

WALK, RIDE AND LEARN: STUDENTS' DISCOVERY OF NATURE AND OTHER ENVIRONMENTAL ELEMENTS ON THEIR ROUTES TO SCHOOL

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Abstract.—America's youth face epidemic levels of childhood obesity and are suffering from a lack of exposure to the outdoors. The Safe Routes to School Program, sponsored by the U.S. Department of Transportation, National Highway Traffic Safety Administration, aims to improve access to safe routes to school for elementary and junior high school children. As a required component of the Safe Routes to School program, researchers use survey instruments and observation tallies to evaluate the effectiveness of the program and assess related local investments in infrastructure and social marketing. The data presented here are from a 2007 and 2008 survey of more than 12,000 Michigan students. The goal of the research is to determine factors that influence transportation behaviors to and from school. Specifically, this research examines students' modes of transportation to school and assesses built structures, natural elements, and social elements along school routes.

1.0 INTRODUCTION AND LITERATURE REVIEW

Parents, teachers, and community planners face many challenges to the health and well-being of our nation's youth. Childhood obesity brought on by a lack of physical activity has become a main topic of concern. One possible way to introduce more physical activity into children's lives is to encourage walking or biking to school. However, opportunities to walk or bike to school diminish when schools are far away from residential communities and when people rely primarily on their vehicles for transportation. The national Safe Routes

to School (SRS) program was created in 2006 to help schools encourage students to walk and bike to school. The program works with primary and middle schools that intend to implement infrastructure changes or social marketing programs to make it safer and more feasible for children to walk or ride their bikes to school.

Louv (2005) raised awareness of an additional challenge in his book *Last Child in the Woods*. He explains that meaningful and extensive outdoor play is lacking in the lives of many young people, who consequently suffer from "nature deficit disorder." Today's children spend far less time outdoors than any past generation. Video games and television keep them indoors, deprived of the experiences and skills they would gain from playing outdoors. Society also places a strong emphasis on academic achievement, and many parents encourage their children to focus on studying after school rather than participating in outdoor activities. Finding inventive ways to incorporate or re-incorporate outdoor physical activity into children's daily routines is an essential first step in reversing these anti-outdoor trends. The Safe Routes to School program encourages parents, teachers, and community planners to make students' routes to school safer as one potential part of the solution.

Researchers have identified many potential benefits from the type of immersion in or exposure to nature that kids may experience while walking or biking to school. Kuo and Taylor (2004) examined the effects of outdoor play on the symptoms of Attention Deficit/Hyperactivity Disorder (ADHD) in children ages 7 to 12 years old. They found that ADHD symptoms were reduced the most when children were exposed to natural settings. Ebbeling et al. (2002) found that regardless of gender and race, children who engaged in less physical activity were more likely to be obese. The Ecological Model of Four Domains of Active Living by Sallis et al. (2006) also emphasizes the important influence of natural features in motivating the adult population to engage in physical activity. This model suggests that features and structures such as parks, trees, and farmlands could be highlighted

or incorporated along school routes to help motivate students to walk or bike to school.

The present research analyzed students' self-reports of what they see on their routes to school and the influence that mode of transportation has on those observations. The observation items were organized a priori into three structural categories: built, natural, and social. The research problem was to determine how mode of transportation influenced observations. Additionally, distance traveled was considered as a possible motivating factor; we expected that students who walked or biked, particularly if they lived less than a mile from school, would report higher levels of social and natural environmental factors. Anecdotal evidence also suggested that kids interact more with others when walking or biking than when riding in a school bus or car.

The purpose of the research is to highlight positive environmental factors and draw attention to negative environmental factors along children's school routes. These findings could inform community planning efforts, school designs, and social programs that would encourage students to walk or bike to school.

2.0 METHODS

Schools in the Safe Routes to School Program are required to participate in evaluations of the program's effectiveness in their communities. The population for this analysis was 245 schools with a total enrollment of 97,960 that registered for the SRS program in 2007 and 2008. The sample consisted of 12,722 students from 54 schools that registered in the program and participated in the evaluation part of the program. The sample included urban (44%), suburban (28%), and rural (28%) schools. The students were from primary and middle school grades; the greatest percentage of respondents were 4th graders (18%) and 3rd graders (17%), as shown in Table 1.

Data were collected using a two-page paper survey written in a kid-friendly format. Teachers and parent volunteers administered the surveys in a classroom setting. Schools ordered paper surveys from Michigan State University and returned completed surveys to

Table 1.—Distribution of respondents' grade levels

Grade (n = 12,722)	Percentage of Respondents
Kindergarten	1%
1st Grade	3%
2nd Grade	6%
3rd Grade	17%
4th Grade	18%
5th Grade	16%
6th Grade	13%
7th Grade	14%
8th Grade	11%
Total	100%

the University for keying and analysis. Schools were encouraged to complete these surveys in the fall and spring, when the weather was amenable to being outdoors. The week that students completed the surveys, survey administrators also conducted a classroom tally of morning and afternoon modes of transportation. Parents were asked to complete a separate survey as well.

The research presented here focused on three pieces of data: students' modes of transportation to school on the morning that the survey was administered (actual behavior); which of 15 physical features students reported seeing on their way to school that day; and distance (in miles) from their home to school. The mode of transportation question was dummy-coded so that walkers, bikers, bus takers, and car riders could be analyzed as separate segments. The observation items and distance questions were also nominal data. The observation items were put into three categories: "Built," "Natural," and "Social." Built structures comprised houses where people live, abandoned houses, apartment buildings, stores, gas stations, factories, parking areas, empty lots, and construction areas. Natural structures were parks, trees, and farmland. Social structures consisted of neighbors, strangers, and crime.

Descriptive and nonparametric statistics were used to examine the relationship between modes of transportation and students' reported observations of what they passed on the way to school. Statistical analysis was conducted on the entire sample, as well as on a subsample of students who live less than a mile from

school. Because of the large sample size, a phi coefficient was used as a measure of association (Sirkin 1995) with nonparametric data. Using the phi coefficient, values less than 0.2 indicate a negligible relationship, values from 0.2 up to 0.5 indicate an important relationship, and values between 0.5 and 1.0 indicate a very strong relationship.

3.0 FINDINGS

Thirty-nine percent of students rode to school in their parents' cars on the morning of the survey (Table 2). Riding the bus (36%) and walking (13%) were the next most-common modes of transportation. Only 1 percent of all respondents had ridden their bikes to school, but data from bikers receive special attention in this analysis because of the potential health benefits of biking to school versus riding in a motor vehicle. Other possible modes of transportation were riding with siblings, riding in someone else's car, riding the city bus, rollerblading, or skateboarding; these options combined represented 11 percent of the sample. Slightly less than one-third (31%) of the students lived within a mile of school, 36 percent lived more than a mile away, and the remaining 33 percent checked "don't know." Further analysis showed that the majority (67%) of students who walked to school lived within a mile of the school, as did the majority of students who biked (Table 3). Students who lived more than a mile from school were more than twice as likely to ride a school bus to school than those who lived less than a mile away (Table 3).

The first round of analysis included all the students in the sample. More than 90 percent reported seeing built elements, and more than 80 percent reported seeing natural elements on their way to school across four modes of transportation (i.e., walking, biking, riding the bus, riding in a parent's car) (Table 4). Seven out of ten children reported seeing social elements, regardless of transportation mode. There were no significant relationships between built structure observations and transportation mode. More than half of the students in all transportation modes saw parking lots, which are considered an unsafe element on school routes because of high traffic levels (Table 5). More than half of the bus riders and students who rode to school in their parents'

Table 2.—Distribution of mode of morning transportation

Mode of Morning Transportation (n = 12,722)	Percentage of Respondents
Walk	13%
Bike	1%
Ride School Bus	36%
Ride in Parent's Car	39%
Other (includes: City Bus, With Siblings, Other Person's Car, Rollerblading, Skateboarding)	11%
Total	100%

Table 3.—Mode of morning transportation by distance traveled

Mode of Morning Transportation (n = 12,722)	Up to a Mile*	Greater than a Mile*
Walk	67%	10%
Bike	65%	16%
Bus	18%	49%
Parent's Car	32%	36%

*Students were also allowed to select "Don't Know" when asked how far they lived from school. This response accounts for the remaining percentages in each transportation category.

cars observed gas stations, as did one-third of walkers and bikers. Gas stations could also be dangerous to walkers and bikers due to high traffic flow and cars entering and leaving the roadway across walking paths. Empty houses also have a potentially negative impact on students' safety; more than one-third of all students across the four modes of transportation reported seeing empty houses on their way to school.

Of the three natural elements in the list, trees were most commonly reported (Table 6). Significantly more walkers versus nonwalkers ($\phi = .16$) and more bus riders versus non-bus riders ($\phi = .20$) reported seeing farmlands.

Observations of social elements did not differ significantly across the four modes of transportation. More walkers than students using other modes of transportation saw neighbors (considered a positive social element) (Table 7). Bikers and walkers saw more crime than students who took the bus or rode with their parents to school.

Table 4.—Observation of built structures, natural elements, and social elements by all respondents

	Walkers	Nonwalkers	Bikers	Nonbikers	Bus Riders	Non-Bus Riders	Parent's Car	Non-Parent's Car
Natural	82%	87%	88%	87%	90%	85%	86%	87%
Social	77%	77%	74%	77%	79%	76%	76%	78%
Built	91%	93%	92%	93%	95%	92%	93%	93%

Table 5.—Observation of built elements by all respondents

Built Elements	Walkers	Nonwalkers	Bikers	Nonbikers	Bus Riders	Non-Bus Riders	Parent's Car	NonParent's Car
Houses Where People Live	83%	88%	83%	87%	90%	85%	87%	87%
Empty Houses	41%	40%	37%	40%	39%	41%	40%	40%
Apartments	27%	38%	30%	36%	41%	33%	36%	37%
Stores	45%	62%	41%	60%	65%	57%	61%	59%
Gas Stations	32%	57%	33%	54%	60%	51%	56%	53%
Factories	8%	12%	9%	11%	11%	11%	12%	10%
Parking Areas	51%	61%	52%	59%	63%	57%	59%	59%
Empty Lots	30%	34%	28%	34%	35%	33%	34%	34%
Construction Areas	17%	28%	20%	26%	29%	24%	27%	26%

Table 6.—Observation of natural elements by all respondents

Natural Elements	Walkers	Nonwalkers	Bikers	Nonbikers	Bus Riders	Non-Bus Riders	Parent's Car	Non-Parent's Car
Parks	34%	36%	42%	35%	37%	34%	35%	35%
Trees	79%	35%	83%	84%	87%	82%	83%	85%
Farmlands	4%	21%	11%	19%	29%	13%	16%	21%

Table 7.—Observation of social elements by all respondents

Social Elements	Walkers	Nonwalkers	Bikers	Nonbikers	Bus Riders	Non-Bus Riders	Parent's Car	Non-Parent's Car
Neighbors	64%	61%	59%	61%	63%	60%	59%	62%
Strangers	55%	62%	60%	61%	64%	59%	60%	61%
Crime	13%	9%	18%	9%	7%	11%	10%	9%

Next, we analyzed data from a subsample of students who lived less than a mile from school to determine whether their observations and experiences differed from those of the entire sample. Students living less than a mile from school were slightly more likely to report seeing built structures on their way to school (Table 8; compare with Table 4). More than 85 percent reported seeing “Houses where people live,” and more than one-third reported seeing empty houses (Table 9).

For natural elements, there was a significant relationship between observations of farmland among walkers versus nonwalkers ($\phi = .15$) and among bus riders versus non-bus riders ($\phi = .22$) (Table 10). A significant relationship also was found between bus riding and observations of farmland. Students who walked and rode the bus observed more farmland than those who did not walk or ride the bus.

Table 8.—Observation of built structures, natural elements and social elements by respondents living ≤1 mile from school

	Walkers	Nonwalkers	Bikers	Nonbikers	Bus Riders	Non-Bus Riders	Parent's Car	Non-Parent's Car
Natural	84%	86%	87%	85%	87%	85%	85%	86%
Social	79%	78%	82%	78%	79%	78%	76%	79%
Built	92%	93%	93%	93%	94%	92%	93%	93%

Table 9.—Observation of built elements by respondents living ≤1 mile from school

Built Elements	Walkers	Nonwalkers	Bikers	Nonbikers	Bus Riders	Non-Bus Riders	Parent's Car	Non-Parent's Car
Houses Where People Live	85%	87%	90%	87%	90%	85%	87%	87%
Empty Houses	40%	40%	34%	40%	38%	40%	39%	40%
Apartments	26%	33%	29%	31%	38%	30%	32%	31%
Stores	43%	53%	30%	50%	57%	48%	51%	49%
Gas Stations	28%	45%	22%	41%	48%	38%	45%	37%
Factories	7%	9%	5%	9%	10%	8%	8%	8%
Parking Areas	52%	57%	51%	56%	63%	55%	55%	55%
Empty Lots	29%	31%	22%	31%	31%	30%	31%	30%
Construction Areas	15%	15%	12%	20%	24%	19%	21%	19%

Table 10.—Observation of natural elements by respondents living ≤ 1 mile from school

Natural Elements	Walkers	Nonwalkers	Bikers	Nonbikers	Bus Riders	Non-Bus Riders	Parent's Car	Non-Parent's Car
Parks	30%	32%	34%	31%	31%	31%	31%	32%
Trees	82%	84%	84%	83%	86%	82%	82%	84%
Farmlands	3%	13%	11%	10%	23%	7%	9%	11%

Table 11.—Observation of social elements by respondents living ≤ 1 mile from school

Social Elements	Walkers	Nonwalkers	Bikers	Nonbikers	Bus Riders	Non-Bus Riders	Parent's Car	Non-Parent's Car
Neighbors	68%	64%	63%	65%	66%	65%	63%	67%
Strangers	55%	59%	65%	58%	61%	57%	57%	59%
Crime	12%	10%	16%	10%	7%	11%	10%	10%

There were no significant relationships between different modes of transportation and the social category of observations. Approximately 6 out of 10 students observed neighbors on their route to school across all

four modes of transportation (Table 11). More walkers (12%) and bikers (16%) observed crime than did students using any other mode of transportation.

4.0 DISCUSSION AND CONCLUSION

Primary and middle school students reported that they saw both positive and negative things on their way to school. Built elements were more prevalent than social or natural elements. While most students reported seeing trees, houses, and neighbors, an alarming number also saw strangers, crime, gas stations, parking lots, and empty houses. Surprisingly, walkers did not report higher levels of parks, trees, and farmlands along their routes than did nonwalkers. On a social thread, more walkers than nonwalkers reported seeing neighbors.

In this analysis, distance did not appear to moderate the relationship between environmental observations and transportation modes. Students who lived close to school had similar patterns of observations as their peers. More advanced statistical analysis of the data may uncover more nuanced findings.

If community planners, educators, and parents work together to develop safe routes to school, students may experience and observe more of the natural and social elements of their environment. This opportunity for observation could lead to a greater awareness of nature and may begin to help combat “nature deficit disorder.” This study shows that less than half of the students who walk or bike to school observe natural elements such as parks en route (Table 6). Creating safe routes to school that connect with parks would enable students to observe more natural elements on the way to school.

This study also showed that negative social structures such as strangers and crime (Table 7) and negative built structures such as empty houses, gas stations, and parking areas (Table 5) are prevalent on the school routes of Michigan students who walk or bike to school. These findings should be validated with walking audits

of the neighborhoods surrounding schools; audits are another element of the larger Safe Routes program. By eliminating negative environmental elements on students’ routes to school, parents, students, and school administrators may have an easier job promoting walking or biking to school.

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