ACTIVE TRANSPORTATION AMONG ELEMENTARY-AGED STUDENTS: WALKING OR BIKING TO AND FROM SCHOOL

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Abstract.—Heightened attention is being drawn to the health conditions linked to physical inactivity, particularly in children. Encouraging students to walk and bike to school encourages them to develop healthier lifestyles and to choose nonmotorized transportation at other times. The Safe Routes to School program, administered by the U.S. Department of Transportation National Highway Traffic Safety Administration, is a new approach to promoting physical activity, health, and wellness in children. Michigan researchers are applying attitude-behavioral models to evaluate relationships among children's beliefs, attitudes, intentions, and behaviors related to walking or biking to school. This paper presents data collected from more than 6,000 Michigan elementary school students in urban, suburban, and rural areas.

1.0 INTRODUCTION AND LITERATURE REVIEW

Professionals in fields related to health, recreation, education, urban planning, and transportation are more clearly identifying major concerns around childhood and adult physical inactivity (a risk factor contributing to health problems such as obesity, heart diseases, and diabetes) and transportation inefficiencies (mostly dependency on motorized travel in personal vehicles). Addressing these concerns includes promoting healthy lifestyles, active living, nonmotorized transportation, and modifications and improvements to the built environment where children and adults work, live, and play. A national program has been developed to address these concerns and to implement social marketing or programming and infrastructure changes in transportation and the built environment (Safe Routes to School National Partnership 2007). Safe Routes to School is authorized by the SAFETEA-LU[1] transportation legislation and funding. The act focuses on "safe, accountable, flexible, and efficient transportation" in an effort to leave a legacy of coordinated, nonmotorized transportation for future generations. The program is aimed at children in primary or middle schools and seeks to: enable and encourage children of all abilities to walk or bike to school; make these transportation choices safer and more appealing in order to promote healthy lifestyles and active transportation; and facilitate the planning and implementation of Safe Routes to School projects so that traffic around schools, fuel consumption by personal and bus vehicles, and, ultimately, air and noise pollution around schools are all reduced.

Marin County, CA, had one of the first programs in the United States to design a safer walking and biking environment for students and their families (Staunton et al. 2003). A 2-year initiative included social marketing to change attitudes and behaviors and extensive grant writing that secured more than $2 million for infrastructure changes. The result was a 64-percent increase in walking, a 114-percent increase in biking, a 91-percent increase in carpooling, and a 39-percent decrease in cars with one child being

[1] Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users.

transported. Michigan became one of the next places to plan for a statewide program with an 11-school pilot program in 2003 and 2004. In Michigan, special emphasis was placed on identifying differences in attitudes and behaviors among students in urban, suburban, and rural areas so that evaluation findings could better inform program planning, infrastructure investments, and program implementation.

As identified by Zhu and Lee (2008), the opportunity to walk to city schools in low-income urban areas may include more adverse conditions than exist in a suburban or rural setting. In their study of Austin, TX, Zhu and Lee found that Hispanics from low-income households were more likely to live in areas with poor street conditions (i.e., more crime, more motor vehicle accidents, and worse road conditions) than non-Hispanics and people from higher income urban households.

Recently, the Centers for Disease Control (CDC) (2008) and McDonald (2007) reported analysis of the National Personal Transportation Survey data for 1969 and 2001 (the McDonald analysis uses several more intermediate years of data). Both studies reveal dramatic declines in the rate of active transportation to school between 1969 and 2001. Deeper analysis into the causes of these declines has revealed the following: the distance between schools and residences has increased with schools more often being built in less developed suburban and rural areas; and the volume of traffic has increased around schools with parents more often driving children to school rather than allowing them to walk, bike, or ride the bus. McDonald (2007) attributed half of the decline in walking or biking to school to the growing distance between home and school for a greater number of children. The CDC recommends examining school locations, placing a greater emphasis on walkable environments, continuing with traffic engineering that improves safety and reduces accidents, and using Safe Routes to School tools. Such tools include education and encouragement for school administrators, students, and parents, and evaluation of these stakeholders over time to gauge attitude and behavioral changes.

Many program and transportation initiatives to encourage active lifestyles involve recreation-focused solutions. Recreation researchers are increasingly studying linkages between recreation, physical fitness, and other daily activities like traveling to school or work. Edwards (2008) emphasizes that urban recreation offers opportunities to encourage active living and spending more time outside. He claims that building and promoting accessible and safe trails between neighborhoods, parks, schools, job locations, and other community places will give communities a competitive advantage and make them a preferred choice for potential residents. Edwards and Poff (2008) suggest a number of recreation and school strategies to reduce childhood obesity, including improved nutrition and food choices, family-based activities, and school partnerships. They also suggest viewing children as agents of change; children presented with active-living choices can help engage parents and other siblings in healthier lifestyle choices.

This research examined schoolchildren's beliefs, preferred transportation choices, current transportation choices, and intent to walk or bike to school if the route from home to school were made safer. This research shows both motivators and barriers to walking or biking to school. Similarities and differences in these attitude-behavioral measures are segmented across the geographical spectrum from urban to suburban and rural. This baseline data will eventually provide a foundation for program evaluation.

2.0 METHODS

Teachers in classroom settings administered a paper survey to school children. The survey was two pages long and was printed in a child-friendly font. The initial questions were selected or written after an extensive review of community and state-level programs (primarily in the United States), a review by program and transportation specialists in Michigan, and a pilot test in a few elementary classrooms. Revisions were made to the initial questions and questionnaire format based on comments received from reviews and pretesting. The content was adopted from Ajzen and Fishbein's (1980) attitude-behavior

model, but the young age of the respondents required more nominal-type responses and fewer multiple-items to test for reliability.

Preliminary data collection began in 2004 at 11 Michigan schools during a pilot phase of the program. The pilot program produced a toolkit that included the evaluation instruments. An additional 18 schools used the evaluation tools in 2005, 2006, or 2007 to initiate their Safe Routes to School program. The data reflect collection efforts over these 3 years. The 2005 data collection was skewed to urban schools, whereas suburban and rural schools were better represented in the more recent years (Table 1). In fall 2007, university researchers were re-engaged in the program to key the surveys and analyze the data.

This analysis is based on responses from students at 29 Michigan schools, primarily third- to fifth-graders, at the start of their Safe Routes program. The population was 279 Michigan schools that together had 113,584 students registered for the program. The nonprobability sample is 6,244 student respondents from the 29 schools. Student responses were geographically coded at a school level with urban-centric locale codes obtained from the National Center for Education Statistics (www.nces.ed.gov). To ensure that the sample was similar to the population in terms of geographic proportion, population and sample proportions were calculated (Table 2). No major differences were noted between the population and sample, so the data were not weighted for the purposes of this paper. Next, descriptive statistics and cross tabulations for belief, attitude, intention, and behavior items were calculated with geographic location controlled. Chi-square was used for significance testing, and phi was selected as the measure of association (Sirkin 1995). As a general rule of thumb, values less than 0.2 indicate a negligible relationship, values from 0.2 to 0.5 indicate an important relationship, and values from 0.5 to 1.0 indicate a very strong relationship.

3.0 FINDINGS

The number of boys and girls was equal in the overall sample. It differed across the geographic locations (x^2=10.9, p<.01), but the difference was negligible (phi=.04). The distance between home and school was found to be significantly different (x^2=490.2, p<.001) across the three geographic location types, and the strength of the relationship was important (phi=.28) (Table 3). Approximately 4 out of 10 urban and suburban elementary school-aged children lived within six blocks of their schools, whereas about 2 out of 10 rural students lived that close to school. More than half (56 percent) of the rural students lived more than six blocks away from their school, compared to urban (44 percent) and suburban (32 percent) students.

Table 1.—Timing of data collection by geographic location

	Urban	Suburban	Rural
Spring 2004	45%	11%	4%
Fall 2004	19%	11%	19%
Spring 2007	29%	65%	11%
Fall 2007	7%	13%	66%
Total	100%	100%	100%

Table 2.—Population and sample by geographic location

	Urban	Suburban	Rural
Population of registered schools (N=279)	28%	35%	37%
Population of students at registered schools (N=113,584)	27%	38%	35%
Sample of registered schools (n=29)	31%	41%	28%
Sample of students at registered schools (n=6,244)	26%	41%	33%

Table 3.—Distance between home and school by geographic location

	Urban	Suburban	Rural
Less than 1 block	9%	10%	4%
1-3 blocks	15%	19%	8%
4-6 blocks	21%	20%	9%
More than 6 blocks	44%	32%	56%
Don't know	11%	19%	23%
Total	100%	100%	100%

X^2=490.2, p<.001; phi=.28

Roughly 11 percent of urban children did not know how far their school was from their home, compared to 19 percent of suburban and 23 percent of rural students.

Students were asked about a set of social and infrastructure beliefs that would make walking or biking to school better. The top responses for social beliefs were friends to walk with and no strangers along the way. Top responses for infrastructure beliefs were safer places to cross the street, sidewalks all along the way to school, and bike racks or a safe place to leave bikes (Table 4). The chi-square test indicated significant differences between most beliefs and types of geographic locations while the phi test revealed some noteworthy, but weak, associations. The strongest influence of geographic location was the belief that the student lived too far away from school, which is considered an infrastructure concern in terms of density of development and location of school (X^2=154.4, p<.001; phi=.16). This was the greatest concern for rural students (37 percent). Another belief that was influenced by geographic location was that more crossing guards (not lights) were needed (X^2=111.1, p<.001; phi=.13), particularly with urban and suburban students. Crossing guards are considered a social facilitator because an adult (often a familiar person on a daily basis) is enlisted to help students cross busy intersections.

In a measure of attitudes toward the various transportation modes for getting to and from school, students were asked how they would like to get to school if they had a choice. Walking, biking, and a parent's car were top choices (Table 5). For urban students, biking, followed by someone's car, were top choices. For suburban students, 38 percent chose walking and another 38 percent chose biking. For

Table 4.—Beliefs held about social and infrastructure characteristics of the route to school by geographic location

	Urban	Suburban	Rural	Phi
Social Beliefs				
Friends to walk or bike with[a]	61%	62%	48%	0.12
No strangers along the way[a]	54%	52%	42%	0.10
Parents won't let me walk[a]	25%	23%	28%	0.05
More crossing guards[a]	47%	47%	33%	0.13
No bullies along the way to school[a]	45%	44%	36%	0.08
Infrastructure Beliefs				
Less cars on the roads near school	42%	42%	40%	0.02
Fewer cars in the school parking lot[a]	27%	22%	23%	0.04
Sidewalks all the way to school	44%	43%	46%	0.03
Bike racks/safe place to leave bike[a]	47%	45%	41%	0.05
Better lighting	27%	27%	26%	0.01
Sidewalks clear of snow[a]	43%	44%	40%	0.04
Safer places to cross the streets[a]	49%	50%	43%	0.06
Live too far[a]	25%	20%	37%	0.16

[a] X^2 p-value < .01

Table 5.—Preferred choice, actual behavior, and intent to use modes of transportation to school by geographic location

	Urban	Suburban	Rural	Phi
Preferred Choice				
Walk[a]	29%	38%	23%	0.14
Bike	40%	38%	41%	0.03
Parent's car[a]	35%	30%	35%	0.05
Someone else's car[a]	7%	11%	7%	0.07
School bus[a]	18%	16%	26%	0.10
Actual Behavior				
Walk[a]	16%	30%	7%	0.26
Bike[b]	0%	1%	1%	0.03
Parent's car[a]	48%	40%	33%	0.12
Someone else's car[a]	7%	9%	4%	0.09
School bus[a]	26%	16%	54%	0.35
Intent to Walk or Bike To School if Route Made Safer				
Yes	44%	47%	43%	0.10
Maybe	43%	40%	37%	
No	13%	13%	20%	

[a] X^2 *p*-value < .01
[b] X^2 *p*-value < .05

rural students, biking, parent's car, and school bus all received more than 25 percent. The phi values were not greater than the 0.20 mark, but walking (X^2 =131.0, p<.001; phi=.14) tended to be preferred by suburban students more than urban or rural students.

Behaviors were assessed with a question about how students got to school on the day of the survey. Vehicular transportation dominated. Being driven by a parent was the top response for urban and suburban students while riding the school bus was the top response for rural students. Only a few students reported biking to school. The test of association showed that geographic location influenced actual behavior for walking (X^2=407.7, p<.001; phi=.26) and taking the school bus (X^2=765.9, p<.001; phi=.35). Suburban students were much more likely to walk and rural students were at least twice as likely to use the bus system. Students were also asked to consider whether they would walk or bike if their route to school were made safer (i.e., the intent of the federal, state, and local funding and program initiatives). Almost 9 of 10 students indicated that they would or might walk or bike if the route were improved. Thirteen percent of urban and suburban students and 20 percent of rural students indicated they would not walk or bike even if route improvements were made.

As a final measure of how behaviors might be changed by the implementation of social marketing and infrastructure programs to make communities more walkable and bike-able, the difference between the preferred choice percent and actual behavior percent was calculated for the five transportation options. Positive scores reflect latent demand for walking, biking, and driving in someone else's car. For urban and suburban students, the negative score for riding in a parent's car indicates that students are being driven to school even though that is not their preferred choice (Table 6). For urban and rural students, scores were also negative for school bus transportation.

4.0 CONCLUSIONS AND DISCUSSION

This study found that elementary-aged students' intentions to be active are much greater than the environments created by community development, planning, and school board decisions have allowed. Trends in school construction have tipped toward building new schools on the outskirts of a community, where land is less expensive and more available (Council of Educational Facility Planners International 2004). Initially, these sites are a great distance from residential areas and are located along rural roads with less traffic engineering (e.g., appropriate stop lights, sidewalks, reduced speeds). Moreover, some school

Table 6.—Differences in preferred choice and actual behavior in modes of transportation to school by geographic location

Difference between percentages shown in Table 5	Urban	Suburban	Rural
Walk	13%	8%	16%
Bike	40%	37%	40%
Parent's car	-13%	-10%	2%
Someone else's car	0%	2%	3%
School bus	-8%	0%	-28%

districts are converting neighborhood schools to grade-specific schools, schools of choice without busing for those who come from out of district, or specialized schools that draw from a larger geographic area. These decisions all potentially reduce walkable environments and increase dependency on motorized transportation.

The present study suggests that infrastructure barriers are higher in rural/suburban areas than in urban areas, possibly because of where newer schools are built. Infrastructure improvements in rural and suburban areas, social marketing programs, and neighborhood-based programs in urban areas could all help to reduce the gap between current walking/biking levels and desired level of activity among elementary-aged students.

It should be noted that school location and infrastructure around the schools in this study may have greatly influenced how students rated their home-to-school environment. Therefore, as more schools are studied, the stability and representativeness of the findings will improve.

5.0 CITATIONS

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