unknown nationally. Data obtained from about 175 schools in about 20 SRTS programs in Alaska, Florida, Texas, and Washington.
Survey topics: school characteristics, SRTS program characteristics, student commute mode to school counted by teachers, distance from school and normal commute mode reported by parents, issues affecting parent's decision to allow children to walk/bike to school, perception of walking or biking to school reported by parents, parents' education
Instrument(s): Background Information form (provides SRTS program information), School Information form, 5-day Student Travel Tally form, and Parent Survey form. All four forms, plus a cover letter explaining the data, were sent to Charlotte and Anne. Copies are held in the UW Urban Form Lab (on the x-drive at: X:\Research\SR2S\1_data\NCSRTS_WA_Data\Washington10-31-08). Forms are also available from the NCSRTS website at http://www.saferoutesinfo.org/data/
Data availability: No national-level data reports available yet. Data are available to state coordinators upon request from NCSRTS. The project has obtained data in excel format for programs in Alaska, Florida, Texas, and Washington. This includes program data for approximately 20 programs and walk to school and parent surveys from about 175 schools. Data were extracted on 10/31/2008, future extractions may not produce identical data as those currently being provided because users can continuously input new and edit existing data.
Questions related to walking to school: all
Notes: data collected, see above

International Walk to School Event Participants

Walk to school day and month are celebrated internationally in October. Data exist on programs that have voluntarily registered for the event and coordinators who have voluntarily offered their contact information. Immediately available data are limited to basic information about the participating schools and the duration of events. Additional statistics (e.g., presence of parade, media coverage, and inclusion of bicycle event) appear in some agency reports and may be available upon request.

Website: international: http://www.iwalktoschool.org/, U.S.: http://www.walktoschool.org
Extent: International, organized by country and, in the U.S., by state.
Agencies: iwalk (International Walk to School), coordinated by the National Center for Safe Routes to School (NCSRTS) in the U.S.
Date of survey: 2007, 2008, and possibly earlier years
Age range: data for schools, no age range specified
N: 3,016 registered schools in the U.S.
Survey topics: information is collected on schools that have registered to participate in international walk to school day or month. Data include school name, school contact, school phone, school city, school state, event duration, event ongoing, and date of registration. Also provides list of resource people who have registered. Additional information may also be available on registered users and the nature of walk to school events, such as presence of parades, bicycling to school, and media coverage.
Instrument(s): an online registration form, available at http://www.walktoschool.org/register/index.cfm
Data availability: interactive online map available at http://www.walktoschool.org/who/index.cfm
Questions related to walking to school: all
Notes:

NHTS: National Household Transportation Survey

The NHTS is considered the 'nation's official inventory of daily travel.' It contains travel information for all trips for entire households. Previous research has extracted trips to school based on age, time, and trip purpose. It is useful for looking at national trends over time. The data, however, are not adequate for state- or local- level analysis.

Website: http://nhts.ornl.gov/
Extent: National sample. Sample data in the NHTS are not adequate to provide statewide, or area-specific estimates. If a state or a local jurisdiction wants to develop travel estimates for a specific area, then it can purchase additional households in their jurisdiction to be interviewed and included in the NHTS. Nine jurisdictions purchased these additional samples in the 2001, including the State of Texas. It appears that Florida and Texas, or jurisdictions therein, have requested additional data for the 2008 survey.
Agencies: The Department of Transportation (DOT) and the Federal Highway Administration (FHWA)
Date of survey: conducted every 5 to 7 years. Data available from 1969, 1977, 1983, 1990, 1995, 2001, and 2008 (In progress; data collection will continue until late April 2009 and public access to the data will not be available until late fall 2009.)
Age range: entire household, as reported by member of household over the age of 18.
N: 14,553 (trips to school in 2001)
Survey topics: trip characteristics, demographic information
Instrument(s): Uses a 1-day travel diary, available from http://nhts.ornl.gov/publications.shtml (see 2001 user's guide, appendix M)
Data availability: download from http://nhts.ornl.gov/download.shtml
Questions related to walking to school: Questions pertain to all trips in a household, for an analysis of mode split for the trip to school, a past study considered trips to be for school if (1) the respondent is aged 5 to 18, (2) the trip occurs on a weekday morning, and (3) if the purpose is school (1969), civic/educational/religious (1977) or school/church (1983–2001). The surveys capture the primary mode used to reach school. For example, if a student walked to a school bus stop, the trip would be counted as a school bus trip and not as a walking trip. (see McDonald, Noreen C. 2007. Active transportation to school: trends among U.S. schoolchildren, 1969-2001. *American Journal of Preventive Medicine* 32 (6):509-516.)
Notes: The state of Texas purchased add-on data in 2001. It appears that Florida and Texas, or jurisdictions therein, have requested add-on data for the 2008 survey. Regional MPOs may also conduct similar transportation surveys. For example, travel diaries from Alameda County, CA, and Gainsville, FL, were used in travel to school research (see Ewing, R., W. Schroeer, and W. Greene. 2004. School location and student travel: analysis of factors affecting mode choice. *Transportation Research Record: Journal of the Transportation Research Board* 1985:55-63. and McDonald, Noreen C. 2007. Travel and the social environment: Evidence from Alameda County, California. *Transportation Research Part D: Transport and Environment* 12 (1):53-63.)

HealthStyles Survey

The HealthStyles survey primarily assesses the relationship between media and health choices and is used by the CDC to inform health communication planning. In 1999 and 2004, questions were asked about the prevalence and barriers of children walking or bicycling to school. It is unclear whether or not similar questions have been asked in other surveys or will be asked in the future.

Website:
http://www.cdc.gov/HealthMarketing/entertainment_education/healthstyles_survey.htm
Extent: nationally representative sample
Agencies: The CDC, Hollywood, Health & Society at the USC Annenberg Norman Lear Center, and Porter Novelli, a social marketing and public relations firm.
Date of survey: annually since 1995
Age range: 18 and older
N: 1,588 (answering walk to school question in 2004)
Survey topics: Second of two postal mail surveys. The first survey is a consumer survey in which data on general media habits, product use, interests, and lifestyle are collected. The second survey, HealthStyles, is administered to respondents to the first survey in which data on health attitudes, behaviors, conditions, and information seeking are collected.
Instrument(s): Proprietary postal mail survey, instrument not available on web
Data availability: Proprietary database product developed by Porter Novelli
Questions related to walking to school: In the 1999 and 2004 surveys, questions were asked of parents of children aged 5 -18 years regarding how many times their youngest child walks to or from school during a usual week and whether one or more of six barriers prevents that child from walking to school (see Martin, S., and S. Carlson. 2005. Barriers to children walking to or from school -- United States, 2004. *Morbidity & Mortality Weekly Report* 54 (38):949-952. and Dellinger, A.M., and C.E. Staunton. 2002. Barriers to children walking and bicycling to school -- United States, 1999. *Morbidity & Mortality Weekly Report* 51 (32):701-704.).
Notes:

Surface Transportation Policy Project Poll

The Surface Transportation Policy Partnership (a non-profit, nationwide coalition working to ensure safer communities and smarter transportation choices) conducted a survey of 'American's attitudes toward walking and creating better walking communities.' This survey was meant to inform policy makers on transportation issues relating to walking. Two questions relate to children's trip to school.

Website: http://www.transact.org/report.asp?id=205
Extent: National
Agencies: The Surface Transportation Policy Project and Belden Russonello & Stewart (polling company)
Date of survey: October 2002
Age range: 18 and older
N: 800
Survey topics: attitudes toward walking
Instrument(s): telephone survey, exact questions are contained in report of results
Data availability: upon request, e-mail: lbailey@transact.org
Questions related to walking to school:
Q54. For each one of the following, please tell me if this is how your child or children get to school: Walk, ride bike, school bus, public transportation, or a parent or other adult drives them to school? *(Base: N=198 who have children ages 7-17).*
Q55. Are any of the following a reason your child(ren) do not walk to school: School is too far away, there is too much traffic and not a safe walking route to the school, fear of child being abducted, not convenient to have child walk – drop them off by car on the way to work, crime in the neighborhood, your children do not want to walk, or there is a school policy against children walking to school? *(Base: N=166 whose children ages 7-17 do not walk or bike to school)*
Notes: No research that uses these data has been identified

Omnibus Household Survey

This data set contains detailed information on use of all travel modes (including walking, biking, and school bus) and perceptions of travel, however the data is limited to persons aged 18 and over. This data set is not useful for the age range the TPF is interested in.

Website: http://www.bts.gov/programs/omnibus_surveys/household_survey/
Extent: National
N: 1,000
Agencies: the Bureau of Transportation Statistics (BTS)
Date of survey: Every 2 months, August 2000 through October 2003
Age range: 18 and older
Survey topics: assesses the public's satisfaction with the transportation system and its interactions with DOT agencies
Instrument(s): telephone interview, script available at: http://www.bts.gov/programs/omnibus_surveys/household_survey/2003/october/html/final_annotated_survey_questionnaire.html
Data availability: available online at: http://www.bts.gov/programs/omnibus_surveys/household_survey/2003/october/
Questions related to walking to school: none
Notes:

National Survey of Pedestrian and Bicyclist Attitudes and Behaviors

This national survey focuses on bicycle and pedestrian activity. It is described as 'the first of its kind designed specifically to benchmark bicycle and pedestrian trips, behaviors, and attitudes. The survey findings will serve as a foundation to improve the environment and infrastructure to support these two transportation modes.' Several questions are relevant to children's commute to school. It could be useful for establishing a national baseline for SRTS indicators. It is unclear if the data is adequate for state-level analysis.

Website:
http://www.bts.gov/programs/omnibus_surveys/targeted_survey/2002_national_survey_of_pedestrian_and_bicyclist_attitudes_and_behaviors/
Extent: National, unclear if data is adequate for state or local analysis
Agencies: sponsored by the U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) and the Bureau of Transportation Statistics (BTS); administered by The Gallup Organization
Date of survey: 2002
Age range: 16 and older
N: 2,548
Survey topics: scope and magnitude of bicycle and pedestrian activity and the public's behavior and attitudes regarding bicycling and walking.
Instrument(s): telephone interview, script available at
http://www.bts.gov/programs/omnibus_surveys/targeted_survey/2002_national_survey_of_pedestrian_and_bicyclist_attitudes_and_behaviors/survey_questionnaire/
Data availability: No data available online, contact: Marvin Levy, 202 366-5597, e-mail: mlevy@nhtsa.dot.gov or Neil Russell, 202 493-2147, neil.russell@bts.gov
Questions related to walking to school:
103. Are there any children ages 5 to 15 in your household who attend school?
104. Do any of the children walk or bike to school?
105. How many days do they walk or bike to school during a typical school week?
106. Is there a safe route to school for your children when they walk or bike?
107. What are the primary reasons your child does not walk or bike to school?
Notes: No research that uses these data has been identified

U.S. Census

The census may be useful in providing general population, demographic, and socio-economic data that can be used in conjunction with other data. No census data are directly related to SRTS.

Website: www.census.gov
Agencies: U.S. Census Bureau
Extent: National, broken down locally on multiple geographic levels
Date of survey: Every 10 years, last completed 2000
Age range: collects data on all household members. Travel to work data for those 16 and older only
N: depends on extent
Survey topics: demographics, population distribution, household information
Instrument(s): questionnaire, interviews
Data availability: http://factfinder.census.gov/home/saff/main.html?_lang=en
Questions related to walking to school: none
Notes:

School Health Profile

School Health Profiles is a survey of school administrators used to asses the strength of a school's health program. A national survey is provided by the CDC and each state can add questions. Some state questions may be relevant to SRTS programs. It also could be potentially useful to compare the general health environment of SRTS schools to other schools.

Website: http://www.k12.wa.us/CoordinatedSchoolHealth/SchlHealthProfiles.aspx
Extent: Washington State, also available for each other state
Agencies: In Washington State, conducted by the Washington State Office of the Superintendent of Public Instruction (OSPI) and the Washington State Department of Health (DOH). It is coordinated by the National Centers for Disease Control and Prevention (CDC) Division of Adolescent School Health (DASH)
Date of survey: every two years, even years
Age range: surveys are given to middle and high school Principals and Lead Health Educators
N: approximately 260 principles, 220 health teachers (Washington State)
Survey topics: status of health and wellness-related policies, procedures, instruction, and environments
Instrument(s): http://www.cdc.gov/HealthyYouth/profiles/questionnaires.htm for 2008 national instrument from the CDC
Data availability: Washington State summary statistics available through the OSPI website for 2004. Other data formats may be available by contacting OSPI. Other state data files may be available through state agencies or the CDC. Many states and districts have given CDC permission to distribute their data files upon request. For information on acquiring data files from specific states or districts from the CDC, use this form or e-mail the CDC directly at cdcinfo@cdc.gov.
Questions related to walking to school:
Question 39 from 2006 Washington State data) School has or participates in a safe-passage to school program (4% for 2004, note this question is not found on the 2008 questionnaire)
From the 2008 CDC questionnaire:
4. Currently, does someone at your school oversee or coordinate school health and safety programs and activities? (Mark one response.)
5. Is there one or more than one group (e.g., a school health council, committee, or team) at this school that offers guidance on the development of policies or coordinates activities on health topics? (Mark one response.)
Notes:

Healthy Youth Survey

This Washington State survey collects data on students' health risk environment. It contains similar data as the CDC's YRBSS. Questions are asked about walking and biking, but not specifically to or from school (although the 2008 survey will have such a question).

Website: https://fortress.wa.gov/doh/hys/default.htm
Extent: Washington State (according to the website, other states collect similar data, perhaps through the YRBSS). State and county level data are available. Local data may be available through local school districts.
Agencies: Office of the Superintendent of Public Instruction (OSPI), the Department of Health (DOH), the Department of Social and Health Service's (DSHS) Division of Alcohol and Substance Abuse (DASA), Community Trade and Economic Development (CTED), the Family Policy Council (FPC) and the Liquor Control Board (WSLCB).
Date of survey: October 2002, 2004, 2006, 2008
Age range: grades 6, 8, 10, and 12
N: 32,531 (2006)
Survey topics: Safety and violence, physical activity and diet, alcohol, tobacco and other drug use, and related risk and protective factors
Instrument(s): https://fortress.wa.gov/doh/hys/PastSurveys.htm
Data availability: To request data, provide name and organization, date of request, desired receipt date, and a detailed description of the requested data. Please include telephone number so that request can be clarified if necessary. The request should be sent to: Washington State Department of Health, Maternal & Child Health Assessment Section, Attn: Diane Pilkey, PO Box 47835, Olympia, WA 98504-7835**.** Requests can also be made by: Telephone: (360) 236-3526 FAX: (360) 236-2323 or E-Mail: Diane Pilkey, (diane.pilkey@doh.wa.gov)
Questions related to walking to school:
Safety: 30 days - when you bicycled or walked in your neighborhood or to school did you have enough room to walk or bike? (asked in 2004 and 2004)
Safety: 30 days - when you bicycled or walked in your neighborhood or to school was it easy to cross the streets? (asked in 2002 and 2004)
Safety: when you bicycled or walked in your neighborhood or to school were there dogs or people who bothered you or made you feel uneasy? / who scared you in past 30 days ? (asked in 2002, 2004, and 2006)
Physical activity: average week bike or walk near home or to school (not counting very short trips). (asked in 2006)
Notes: In the 2008 survey, form B will have a question regarding the number of days per week a student walks to school. 2008 data will be available in February/March of 2009. Charlotte has requested data for various questions from the 2006 and 2008 survey from the DOH (e-mail sent 10/23/2008).

OSPI Bus Ridership Data

This data is used to calculate student transportation funding for Washington State school districts. It is useful for estimating the number and spatial distribution of students riding the bus to school. This data should be used with care since it is used to calculate funding and therefore may overestimate actual school bus use.

Website: http://www.k12.wa.us/transportation/Allocations/default.aspx
Extent: Washington State, other states may have similar data
Agencies: Office of the Superintendent of Public Instruction (OSPI)
Date of survey: 2005-2008
Age range: pre-kindergarten – 12^{th} grade
N: all Washington State school districts
Survey topics: Data on bus ridership. Datasets have fields containing the state route number, building number, bus number, and type of bus service. The number of students riding each bus route to each building is broken down by miles from school. Buildings are associated with an address.
Instrument(s): Each district submits an excel spreadsheet for each state bus route. That sheet contains the latitude and longitude of each school bus stop served by that route, the number of students picked up at each stop, as well as the latitude and longitude for the destination school. The spreadsheet contains the formula to calculate the radius mile from those coordinates. The result is a data on the number of students picked up at certain distances away from the destination school
Data availability: reports are available online at http://www.k12.wa.us/transportation/Allocations/default.aspx. The UW Urban Form Lab has obtained .csv files of this data for the 2005/06, and 2006/07, 2007/08 school year.
Questions related to walking to school: none
Notes:

Texas WIC Data

No data related to safe routes to school was found. However, the Robert Wood Johnson Foundation (RWJF) has awarded a $2 million grant to Live Smart Texas, a coalition of more than 80 organizations, to evaluate the effectiveness of the Texas Safe Routes to School program and Texas's implementation of the new Healthy WIC package.The purpose of the grants is to inform decision makers about the effectiveness of these two childhood obesity prevention policies. These studies will also help local, state and national policymakers identify policies that work toward promoting children's healthy eating and increased physical activity.

Co-leading the program will be Deanna Hoelscher, Ph.D., R.D., professor at The University of Texas School of Public Health Austin Regional Campus and director of the Michael & Susan Dell Center for Advancement of Healthy Living, and Marcia Ory, Ph.D., Regents Professor at the Texas A&M Health Science Center School of Rural Public Health. Project director will be Diane Dowdy, Ph.D., from the Texas A&M Health Science Center School of Rural Public Health. Dr. Hoelscher stated: "This grant is historic in that it brings together researchers from both the University of Texas School of Public Health and Texas A&M Health Science Center School of Rural Public Health, as well as a statewide consortium of other academic institutions, community groups and stakeholders in a focused effort to address one of the most significant public health issues of our time- childhood obesity."

It may be useful to contact the PIs of this study for information on Texas-specific SRTS data.

Website: Sources of this information are the Robert Wood Johnson Foundation website: http://www.rwjf.org/childhoodobesity/digest.jsp?id=8629 and the National Partnership for SRTS website: http://www.saferoutespartnership.org/state/4373/texas
Extent: Texas
Agencies: Live Smart Texas, Texas, a coalition of more than 80 organizations
Date of survey: forthcoming?
Age range: unknown
N: unknown
Survey topics: Evaluation of SRTS and WIC food labeling programs
Instrument(s): unknown
Data availability: unknown
Questions related to walking to school: unknown
Notes:

SPAN: School Physical Activity and Nutrition Project

This survey is used primarily to evaluate the prevalence of overweight in Texas children and the general health environment, especially regarding food and nutrition. While no questions relate to the trip to school, some questions are asked about physical activity. This data set is likely best used in conjunction with other walk to school data to compare health environments between SRTS and other schools.

Website: http://www.sph.uth.tmc.edu/dellhealthyliving/default.aspx?id=4061
Extent: Texas
Agencies: Dell Center for Healthy Living at the University of Texas School of Public Health in Houston, with funding from the Texas Department of Health (TDH)
Date of survey: 2000-2001, 2004-2005
Age range: 4th, 8th, and 11th grade students
N: 6,630 (2000 – 2001)
Survey topics: food choice behaviors, food selection skills, weight perceptions and practices, nutrition knowledge, attitudes about food and eating, and physical activity behaviors.
Instrument(s): a questionnaire and height and weight measurements available at http://www.sph.uth.tmc.edu/DellHealthyLiving/default.aspx?id=4064
Data availability: or data requests on Texas SPAN Projects I, II, and III, contact the NPAOP Program by phone at (512) 458-7200, by fax at (512) 458-7618 or e-mail lindsay.rodgers@dshs.state.tx.us
Questions related to walking to school: none
Notes:

Appendix D

National Center for Safe Routes to School Data Review

Memo

To: SRTS Pooled Fund Project Participants

From: Urban Form Lab

Date: originally sent January 16, 2009; updated on July 15, 2009.

Subject: **DRAFT** NCSRTS data review

This memo provides a brief overview of data the SRTS Pooled Fund Project has obtained from the NCSRTS (National Center for Safe Routes to School). First the data are described, then potential uses of the data are discussed. These potential uses include: program evaluation, program element evaluation, funded and unfunded program comparisons, and trend identification. Due to the small amount of data, which is sometimes incomplete, any of these analyses may be limited. Therefore, the NCSRTS data may be most useful as an indicator that greater data collection efforts are needed and to help identify individual state or local programs to study in greater depth.

Data Description

The Pooled Fund Project has obtained data from the NCSRTS for the states of Alaska, Florida, Mississippi, Texas, and Washington. These data were voluntarily submitted to the NCSRTS from various local SRTS programs between August 2007 and May 18, 2009. Data were received by the Urban Form Lab on May 18, 2009. Since data is submitted to the NCSRTS on an ongoing basis, these data may not represent what is currently in the NCSRTS database.

Four types of data were received and are described below; the outline indicates the hierarchy of these data: a local program can contain one or more schools and within each of those schools, the school can collect student travel tally and parent survey information at multiple time periods.

1. **Program:** Contain information about local SRTS programs. Includes basic information about the organization, any government funding it has received, and which of the 4 Es (engineering, education, encouragement, and enforcement) are included in its SRTS program. Each program has a unique ID number that links it to other data.

    a. **School:** Contains information about individual schools within each SRTS program. Includes school enrollment, grade levels taught, and information about other organizations involved in the school's SRTS project. Each School has a unique ID number that links it to other data.

        i. **Student Tally:** Contains information about student travel modes to and from schools as counted by teachers on survey days. Includes additional information on grade, class size, date of survey, weather, and time period of survey in relation to SRTS project (before, during, after, or other).

ii. **Parent Survey:** Contains information about parents' practices and concerns regarding their child walking and biking to school. Includes child's usual commute mode, home location, distance from school, length of time for school commute, factors affecting decision to let child walk to school, barriers to child walking to school, attitudes about walking to school, and more.

The Pooled Fund Project received data representing 60 Programs, 345 Schools, more than 142,000 students, and 32,000 parents. Table 1, below, provides a breakdown of these figures for each state involved in the Pooled Research Project.

Table 1: data received from NCSRTS

State	Programs	Schools	Student tally datasets (students)	Parent survey datasets (parent surveys)
Alaska	2	2	1 (148)	2 (178)
Florida	34	198	214 (101,108)	131 (13,462)
Mississippi	8	28	22 (8,220)	37 (5,552)
Texas	14	112	72 (32,872)	85 (12,422)
Washington	2	5	1 (401)	8 (436)
Total	**60**	**345**	**310 (142,749)**	**263 (32,050)**

The data obtained from the NCSRTS represent only a small portion of programs and schools that have received SRTS government funding—12% and 25%, respectively. Table 2 provides a state-by-state breakdown of the portion of funded programs and schools that submitted data to the NCSRTS. These portions are imprecise because not all programs that submitted data to the NCSRTS were part of federal or state SRTS programs and the numbers of programs and schools funded are estimates that are likely now outdated[1]. Nonetheless, these small portions may inhibit any attempt to make a valid inference to all SRTS programs or schools in a state.

Table 2: portion of programs and schools with NCSRTS data

State	Funded programs	Programs w/ NCSRTS data (portion of funded programs)	Funded schools	Schools w/ NCSRTS data (portion of funded schools)
Alaska	6	2 (33%)	9	2 (22%)
Florida	209	34 (16%)	900	198 (22%)
Mississippi	20	8 (40%)	56	28 (50%)
Texas	244	14 (6%)	395	112 (28%)
Washington	32	2 (6%)	32	5 (16%)
Total	**511**	**60 (12%)**	**1,392**	**345 (25%)**

*Total excludes Alaska, since no data is available on the number of schools funded in Alaska.

[1] Total number of programs and schools as reported by the NCSRTS's winter 2008 SRTS Program Tracking Brief, available at Hhttp://www.saferoutesinfo.org/resources/collateral/status_report/TrackBriefOct-Dec08Revised.pdfH.

Potential Data Uses

Data from the NCSRTS offers detailed insight into specific SRTS programs and schools, the commute modes of children, and the attitudes and characteristics of parents. These data are potentially useful for establishing baselines and evaluating the effects of a local SRTS programs. Possible evaluations include program effectiveness and funded vs. unfunded program effectiveness. The feasibility of each of these evaluations is discussed below. Additionally, these data could be used to identify state-wide trends.

Program effectiveness evaluation

The most straightforward evaluation of a SRTS project's effectiveness is the extent to which it alters behavior and attitudes, such as children's commute mode or parents' perception of safety during the school commute. NCSRTS data allow this type of evaluation. Student tally and parent survey datasets indicate whether they were administered before, during, or after implementation of a SRTS project. As indicated in Table 3, the Pooled Fund Project has data for all three time periods, with the majority of post-implementation data from Florida.

Even though we have 65 post-implementation student tallies, only 23 schools have completed both pre- and post-implementation student tallies (see Table 4). All of these schools are in Florida. Similarly, 23 schools have submitted parent surveys over multiple time periods, most of which are pre- and post-implementation surveys from schools in Florida. These data may allow for a pre/post study, although confounding variables is an issue to consider when using these data. Part or all the differences in pre versus post commute modes or attitudes could be attributed to factors other than those measured as part of the implementation of a SRTS project.

Table 3: time period of student tally and parent survey datasets

State	Student tally datasets				Parent survey datasets			
	Pre	Mid	Post	other	Pre	Mid	Post	other
Alaska	1	0	0	0	2	0	0	0
Florida	113	6	62	33	72	7	46	6
Mississippi	19	0	3	0	34	3	0	0
Texas	70	2	0	0	82	2	1	0
Washington	0	1	0	0	3	1	4	0
Total	**203**	**9**	**65**	**33**	**193**	**13**	**51**	**6**

Table 4: Schools with data submitted at multiple time periods

State	Schools with pre and post student tallies	Schools with pre and post parent surveys	Schools with mid and post parent surveys
Alaska	0	0	0
Florida	23	19	0
Mississippi	0	0	0
Texas	0	0	0
Washington	0	3	1
Total	**23**	**22**	**1**

An alternate measure of a SRTS program's effectiveness would be to compare the prevalence of walking and biking at schools that have completed a SRTS project to regional, state, or national rates of walking and biking to school. In the state of Florida, the Pooled Fund Project has 62 post-implementation student tally datasets and 46 parent survey datasets. The commute mode split of these datasets could be compared to state or regional commute mode data in order see if schools that implemented a SRTS program have a higher rate of walking or biking. This could be done using Florida add-on data from the 2008 NHTS (National Household Travel Survey) once these data are available in fall 2009[2]. Comparing rates of walking and biking at SRTS schools to rates in a larger area may not be entirely valid. As mentioned above, other factors besides SRTS projects could influence rates of walking and biking. A better study design may be to carefully select control areas that are similar to the areas in which the SRTS projects are located.

The large number of pre-implementation datasets compared to the small number of post-implementation datasets suggests that programs may be in the process of implementation and unable to submit post data at this time, or completed programs simply have not submitted post data. In either case, encouragement to submit post data may be helpful so that evaluations can eventually be performed.

Program element effectiveness evaluation

Program data contain detailed information on which specific elements of the 4 E's were included. Programs are characterized as including any of 18 specific engineering elements, 9 education elements, 13 encouragement elements, and 12 enforcement elements. The presence or absence of any of these elements in a program could be compared to the program's effectiveness, as measured by any change in commute mode or parental attitudes from before to after the program's implementation. As mentioned above, however, the current data does not facilitate any accurate measure of a program's effectiveness because almost no schools have submitted both before and after data. If such an evaluation could be carried out, however, it would inform SRTS program administrators as to which elements they should encourage in future SRTS programs in order to obtain maximum effectiveness.

Funded/unfunded program comparison

Program data contain information on whether or not a program applied for a state or federal SRTS grant, whether or not the program is part of a state or federally funded SRTS program, and the amount of any state or federal funding a program received, if known. These data could be used to compare characteristics and/or the effectiveness of unfunded programs to funded programs (again, measures of effectiveness may be hard to ascertain). The existing data contains 16 programs that were not part of a state or federally funded SRTS program, 29 that were part of a funded program, and 15 that have no data available.

Program and community trend identification

At its most basic level, NCSRTS data offers Insights into the nature of SRTS programs and the communities in which they are located. Program and school characteristics could be evaluated at a local or state level to uncover any trends that may exist. For example, perhaps a state has very few programs that include an enforcement element. In this case, enforcement elements could be encouraged in local SRTS programs throughout that state. Possible trends such as these could be used to identify aspects of SRTS programs that could be strengthened. However, due to the small portion of programs and schools with NCSRTS data, other sources, such as actual SRTS applications or state DOT records (where available), may be more useful. If more complete sources of program data exist, it may be interesting to compare characteristics of schools and programs that submitted data to the NCSRTS vs. those that did

[2] For more information on the NHTS, see Hhttp://nhts.ornl.govH.

not. Perhaps larger schools or schools in higher income areas are more likely to submit data. If submission of data to the NCSRTS is viewed as a proxy for a well-administered SRTS program, then the answer to these questions could identify areas where barriers to SRTS program implementation exist.

Student tally and parent survey data are useful for collecting baseline rates of walking and bicycling to school within a community and custom-tailoring SRTS programs to those specific needs. Additionally, a Review of these data at a state level may uncover larger trends. Such trends could help inform state-level design of SRTS programs. For example, if all parent survey datasets within a state reported that the absence of an adult to walk with was a major barrier for children walking to school, then a walking school bus program element could be encouraged on a statewide level. As mentioned earlier, due to the small portion of total programs that these data represent, currently it may not be prudent to extrapolate any trends to an entire state.

Conclusion

Although NCSRTS data could be used for many valuable evaluations and analyses, the varying number of programs and schools with data for each state in our Pooled Research Project requires that any work done with the data be well-designed and probably focused on individual states or schools. Until these analyses are done, the amount of NCSRTS data may be most useful as an indicator that greater incentives are necessary for SRTS programs to collect and submit data if evaluations are to be carried out. At the local and state level the data may provide useful insights, which can provide value and utility to SRTS program implementers and decision makers.

Appendix E

Washington State SRTS Program 2005-2009
Preliminary Assessment Overview

EXECUTIVE SUMMARY

Washington state's Safe Routes to School (SRTS) program provides technical assistance and resources to schools for projects that support and promote more children walking and bicycling to school safely. The projects address Kindergarten through 8th grade (children ages 4 to 15).

Preliminary evaluation results indicate that the Safe Routes to School program is successful in accomplishing its goal of increasing the number of students walking to school. Pre/post counts show a 56 percent average increase in the number of children walking or biking to school following the completion of the Safe Routes to School projects. While a lack of pre/post project child pedestrian and bicycle collision data precluded an objective analysis of the program's safety impacts, anecdotal evidence from communities suggest that SRTS projects result in safer behaviors.

As more projects are completed, traffic safety and collision information will continue to be tracked so that these indicators can inform the safety impacts of the program. Additional evaluation tools, including a parent survey, will also be used to assess other outcomes, such as changes in awareness, attitudes, and information about pedestrian/bicycle safety.

1. INTRODUCTION

Washington state's Safe Routes to School (SRTS) program provides technical assistance and resources to schools for projects that support and promote more children walking and bicycling to school safely. The projects can address engineering, education, encouragement, and/or enforcement improvements for Kindergarten through 8th grade (children ages 4 to 15). In 2004, before the federal Safe Routes to Schools program was created, the Washington State Legislature approved a Safe Routes to Schools Pilot Program to be administered by the Washington State Department of Transportation (WSDOT). Additionally, in 2005, the same legislature committed $74 million in state funding over 16 years to improve bicycle and pedestrian safety and mobility, including Safe Routes to School.

WSDOT has had a remarkable response to the SRTS program. On average, the program is oversubscribed by about 80 percent; only about 20 percent of the applications submitted can be funded. Since 2005 (a period that includes the pilot phase of the program), 81 schools have participated in the program.

This appendix provides a preliminary assessment overview of the WSDOT SRTS program between 2005 and 2009. Schools that received funding were geocoded in order to examine the social and economic characteristics of the areas where the schools were located. This report also includes a detailed description of completed projects (2005-2007), together with a summary of counts of students walking and biking to school before and after the SRTS projects.

2. GEOCODING THE SCHOOLS

The Washington State SRTS program funded 50 projects between 2004 and 2008, which involved 81 schools. Two schools, Taholah Elementary and Taholah High School, received SRTS funding both in the 2004/2005 period and in the 2005/2007 biennium.

The 81 schools' addresses and codes were extracted from the Office of the Superintendent of Public Instruction (OSPI) website (http://www.k12.wa.us/DataAdmin/default.aspx#download). Most schools were geocoded by using ESRI StreetMap USA. However, because data were missing in Street MAP USA for a few parts of Washington state, four schools were geocoded to the Washington state routes network data. Table E.1 summarizes the schools that were not geocoded to the StreetMAP USA

Table E.1: Schools not geocoded to the StreetMAP USA

	School name (WSDOT)	school code (OSPI)	Address (OSPI)	City and County (OSPI)	ZIP (OSPI)	Note
1	Crescent School	3473	50350 HWY 112 (SR112, milepost 60.34)	JOYCE, Clallam Co	98343-0020	Geocoded with help of Charlotte Claybrooke using SR mile post data. Pedestrian and bicycle collisions were not found around school. ***
2	Keller School (K-6)	2602	SCHOOL ROAD (SR 21, milepost 116.82)	KELLER, Ferry Co	99140-0367	DITTO above
3	Taholah Elementary School	5032	600 CHITWHIN DR (SR 109, milepost 40.12)	TAHOLAH, Grays Harbor Co	98587-0000	DITTO above
4	Taholah High School	3580	600 CHITWHIN DR (SR 109, milepost 40.12)	TAHOLAH, Grays Harbor Co	98587-0000	DITTO above
5	Gaiser Middle School	3902	16814 SE 38TH CIRCLE	VANCOUVER, Clark Co	98613-0000	Geocoded by changing the zip code to 98683

The 81 geocoded schools with an SRTS program are located throughout Washington state. Sixty of the schools are within the limits of an incorporated city (Figure E.1).

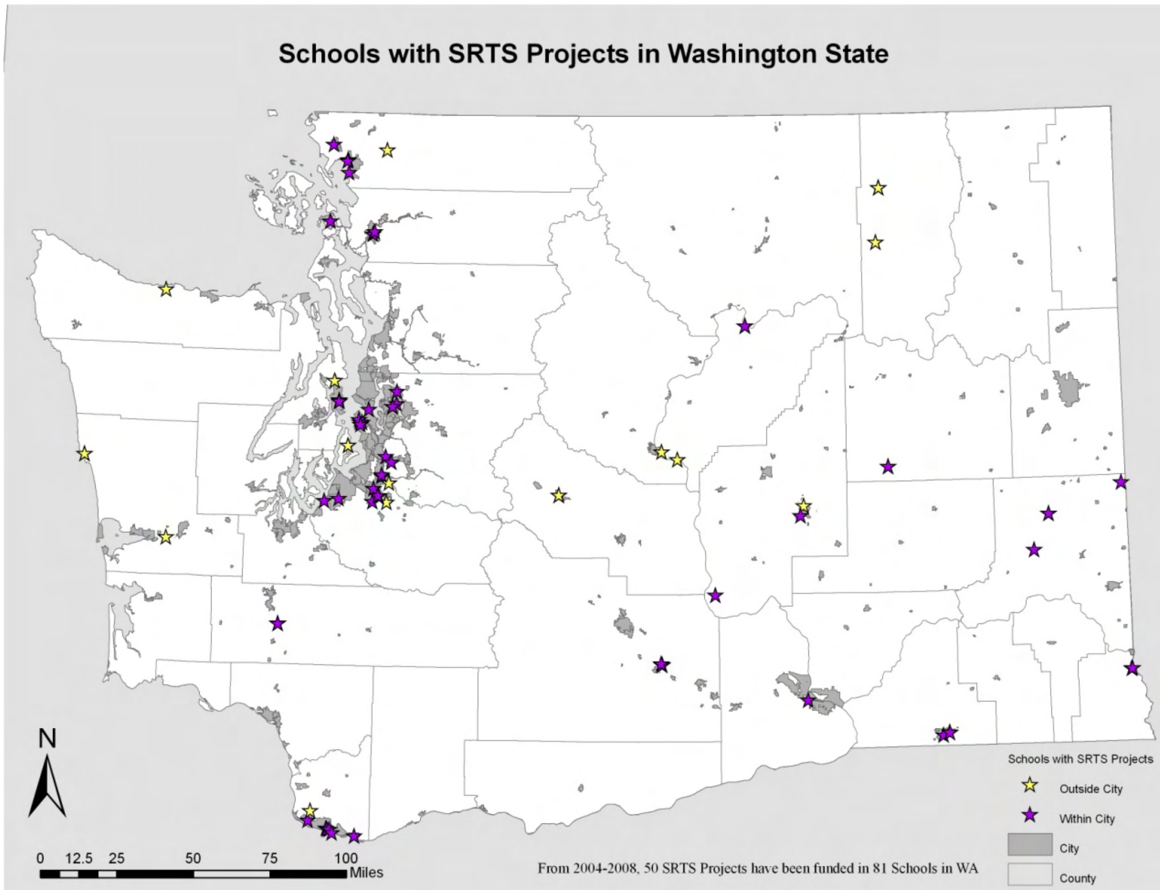


Figure E.1: Schools with SRTS projects in Washington state

3. SCHOOL CHARACTERISTICS

According to OSPI, schools involved in the WSDOT SRTS projects had more than 30,000 K-12 students. About one-third of the students were non-whites, a percentage similar to that of non-white students in K-12 in Washington state. More than two-fifths of the students from those schools (about 14,000 students) commuted to school by school bus. Table E.2 lists some of the characteristics of schools in the three SRTS funding cycles.

Table E.2: Characteristics of schools with SRTS projects

	SRTS Projects			Total
	2004/2005[a]	2005/2007	2007/2009	
# of SRTS projects	11	20	19	50
# of schools with SRTS projects	21	33	29	81 (83)[b]
School enrollment in 2006 (OSPI data)	9,976	11,884	12,076	33,936
Students taking school bus in 2006	3,115 (31.22%)	6,769 (56.96%)	5,250 (43.47%)	15,134 (44.60%)
Percentage of non-white students in 2006 (OSPI data)	30.05%	50.19%	27.87%	36.3%
Students with reduced or free lunch (OSPI data)	844.5	1256.2	1152.1	3352.8

[a] Pilot projects that are limited in scope and not prioritized on the basis of the current review criteria. Lessons learned from these projects were used to make changes to the program in 2005.

[b] Two schools, Taholah Elementary and Taholah High schools, received SRTS funding in 2004/2005 and in 2005/2007.

4. SCHOOL NEIGHBORHOOD CHARACTERISTICS

Data about the characteristics of neighborhoods around schools with SRTS projects were obtained from block groups of the Census 2000.

For 57 schools, there were 368 Census 2000 block groups that were entirely contained within a 2-mile buffer of the schools. For the remaining 24 schools, 21 Census 2000 block groups were also selected because more than half of their areas were overlapping with the 2-mile buffer. Overall, 389 census block groups were included in this summary.

There were 493,335 people living around the SRTS project areas, with 215,924 housing units and 204,093 households. In comparison with Washington state as a whole, the SRTS project areas had a somewhat higher percentage of non-white population, a lower percentage of family households, and a higher percentage of households with income of less than $15,000. This indicated that SRTS schools were located in neighborhoods that were more disadvantaged than the average neighborhoods in the state. It should be emphasized that those were the characteristics of the population living in the neighborhood of the schools, and not necessarily those of the schools’ population (Table E.3)

Table E.3: Characteristics of SRTS school neighborhoods as compared to those of Washington state

		Count	% SRTS Project Area	% for entire state
Population	Total	493,335		
Gender	Male	246,041		
	Female	247,987	50.13%	50.28%
Age	< 3	26,266	5.32%	5.32%
	4-19	103,819	21.04%	23.11%
Race	White	369,394	74.88%	81.69%
Household	Total	204,093		
Number	Family household	115,288	56.49%	66.43%
Income	< $15,000	32,924	16.13%	13.06%
	$15,000-$25,000	26,861	13.16%	11.67%
	]> $100,000	20,921	10.25%	12.56%
Housing Units	Total	215,924		

In addition to providing information on school neighborhood characteristics, geocoded school locations will also be used to objectively analyze the effect of the program on safety. School locations will be analyzed along with geocoded locations of pedestrian and bicycle collisions involving school-age children. Preliminary analyses are under way, and these data will continue to be tracked so that these indicators can inform the safety impacts of the program.

5. SRTS PROJECT SUMMARIES 2005-2006

This section provides a brief description of 15 completed SRTS projects that were funded in 2006.

Project	Blue Ridge Elementary Safe Routes to School – 7186(003)
City	Walla Walla
Grant Amount	$117,536
School(s)	Blue Ridge Elementary School

	NOT AVAILABLE AT THIS TIME
Figure E.2a: Blue Ridge Elementary School before the SRTS project	**Figure E.2b: Blue Ridge Elementary School after the SRTS project**

Project Description: Engineering improvements included construction of a sidewalk, pedestrian ramps, and an ADA-accessible railroad crossing. The education curriculum included a pedestrian safety clinic, establishment of safety sites, and printing and distribution of educational materials.

Infrastructure Location: Chestnut Street from the entrance of the school to 9th Street.

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other)

- 950 feet of sidewalk
- Railroad crossing improvement
- Crosswalk markings

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project	50
Walking and Biking After Project	67
% Change	34% increase

Final Report Highlights and Quotes: Noted project side effects included improved neighborhood aesthetics, improved pedestrian access to the Veteran's Administration hospital, and improved access for all residents. School faculty, police, nearby business owners, and residents complimented the project and felt that it had made a positive impact on the community.

Project	New and Connecting Sidewalks – LaVenture Middle School – SRTS-7337(002)
City	Mt Vernon
Grant Amount	$190,000
School(s)	Centennial, Lincoln, Jefferson, and Little Mountain elementaries and LaVenture Middle School

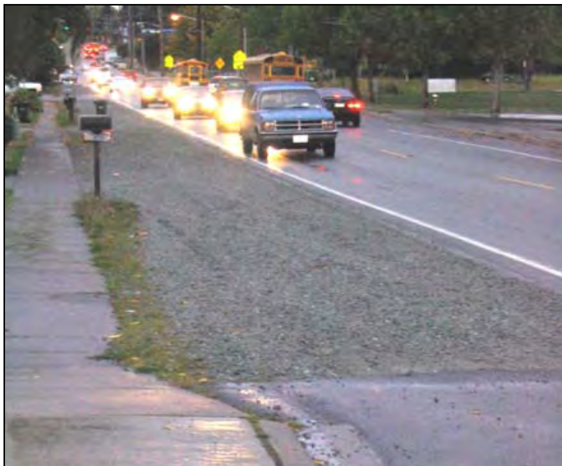


Figure E.3a: LaVenture Middle School before the SRTS project

Figure E.3b: LaVenture Middle School after the SRTS project

Project Description: Engineering improvements included construction of sidewalk, curb and pedestrian-activated crosswalk warning system. The education curriculum included walking and biking as a safe and healthy alternative and a pedestrian awareness campaign. Enforcement efforts included installation of solar-powered speed signs.

Infrastructure Location: LaVenture Road between Kulshan Trail and East Viewmont Street, intersection at LaVenture and Kulshan Trail.

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other)

- 1098 feet of sidewalk and shoulder/roadway improvements
- Solar-powered active speed detection signs
- Pedestrian-activated crosswalk warning system
- Mid-block crosswalk with pedestrian-activated crosswalk warning system

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project:	46
Walking and Biking After Project:	110
% Change:	139% increase

Final Report Highlights and Quotes: An average of 71 children participated in the morning Walking Wednesdays and Walking Fridays program at Lincoln Elementary. In 2008 students and parents from Centennial school worked with the school board to create a bicycle helmet policy for the district. Mount Vernon police reported significant reductions in speeding in the school speed zones as a result of police presence and the active speed detection signs. City police believe that the speed detection signs greatly affected school zone speeds.

Project Safer Walking & Bicycling Routes for Students – 2017(087)
City Vashon Island
Grant Amount $236,500
School(s) Chautauqua Elementary and McMurray Middle School

	NOT AVAILABLE AT THIS TIME
Figure E.4a: McMurray Middle School and Chautauqua Elementary School before the SRTS project	**Figure E.4b: McMurray Middle School and Chautauqua Elementary School after the SRTS project**

Project Description: Engineering improvements included installation of sidewalks, crosswalks, signing, lighting, and bicycle racks. The education curriculum included a bicycle safety program and a walking/pedometers program. Enforcement efforts included use of speed radar trailers.

Infrastructure Location: SW Cemetery Road between the elementary and middle schools and on the school grounds

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other)

- 600 feet of sidewalk
- Four raised and stripped crosswalk/speed tables
- Four pedestrian refuge locations (in parking lot)
- A landscaped traffic island to redirect traffic and reduce vehicle/pedestrian conflicts
- A stop sign and pedestrian crossing
- Bicycle parking racks at both schools
- Illumination

Counts of Students Walking and Biking to and from School
Walking and Biking Before Project: 7
Walking and Biking After Project: 32

% Change: 357% increase

Final Report Highlights and Quotes: The grant allowed the school district to dramatically increase safety for student pedestrians and cyclists. The reorientation of vehicle routes eliminated the need for a crossing guard at one location. The project stimulated an additional investment by the county (50,000) to connect the school entrance to the new facilities.

Project	SR 112 Safe Routes to School – 0112(016)
City	Joyce
Grant Amount	$116,500
School(s)	Crescent School

	
Figure E.5a: Crescent School before the SRTS project	**Figure E.5b: Crescent School after the SRTS project**

Project Description: Engineering improvements included construction of a separated sidewalk. Education activities included instruction on bicycle and pedestrian safety, safety equipment (e.g., helmets, safety lighting), and health and exercise.

Infrastructure Location: State Route 112, Mile Post 50.3 to Mile Post 51.

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other): 2000 feet of sidewalk

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project:	32
Walking and Biking After Project:	118
% Change:	269% increase

Final Report Highlights and Quotes: The new sidewalk, named "Logger's Lane," is a matter of pride for the community, as it is the first sidewalk that the community has ever had.

Project	Vancouver School District, Discovery Middle School
City	Vancouver
Grant Amount	$108,900
School(s)	Discovery Middle School

	NOT AVAILABLE AT THIS TIME
Figure E.6a: Discovery Middle School before the SRTS project	**Figure E.6b: Discovery Middle School after the SRTS project**

Project Description: Engineering improvements included installation of a chain link fence on both sides of a pedestrian overpass. The education curriculum included instruction on walking and bicycling transportation, personal health and safety, how transportation choices affect the environment, and distribution of safety materials. Enforcement efforts included increased police presence.

Infrastructure Location: East 39th Street and I-5.

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other): Installation of an overpass safety fence.

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project	52
Walking and Biking After Project	92
% Change	77% increase

Report Highlight: Students at all grade levels are now regularly receiving education about safe walking and biking.

Project Safe Passage – SRTS-
City East Wenatchee
Grant Amount $140,000
School(s) Kenroy Elementary

	
Figure E.7a: Kenroy Elementary before the SRTS project	**Figure E.7b: Kenroy Elementary after the SRTS project**

Project Description: Engineering improvements included construction of a sidewalk, curb, and gutter. Education efforts included a walk to school campaign, crossing guard training, and a bicycle safety program. Enforcement activities included enhanced enforcement of school zone speed limits and stop and yield for pedestrians near the school.

Infrastructure Location: North Jonathan and North Kansas Ave between 5th St NE and 8th St NE.

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other): 2000 feet of sidewalk improvements

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project	95
Walking and Biking After Project	118
% Change	24% increase

Final Report Highlights and Quotes: "The most important consideration, however, is that these students are now safer as they walk to and from school on a sidewalk, rather than on a street or gutter." Jon Abbot, Principle Kenroy Elementary

Project	86th Street Sidewalks – 0665(001)
City	Lakewood
Grant Amount	$177,000
School(s)	Lochburn Middle School

Figure E.8a: Lochburn Middle School before the SRTS project

Figure E.8b: Lochburn Middle School after the SRTS project

Project Description: Engineering improvements included installation of a curb, sidewalks, and yellow-flashing lights in the school zone. The education curriculum included guidance to enhance safety, physical education programs, an all-school assembly to encourage riding bikes to school, and direct classroom education.

Infrastructure Location: 86th Street SW from Bridgeport to Lochburn Middle School and at the intersection of Steilacoom Blvd and Gravelly Lake Dr

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other)

- 1056 feet of sidewalk
- Three yellow-flashing school zone beacons

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project:	26
Walking and Biking After Project:	42
% Change:	62% increase

Site Observation: All of the children using the crossing waited for the light and walked in the crosswalk. A total of 39 children and two adults used the intersection during the observation period. At one point a football, which was being passed around by four boys, fell into the roadway. One of the boys stepped into the road to get the ball, and a motorist had to change lanes to avoid a conflict. Fortunately, traffic was moving slowly, and the vehicle was able to accommodate the student. Most vehicles appeared to be traveling the posted speed of 20 MPH. There was a notable reduction in speed at the flashing beacon signs. Local law enforcement passed through the intersection twice. Three bicycles were parked in the school bike racks on the opposite side of the school.

Final Report Highlights and Quotes: The effects of the yellow flashing school zone beacons have been remarkable. Speeds during kids' travel time to and from school were typically 26.5 MPH before installation. After the lights were installed and increased enforcement was provided, typical travel speeds have been 20.4 MPH. There haven't been any increases in the numbers of students walking down 86th street yet because the traffic signal and sidewalk improvements planned by the city for Bridgeport Way, which are being paid for from a separate funding program, haven't been completed.

Project	Longview Elementary Safe Routes to School – 2013(066)
City	Moses Lake
Grant Amount	$132,365
School(s)	Longview Elementary School

Figure E.9a: Longview Elementary School before the SRTS project

Figure E.9b: Longview Elementary School after the SRTS project

Project Description: Engineering improvements included construction of a sidewalk, curb, and activity path. The education curriculum included parent and student pedestrian and bicycle safety programs.

Infrastructure Location: Maple Drive from Stratford Road to the railroad tracks and sidewalks on Apple Lane from Maple Drive to the school.

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other)

- 2165 feet of sidewalk/activity path
- Pedestrian crosswalk improvements

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project:	63
Walking and Biking After Project:	86
% Change:	37% increase

Final Report Highlights and Quotes: We found that construction, education, and enforcement clearly have made for safer travel conditions for our students. The majority of students who live along Maple are consistently using the improved pathways to travel to and from school. Parents and staff have indicated that the improvements have had a positive impact on community and school pride.

Project	Safe Routes to School – 0750(001)
City	Mattawa
Grant Amount	$150,000
School(s)	Mattawa Elementary, Middle and High

Figure E.10a: Mattawa elementary, middle, and high before the SRTS project

Figure E.10b: Mattawa elementary, middle, and digh after the SRTS project

Project Description: Engineering improvements included construction of a walking path and installation of school and pedestrian beacons along the routes. The education curriculum included educating students and drivers about street and pedestrian safety. Enforcement efforts included improving traffic safety around schools.

Infrastructure Location: Boundary from Saddle Mountain to 4th, Riverview from Saddle Mountain to Government, and William from Government to 4th

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other)

- 2100 feet sidewalk
- Four crosswalk and school zone flashing beacons

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project:	240
Walking and Biking After Project:	346
% Change:	44% increase

Final Report Highlights and Quotes: "We feel our students are a lot safer walking to and from school, as well as getting exercise." Patrick Ulery, Wahluke School District.

Project	Safe Walk and Wheel-Safe Routes to School Program – SRTS – 8030(004)
City	Ferndale
Grant Amount	$151,000
School(s)	Mountain View Elementary

Figure E.11a: Mountain View Elementary before the SRTS project

Figure E.11b: Mountain View Elementary after the SRTS project

Project Description: Engineering improvements included installation of sidewalks, signage, and signalization. The education curriculum included how to walk, bike, and share the road safely; bicycle rodeos; walking school buses; and a walk and bike to school day.

Infrastructure Location: Main Street and Douglas Road

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other): Traffic signal with pedestrian-activated crossing signal.

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project:	77
Walking and Biking After Project:	137
% Change:	78% increase

Final Report Highlights and Quotes: There were 195 students who participated in the Walk and Wheel events. A significantly higher number of children participated in the Bike to Work and School Day event in 2008 (76) than did in 2007 (21). Walking and bicycling traffic safety education was provided to 450 students.

Project	Salter’s Point Elementary School Safe Routes to School Project – 1245(001)
City	Steilacoom
Grant Amount	$367,948
School(s)	Saltar's Point Elementary School

Figure E.12a: Saltar's Point Elementary school before the SRTS project

Figure E.12b: Saltar's Point Elementary school after the SRTS project

Project Description: Engineering improvements included construction of a sidewalk and curb. Education activities included a bicycle safety fair and monthly bicycle and walking articles in the newsletter. Enforcement efforts included school zone safety emphasis patrols.

Infrastructure Location: 3rd Street from Beech Street to Grove Street, Grove Street from Union Avenue to 3rd Street, and from 3rd Street to 1st Street.

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other)

- 3500 feet of sidewalk
- Curb extensions
- Bicycle lane
- Crosswalks

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project:	14
Walking and Biking After Project:	27
% Change:	93% increase

Final Report Highlights and Quotes: Walking and biking counts were conducted with 4th and 5th graders only. “We expect the percentage of walkers/bicyclists to continue to increase as more parents and students become familiar with the improvements. We continue to receive many compliments related to these improvements and the increased level of safety they provide. This project represents a major infrastructure investment that continues to pay dividends to the community by providing a safe, reliable and “walk-able” corridor for everyone to enjoy.” Mark Burlingame, Steilacoom Public Works.

Project	NE 104th Street Sidewalk Project – 2006(050)
City	Vancouver
Grant Amount	$148,000
School(s)	Sarah J Anderson Elementary School and Gaiser Middle School

	
Figure E.13a: Sarah J Anderson Elementary School and Gaiser Middle School before the SRTS project	**Figure E.13b: Sarah J Anderson Elementary School and Gaiser Middle School after the SRTS project**

Project Description: Engineering improvements included sidewalk improvements. Education activities included bicycle and pedestrian safety training and distribution of safety materials. Enforcement efforts included increased police presence.

Infrastructure Location: NE 104th Street from NE 28th to NE 23rd.

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other): 350 feet of sidewalk

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project	51
Walking and Biking After Project	63
% Change	24% increase

Final Report Highlights and Quotes: When talking with long-time crossing guards, they stated that there is an obvious increase in the number of walking/biking students in the area throughout the year and that the overall “feel” is safer and more “neighborhood-like” than it was four years ago. Crossing guards also noted that several students who had graduated from Anderson Elemetary to Gaiser Middle school were using the new sidewalk at the beginning of the new school year. Completion of this project has enabled the school district to eliminate one nearby bus stop.

Project	St. John/Endicott School District 322 – 1135(003)
City	St. John
Grant Amount	$23,100
School(s)	St John Elementary and High School

	NOT AVAILABLE AT THIS TIME
Figure E.14a: St John elementary, middle and high before the SRTS project	**Figure E.14b: St John elementary, middle and high after the SRTS project**

Project Description: Engineering improvements included repair and construction of a sidewalk on the school walk route. The education curriculum included developing and distributing educational literature and workshops on safe walking and biking.

Infrastructure Location: Along Nob Hill West of Loomis St.

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other): 200 feet of sidewalk

Counts of Students Walking and Biking to and from School
Walking and Biking Before Project: 27
Walking and Biking After Project: 45
% Change: 67% increase

Final Report Highlights and Quotes: Twenty-five percent of the students who attend school either walk and/or ride bicycles to school.

"When people feel safe walking and/or biking to and from school, they will increase the number of times they utilize that mode of transportation; not only does this improve the quality of air in our environment, but it gives adults opportunities to be positive, healthy role models for our children and increases the level of physical fitness." "Thank you again for making our community and school a more safe and better place to live." Rick Winters, Superintendant, St. John – Endicott School District.

Project Stevenson Elementary School – 2040(006)
City Bellevue
Grant Amount $132,000
School(s): Stevenson Elementary School, and Odle Middle School

Figure E.15a: Stevenson Elementary School and Odle Middle School before the SRTS project

Figure E.15b: Stevenson Elementary School and Odle Middle School after the SRTS project

Project Description: Engineering improvements included crosswalks and signage. Education activities included two programs to raise awareness about pedestrian safety. Enforcement efforts addressed school zone speed limits.

Infrastructure Location: NE 8th Street and 143rd Avenue NE intersection

Infrastructure Improvements (number of feet of sidewalk, multi-use path, or bike lane, crossing improvements and other)

- Crosswalk realignment
- Pedestrian countdown signal
- Curb extension
- Curb ramps upgrade
- School zone signage upgrade

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project	160
Walking and Biking After Project	165
% Change	3% increase

Final Report Highlights and Quotes: Following the project improvements, the number of students using the crosswalk doubled (19 to 38), and the number of children being dropped off by a family member decreased by 29 percent. As a result of increased enforcement patrols in the school speed zone, the average number of stops/citations decreased from ten per hour during the first month to six per hour during the last month of school.

Project	Tekoa School District SR 274 Poplar Street Sidewalks – 0274(006)
City	Tekoa
Grant Amount	$73,150
School(s)	Tekoa Elementary ASB

	
Figure E.16a: Tekoa Elementary ASB before the SRTS project	**Figure E.16b: Tekoa Elementary ASB after the SRTS project**

Project Description: Engineering improvements included construction of sidewalks. Education activities included promotion of the use of the safe routes and a physical activity component in PE classes.

Infrastructure Location: Poplar Street (aka State Routes 274) from the intersection with State Route 27 to the school entrance.

Infrastructure Improvements (number of feet of sidewalk, multi-use path or bike lane, crossing improvements and other)

- 950 feet of sidewalk

Counts of Students Walking and Biking to and from School

Walking and Biking Before Project	9
Walking and Biking After Project	19
% Change	111% increase

Final Report Highlights and Quotes: The County Sheriff Deputy commented that the sidewalk provides a much better area to patrol, and it will act as a reminder to drivers to slow down.

"The homeowners were all very cooperative and were pleased with the final project." Wayne Massie, Superintendent, Tekoa School District

6. CHILDREN WALKING OR BIKING TO SCHOOL – 2005/2007

One of the main performance measures for the Washington State Safe Routes to School Program is the number of children walking and biking to school. This section presents pre-/post-walking and biking data for the 2005 to 2007 biennium. Pre-2005 data were not available because tallying the number of children walking or biking to school was not required for the pilot projects preceding this period. Post-2007 data will be available, when the projects funded in the 2007 to 2009 biennium are completed. In 2006, 20 projects were awarded Safe Routes to School funding. To date, 15 have completed their projects and reported post-project numbers of children walking and biking to school.

Table E.4: Number of children walking or biking to school – 2005/2007 SRTS projects

School name	School code	Children walking or biking		Percent Change
		Before SRTS	After SRTS	
Blue Ridge Elementary	4193	50	67	+34%
Centennial Elementary	4367	46	110	+139%
Chautauqua Elementary School	4468	7	32	+357%
Crescent School	3476	32	118	+269%
Discovery Middle School	4376	52	92	+77%
Kenroy Elementary School	3212	95	118	+24%
Lochburn Middle School	3602	26	42	+62%
Longview Elementary School	3153	63	86	+37%
Mattawa Elementary, Middle and High Schools	3152	240	346	+44%
Mountain View Elementary	3364	77	137	+78%
Saltar's Point Elementary School	3827	14	27	+93%
Sarah J Anderson Elementary and Gaiser Middle School	3016	51	63	+24%
St John Elementary and High Schools	3068 / 3069	27	45	+67%
Stevenson Elementary School	2682	160	165	+3%
Tekoa Elementary ASB	2052	9	19	+111%
Total		897	1398	+56%

Counts of children walking or biking to schools were provided independently from each project. The counts were conducted between 2005 and 2009. Methods varied among projects, but in most cases the counts were taken by school staff. Projects that were awarded funding in 2007 were encouraged to use the National Center for Safe Routes to School Student In-Class Travel Talley form.

Counts performed in these schools showed a 56 percent average increase in the number of children walking or biking to school following the completion of the Safe Routes to School projects. Stevenson Elementary had the smallest increase, perhaps because a relatively large number of children at that school was already walking or biking before the project. Starting with a small number of children walking or biking to school, Chautauqua Elementary, had the largest increase in the number of children walking or biking to school. Overall, changes in the numbers of children walking or biking to school varied greatly.

Numbers of children walking and biking to school will continue to be evaluated as more projects come to completion. Traffic safety and collision information will also continue to be tracked so that these indicators can inform the safety impacts of the program. Additional evaluation tools including a parent survey will also be used to assess other outcomes such as changes in awareness, attitudes, and information about pedestrian/bicycle safety.