Technical Report Documentation Page

1. Report No. SWUTC/06/473700-00031-1	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Children and Transportation: Identifying Environments that Foster Walking and Biking to School		5. Report Date September 2006
		6. Performing Organization Code
7. Author(s) Byoung-Suk Kweon, Woo-Hwa Shin, Robert Folzenlogen, & Jun-Hyun Kim		8. Performing Organization Report No. Report 473700-00031
9. Performing Organization Name and Address Texas Transportation Institute Texas A&M University System College Station, Texas 77843-3135		10. Work Unit No. (TRAIS)
		11. Contract or Grant No. DTRS99-G-0006
12. Sponsoring Agency Name and Address Southwest Region University Transportation Center Texas Transportation Institute Texas A&M University System College Station, Texas 77843-3135		13. Type of Report and Period Covered Research Report: September 2004-September 2006
		14. Sponsoring Agency Code

15. Supplementary Notes

Supported by a grant from the U.S. Department of Transportation, University Transportation Centers Program.

16. Abstract

Few children walk or bike to school. In fact, less than 13% of children in the U.S. walk or bike to school and 85% of trips to school are made by car or school bus (United States Department of Health and Human Services [USDHHS], 2004). Almost 50% of children walked or biked to school in 1969 (United States Environmental Protection Agency [USEPA], 2003). Did changes in transportation infrastructure contribute to this reduction in walking and biking? What new changes should be made in transportation infrastructure today to reverse this trend and provide a greater likelihood that children will walk or bike to school?

Although there is very limited understanding of how pedestrian environments influence children's walking and biking to school, previous research shows that physical environments can foster non-automobile mode choices to school. Landscape buffers and trees add to parents' perceptions of their children's safety and increase their willingness to let their children walk to school (Kweon, Naderi, Maghelal, & Shin, 2004). Ewing (in press) also found that more children walked to school where there were sidewalks. In addition, Safe Routes to School programs increase children's walking to school (Staunton, Hubsmith, & Kallins, 2003).

Physical environments can also be a barrier to children walking and biking to school. In fact, in a study completed by the CDC (2002, August 16), distance was found to be the number one barrier to children walking to school. Texas along with many other states established 2mile school walk zones measured by the nearest practical route from the school attended. However, particularly in the U.S., why distance is the dominant factor in determining walk zone policies and what an appropriate distance might be for walking to school have yet to be consistently documented.

In this research we investigated how additional physical attributes (e.g., street pattern, land use, housing density, environmental content) in the pedestrian environment influence children's walking and biking to school. We also measured what school children consider walkable and bikable distances to school.

One hundred eighty six parents from four school walk zones in College Station, TX participated in this study. They reported their children's commute modes, routes to school and perceived walking and biking environments to school. Satellite imagery and spatial data from the College Station Geographic Information Services were used to further investigate distances to school, environmental content, surrounding land use, and street patterns.

Results indicate that children walk more in older neighborhoods with mature trees while they bike more in newer neighborhoods with more sidewalks. Also children who live on cul-de-sacs walk to school less than those who live on grid streets. Also, children's walking is also significantly related to housing densities and mixed land use. Contrary to the popular 2mile walk zone guidelines, the mean distance for walking in this study is .71 miles while the mean distance of biking is .93 miles. On average, children who live beyond 1 mile from their school either ride in a car, car pool, or pay a transportation fee to ride a school bus. These findings are being used to shape better school walk zone guidelines in support of active and healthy communities.

17. Key Words Walking and Biking, Children, School Walk Zone, Pedestrian Environment		18. Distribution Statement No restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161	
19. Security Classif.(of this report) Unclassified	20. Security Classif.(of this page) Unclassified	21. No. of Pages 37	22. Price

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

Children and Transportation: Identifying Environments that Foster Walking and Biking to School

By

Byoung-Suk Kweon, Ph. D.
Assistant Professor
Department of Landscape Architecture and Urban Planning
Texas A&M University

Woo-Hwa Shin
Ph.D. Student
Department of Landscape Architecture and Urban Planning
Texas A&M University

Robert Folzenlogen
MLA Student
Department of Landscape Architecture and Urban Planning
Texas A&M University

Jun-Hyun Kim
Ph.D. Student
Department of Landscape Architecture and Urban Planning
Texas A&M University

Research Report SWUTC/06/473700-00031-1

Sponsored by

Southwest Region University Transportation Center

TEXAS TRANSPORTATION INSTITUTE
The Texas A&M University System
College Station, Texas 77843-3135

September 2006

ABSTRACT

Few children walk or bike to school. In fact, less than 13% of children in the U.S. walk or bike to school and 85% of trips to school are made by car or school bus (United States Department of Health and Human Services [USDHHS], 2004). Almost 50% of children walked or biked to school in 1969 (United States Environmental Protection Agency [USEPA], 2003). Did changes in transportation infrastructure contribute to this reduction in walking and biking? What new changes should be made in transportation infrastructure today to reverse this trend and provide a greater likelihood that children will walk or bike to school?

Although there is very limited understanding of how pedestrian environments influence children's walking and biking to school, previous research shows that physical environments can foster non-automobile mode choices to school. Landscape buffers and trees add to parents' perceptions of their children's safety and increase their willingness to let their children walk to school (Kweon, Naderi, Maghelal, & Shin, 2004). Ewing (in press) also found that more children walked to school where there were sidewalks. In addition, Safe Routes to School programs increase children's walking to school (Staunton, Hubsmith, & Kallins, 2003).

Physical environments can also be a barrier to children walking and biking to school. In fact, in a study completed by the CDC (2002, August 16), distance was found to be the number one barrier to children walking to school. Texas along with many other states established 2mile school walk zones measured by the nearest practical route from the school attended. However, particularly in the U.S., why distance is the dominant factor in determining walk zone policies and what an appropriate distance might be for walking to school have yet to be consistently documented.

In this research we investigated how additional physical attributes (e.g., street pattern, land use, housing density, environmental content) in the pedestrian environment influence children's walking and biking to school. We also measured what school children consider walkable and bikable distances to school.

One hundred eighty six parents from four school walk zones in College Station, TX participated in this study. They reported their children's commute modes, routes to school and perceived walking and biking environments to school. Satellite imagery and spatial data from the College Station Geographic Information Services were used to further investigate distances to school, environmental content, surrounding land use, and street patterns.

Results indicate that children walk more in older neighborhoods with mature trees while they bike more in newer neighborhoods with more sidewalks. Also children who live on cul-de-sacs walk to school less than those who live on grid streets. Also, children's walking is also significantly related to housing densities and mixed land use. Contrary to the popular 2mile walk zone guidelines, the mean distance for walking in this study is .71 miles while the mean distance of biking is .93 miles. On average, children who live beyond 1 mile from their school either ride in a car, car pool, or pay a transportation fee to ride a school bus. These findings are being used to shape better school walk zone guidelines in support of active and healthy communities.

EXECUTIVE SUMMARY

Children Commuting to School

Few children walk or bike to school. In fact, less than 13% of children in the U.S. walk or bike to school and 85% of trips to school are made by car or school bus (United States Department of Health and Human Services [USDHHS], 2004). Almost 50% of children walked or biked to school in 1969 (United States Environmental Protection Agency [USEPA], 2003). Did changes in transportation infrastructure contribute to this reduction in walking and biking? What changes should be made in transportation infrastructure today to reverse this trend and provide greater safety for children?

Children and Obesity

Increased walking and biking may help to reduce childhood obesity. Obesity among American children is rising. About 15 percent of children aged 6 to 19 are overweight. Since 1970, the prevalence of childhood obesity has been tripled. Health experts have referred to this situation as an epidemic of obesity.

Links between Transportation Choices and Children's Obesity

- **National Impacts**- The Surgeon General identified that obesity is a major public health problem in the U.S. (U.S. Department of Health and Human Services, 2001). In Response, the CDC has developed a new "Kids Walk-to-School" program. However, no studies have provided evidence of whether our transportation infrastructure is adequately prepared to support these national efforts.

- **Nontraditional Groups**: Young school aged children are an under-represented group in transportation research. However, current efforts to increase physical activity among children will likely lead to greater use of transportation corridors by this group. Increasing transportation research in this population is both timely and necessary to ensure children's safety and to augment the potential benefits of increased walking and biking.

- **Enormous economic significance**: Healthcare costs that associated with childhood obesity may be reduced by providing safe commuting environments that accommodate walking and biking to school. These costs can include diagnostic, and treatment services by physicians as well as hospital stays and prescription medicine.

This study examines the transportation infrastructure currently available for children to walk and bike to school in College Station, TX. The College Station Independent School District provides school buses for children who live beyond 2 miles of their school or who cross major arterials. Otherwise, the School District recommends students walk or bike to school. The objectives of this study are two fold:

1. Find out how many students actually walk or bike to school when the commute distance is less than 2 miles.
2. Investigate specific elements of commuting environments that motivate children and their parents to walk or bike to school such as the existence and connectivity of sidewalks/bike lanes, street pattern, land use mix and so on.

The results of this study indicate that 20-30% of children walk to school within walk zones. However, a 2 mile walk zone might not be a practical distance for the intermediate and middle school children. In our study, the average walking distance is .71 miles. Different distance considerations should probably be made for different age groups and the actual distance threshold should be determined using a more scientific approach.

We also found that physical environments have a significant impact on children's walking and biking to school. Results indicate that distance to school, street pattern (grid vs. cul-de-sac), land use mix, greenery, sidewalks, bike lanes, intersections, and housing density have significant relationships with children's walking and biking to school. These finding can be used to shape better school walk zone transportation infrastructure that may have lasting health consequences for young school children.

TABLE OF CONTENTS

Page

LIST OF ILLUSTRATIONS

LIST OF TABLES

DISCLAIMER

ACKNOWLEDGEMENT

The authors recognize that support was provided by a grant from the US Department of Transportation, University Transportation Centers Program to the Southwest Region University Transportation Center.

INTRODUCTION

Few children walk or bike to school. In fact, less than 13% of children in the U.S. walk or bike to school and 85% of trips to school are made by car or school bus (United States Department of Health and Human Services [USDHHS], 2004). Back in 1969 almost 50% of children walked or biked to school (United States Environmental Protection Agency [USEPA], 2003). Did changes in transportation infrastructure contribute to this reduction in walking and biking? What changes should be made in transportation infrastructure today to reverse this trend and provide a greater likelihood that children will walk or bike to school?

Quadrupling over the past 25 years, more than 30% of adolescents (ages 12 to 19) are overweight and 15% are obese (American Obesity Association [AOA], 2004). Additionally, overweight adolescents have a 70% chance of becoming overweight or obese as adults (USDHHS, 2001). Second only to tobacco, obesity is the leading cause of preventable death in the United States (AOA, 2000). In the U.S. alone, more than 300,000 deaths per year are attributed to overweight conditions and obesity. The cost of obesity to the U.S. in 2000 was estimated to be more than 100 billion (USDHHS, 2004).

Overweightness and obesity among all ages has been found to significantly increase the chances for many illnesses, including heart disease, hypertension, Type 2 diabetes and depression. Previously considered adult-only issues, both high blood pressure and Type 2 diabetes amongst children are on the rise with the increase in childhood overweight and obesity (USDHHS, 2001). More than 35% of children do not participate in regular physical activity and on average children watch television for 4 hours a day (AOA, 2004). Increasing physical activity amongst children is one way to reduce the overweight and obesity epidemic. Walking or biking to school is an avenue for physical activity that many children can easily incorporate into their daily lives.

In addition to weight control, walking and biking to school can lead to other individual benefits. Walking is associated with maintaining healthy bones, muscles and joints, preventing high blood pressure, reducing depression and anxiety, and increasing self-esteem (AOA, 2004). Other benefits of children walking or biking to school include decreasing rush-hour traffic congestion, reducing environmental pollution, and cutting down fuel consumption (USEPA, 2003). An equally important outcome is the possibility that children who incorporate walking or biking to school into their daily lives also seek out other means of obtaining physical activity. Research has shown that children who walked to school recorded a significantly higher amount of moderate-to-vigorous physical activity during the afternoon and evening hours compared to those kids that did not walk or bike to school (Cooper, Page, Foster, & Qahwaji, 2003). Establishing adolescent patterns of physical activity outside school hours is growing in importance as more and more school systems decrease physical education and recess times.

America is taking national action to increase children's physical activity in general, and walking and biking to school in particular. Programs like the CDC's "Kids Walk-to-School" and the "Safe Routes to School (SRS)" initiative are sustained efforts by parents, community members, local, state, and federal governments to improve the health and well-being of children by enabling and encouraging them to walk and bike to school. By 2010, the target proportions for walking within 1 mile or bicycling within 2miles to school are 50% and 5% respectively

(USDHHS, 2004). However, it is likely that these campaigns will be short lived if in fact there are barriers to walking or biking to school that outweigh the momentum created by such programs.

Although there is very limited understanding of how pedestrian environments influence children's walking and biking to school, previous research shows that physical environments can foster non-automobile mode choices to school. Landscape buffers and trees add to parents' perceptions of their children's safety and increase their willingness to let their children walk to school (Kweon, Naderi, Maghelal, & Shin, 2004). Ewing (in press) also found that more children walked to school where there were sidewalks. In addition, Safe Routes to School programs increase children's walking to school (Staunton, Hubsmith, & Kallins, 2003).

The physical environment can also be a barrier to children walking and biking to school. In fact, in a study completed by the CDC ("Barriers to Children," 2002), distance was found to be the number one barrier to children walking to school. Several additional studies support distance as a significant factor in whether or not children walk or bike to school (USEPA, 2003; Cervero & Duncan, 2003; Rivara et. al, 1989; Ziviani, Scott, & Wadley, 2004). In a study conducted by the EPA ("Travel and Environmental," 2003), it was suggested that even if distances to schools were decreased from 1.5 to 1.1 miles, one more student for every 100 would walk to school. It is unclear if distance is purely associated with a time and convenience factor, or if it is also associated with ones attitude towards a desired level of physical activity or perhaps a perceived safety risk tied to increased distances. All we really can conclude is that parents perceive distance to be an issue, and, in some areas, that the distance between residences and schools is being increased by poor municipal planning practices.

Texas, along with many other states established 2-mile school walk zones measured by the nearest practical route from the school attended. Why is distance the dominant factor in determining walk zone policies? What is an appropriate distance for walking to school? Answers to these questions have yet to be consistently documented.

In order to meet local "minimum acreage guidelines," new schools are often pushed to the fringes of communities where land is less expensive (USEPA, 2003; Walljasper, 2001). For example, some California middle schools are required to have 20 acres plus a minimum of one acre per 100 students ("Surface Transportation," 2003). These requirements can be double or triple this amount for high schools in some states. Only a handful of states, including Texas, have no such requirements (CEFPI, 2004). Additionally, some municipal budget processes discourage renovation of smaller, often more centrally located schools in favor of new, larger schools that serve a broader area (and therefore longer distances to some residences). Regardless, even when kids live within a couple of miles from school they often still ride the bus ("Surface Transportation," 2003); thereby suggesting that distance by itself is certainly not the only factor influencing whether or not a child will walk to school.

In this research we investigated how additional physical attributes (e.g., street pattern, land use, housing density, environmental content, etc) in the pedestrian environment influence children's walking and biking to school. We also measured what school children consider walkable and bikable distances to school.

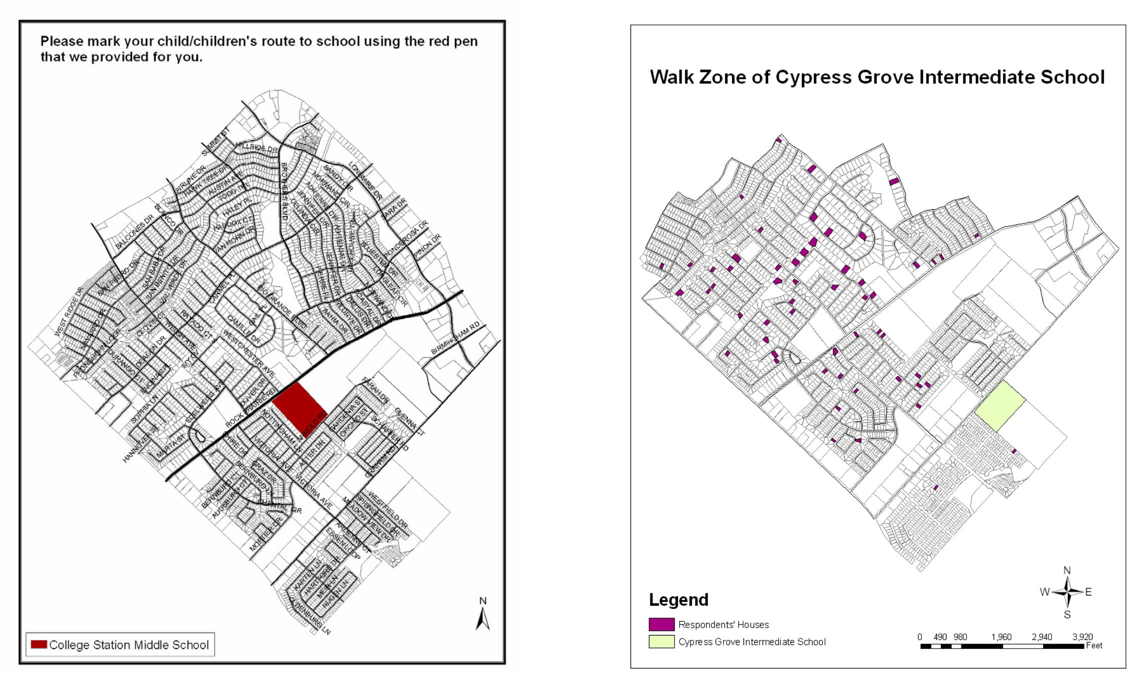
METHODS

Sampling and Participants

Three hundred seventy survey questionnaires were mailed to households with intermediate and middle school children within four school walk zones. Intermediate schools include grades 5-6 while middle schools include grades 7-8. Participants' addresses were obtained from the College Station Independent School District. Among 370 survey questionnaires, 10 questionnaires (3%) were returned with a vacancy notice while 187 questionnaires (50%) were completed and returned: 89 from two different intermediate schools and 106 from two middle schools (see Table 1). The participants were scattered throughout the study area (see Figure 1b). The majority of children are white (79.2%) followed by Hispanic (8.8%), Asian (8.2%), and African American (3.8%). The student gender distribution consists of 46.5% male and 53.5% female. More than 50% of the household earned over $80,000 (see table 2).

Figure 1. Examples of school walk zone map (a) and respondent distribution (b)

Middle School | Intermediate School



a) Walk zone map | b) Spatial distribution of respondents

Table 1. Response rate by school

Category	School name	Sample Size	Completion	Vacant	Total
Intermediate School (Grade 5-6th)	Oakwood	43	26 (60.5%)	2 (5%)	28 (65.1%)
	Cypress Grove	107	58 (54.2%)	3 (3%)	61 (57.0%)
Middle School (Grade 7-8th)	A & M Consolidate	61	27 (42.6%)	1 (2%)	28 (45.9%)
	College Station	159	75 (47.2%)	4 (3%)	79 (49.7%)
Total		370	186 (50.3%)	10 (3%)	196 (53.0%)

Table 2. Respondents' background information

	Intermediate School			Middle School			
	Oakwood	**Cypress Grove**	**Subtotal**	**A & M Consolidated**	**College Station**	**Subtotal**	**Total**
CHILD							
Age(Mean)	11.21	11.11	11.14	13.35	13.22	13.25	12.40
Gender							
Male	13 (68.4%)	19 (40.4%)	32(48.5%)	10 (40.0%)	32 (42.7%)	42(45.2%)	74(46.5%)
Female	6 (31.6%)	28 (59.6%)	34(51.5%)	15 (60.0%)	36 (52.9%)	51(54.8%)	85(53.5%)
Grade							
5	12 (63.2%)	26 (55.3%)	38(57.6%)				38(23.3%)
6	7 (36.8%)	21 (44.7%)	28(42.4%)				28(17.2%)
7				10 (38.5%)	33 (46.5%)	43(44.3%)	43(26.4%)
8				16 (61.5%)	38 (53.5%)	54(55.7%)	54(33.1%)
Ethnicity							
African American	1 (5.3%)		1(1.6%)	2 (7.7%)	3 (4.3%)	5(5.3%)	6(3.8%)
Hispanic	3 (15.8%)	3 (6.7%)	6(9.4%)	2 (7.7%)	6 (8.7%)	8(8.4%)	14(8.8%)
Asian	1 (5.3%)	5 (11.1%)	6(9.4%)	1 (3.8%)	6 (8.7%)	7(7.4%)	13(8.2%)
White	14 (73.7%)	37 (82.2%)	51(79.7%)	21 (80.8%)	54 (78.3%)	75(78.9%)	126(79.2%)
Other							
Height (Mean)	57.88	59.08	58.73	64.84	62.89	63.37	61.58
Weight (Mean)	98.13	95.03	95.89	123.15	110.25	113.32	106.50
Bikeownership							
Y	18 (94.7%)	42 (93.3%)	60(63.8%)	18 (75%)	60 (89.6%)	78(85.7%)	138(89%)
N	1 (5.3%)	3 (6.7%)	4(6.3%)	6 (25.0%)	7 (10.4%)	13(14.3%)	17(11%)
PARENTS							
Age (Mean)	41.32	41.73	41.60	43.38	42.78	43.01	42.37
Gender							
Male	5 (19.2%)	12 (21.1%)	17(20.5%)	3 (11.5%)	15 (20.5%)	18(18.2%)	35(19.2%)
Female	21 (80.8%)	45 (78.9%)	66(79.5%)	23 (88.5%)	57 (78.1%)	80(80.8%)	146(80.2%)
Both					1 (1.4%)	1(1%)	1(0.5%)
Ethnicity							
African American	1 (3.8%)		1(1.2%)	1 (3.8%)	3 (4.1%)	4(4.0%)	5(2.7%)
Hispanic	4 (15.4%)	3 (5.3%)	7(8.4%)	1 (3.8%)	5 (6.8%)	6(6.1%)	13(7.1%)
Asian	1 (3.8%)	6 (10.5%)	7(8.4%)	1 (3.8%)	9 (12.3%)	10(10.1%)	17(%9.3)
White	20 (76.9%)	47 (82.5%)	67(80.7%)	21 (80.8%)	55 (75.3%)	76(76.8%)	143(78.6%)
Other		1 (1.8%)	1(1.2%)	2 (7.7%)	1 (1.4%)	3(3.0%)	4(2.2%)
Marital State							
Married	22 (84.6%)	51 (89.5%)	73(88%)	22 (84.6%)	64 (88.9%)	86(84.3%)	159(87.8%)
Common-law married	1 (3.8%)		1(1.2%)		3 (4.2%)	3(2.9%)	4(2.2%)
Divorced	3 (11.5%)	3 (5.3%)	6(7.2%)	3 (11.5%)	4 (5.6%)	7(6.9%)	13(7.2%)
Widowed		1 (1.8%)	1(1.2%)	1 (3.8%)	1 (1.4%)	2(2.0%)	3(1.7%)
Never-married		2 (3.5%)	2(2.4%)				2(1.1%)
Farther-Work							
Full Time	24 (96.0%)	51 (92.7%)	75(93.8%)	20 (95.2%)	67 (94.4%)	87(94.6%)	162(94.2%)
Part Time		2 (3.6%)	2(2.5%)	1 (4.8%)		1(1.1%)	3(1.7%)
Retired					3 (4.2%)	3(3.3%)	3(1.7%)
Not employed	1 (4.0%)	2 (3.6%)	3(3.8%)		1 (1.4%)	1(1.1%)	4(2.3%)
Mother-Work							
Full Time	13 (50.0%)	32 (57.1%)	45(54.9%)	13 (52.0%)	44 (61.1%)	57(58.8%)	102(57.0%)
Part Time	6 (23.1%)	10 (17.9%)	16(19.5%)	4 (16.0%)	14 (19.4%)	18(18.6%)	34(19.0%)
Not employed	7 (26.9%)	14 (25.0%)	21(25.6%)	8 (32.0%)	14 (19.4%)	22(22.7%)	43(24.0%)

Household Income(Mean)	3.96	4.33	4.21	3.5	4.07	3.92	4.06
Less than $20,000				2 (8.3%)	4 (5.9%)	6(5.9%)	6(3.5%)
$40,000	6 (24.0%)	5 (9.1%)	11(13.8%)	6 (25.0%)	4 (5.9%)	10(9.8%)	21(12.2%)
$60,000	2 (8.0%)	7 (12.7%)	9(11.3%)	3 (12.5%)	11 (16.2%)	14(13.7%)	23(13.4%)
$80,000	4 (16.0%)	8 (14.5%)	12(15.0%)	4 (16.7%)	13 (19.1%)	17(16.7%)	29(16.9%)
More than $80,000	13 (52.0%)	35 (63.6%)	48(60.0%)	9 (37.5%)	36 (52.9%)	45(44.1%)	93(54.1%)
Education(Mean)	4	3.939	3.96	3.740	3.932	3.88	3.92
Less than High School				1 (4.0%)		1(1.0%)	1(1.0%)
High School / GED	2 (8.3%)	5 (10.6%)	7(9.0%)	4 (16.0%)	8 (11.0%)	12(13.0%)	19(11.0%)
Community Collage	3 (12.5%)	10 (17.5%)	13(16.0%)	3 (12.0%)	13 (20.5%)	16(17.0%)	29(17.0%)
College Degree	12 (50.0%)	23 (40.4%)	35(44.0%)	9 (40.0%)	25 (34.2%)	34(36.0%)	69(39.0%)
Graduate Degree	7 (29.2%)	18 (31.6%)	25(31.0%)	7 (28.0%)	25 (34.2%)	32(34.0%)	57(33.0%)
No. of Household Members (Mean)	5.16	4.42	4.65	5.00	4.35	4.52	4.58
No. of Children (Mean)	3.40	2.40	2.71	3.54	2.50	2.78	2.74
No. of Cars (Mean)	2.44	2.30	2.34	2.19	2.51	2.43	2.39
No. of Licensed Drivers (Mean)	2.48	2.25	2.32	2.35	2.29	2.31	2.31
No. of Years (Mean)	7.38	5.78	6.27	6.23	6.61	6.51	6.40

Measures

Survey Questionnaire (see Appendix I)
The survey questionnaire "Children's Walking and Biking to School" has five sections: 1) Information about children, 2) Walking and biking environments to school, 3) Walking and biking in your neighborhood, 4) Commute route to school, 5) Background information and 6) Comments for walking and biking to school. These are described below.

Information about Children: In this section we asked parents about their children's age, gender, ethnicity, height, weight, and grade. We also asked about children's commute modes to and from school within a typical week.

Walking and Biking Environments to School: We asked parents about their children's walking and biking environments to school. Concerns about current walking conditions as well as possible incentives to increase walking and biking were included in the section. Concerns about walking and biking environments within school zones were measured with the question "What concerns do you have about your child/children walking to or from school?" The sample items included distance, traffic conditions (e.g., traffic volume and speed), infrastructure (e.g., sidewalks, landscape buffer), safety, convenience, weather, time, etc. Parents answered the question using 4 response-scales from "not a concern" to "concerns me greatly."

Parents also asked "if your child/children does not walk or bicycle to school what would make you more likely to allow your child/children to walk or bike to school? Examples included crime watch, group walking, traffic controls, safety training, better infrastructure (e.g., sidewalks, bike lane, landscape buffer) walking program and so on. We also asked appropriate walking and biking distances to school for their children.

Walking and Biking in Your Neighborhood: In this section, we accessed children's walking and biking activities in their neighborhood using the question "How often do your children walk or bike to the following places within one week?" We included friend's house, park/trails/playgrounds, stores/restaurants, sport facilities/after school events, and children's part-time work place as destination places. Parents indicated the frequency of their children's trips to each place by using a "none" to 7 times/week response scale. We also include "Not within walking /biking distance" as an option.

Commute Route to School: We asked parents to mark their children's route to school on a school walk zone map that was included in the questionnaire (see Figure1)

Background information: Parents provided background information about themselves such as gender, age, work status, marital status, and so on. They also provided household information such as income, number of children, number of cars, number of household members, number of licensed drivers, and so on.

Comments for walking and biking to school: In the final section we asked an open end question using "would you like to say anything else about your children's walking or biking to school? Do you have any additional comments on what is needed for your child to walk or bike to school?"

Geographic Information System (GIS) Data
Spatial data from the College Station Geographic Information Services were used to measure the street distance to school, intersection density, sidewalk density, bike lane density, housing density, land use mix, amount of greenery, and street pattern (grid vs. cul-de-sac).

Street distance to school: Parents marked their children's route to school on a map that we provided in the questionnaire (see Figure 1a) and GIS was used to measure the street distances from home to school for each child.

Intersection density: This was measured by the number of intersections per acre of walk zone. A higher measured value indicates more intersections per acre.

Sidewalk density: Sidewalk density was measured by the number of linear miles of sidewalk per acre within a walk zone. A higher measured value indicates more sidewalks.

Bike land density: Bike lane density was measured by the number of linear miles of bike lane per acre.

Housing density: Housing density was measured by the number of housing units per acre within each walkzone.

Land use mix: Land use mix ranged from 0 to 1 and captured how evenly the square footage of each area is distributed within the walk zone. A lower value (0) indicates homogeneity, wherein all land uses are of a single type while a higher value (1) indicates heterogeneity wherein all land use categories are evenly distributed throughout the area. Land use mix is calculated by the following formula (Frank, Schmid, Sallis, & Chapman, 2005):

$$\text{Land Use Mix} = -[\{\sum_{i=1}^{n}(p_i)(\ln p_i)\}/\ln n]$$

p_i = the total proportion of estimated square footage attributed to land use i (proportion of total land uses)
n = the number of land uses (category of land use)

Amount of greenery: Data values for greenery were derived from 4-meter, multispectral satellite imagery (Ikonos). These data were processed by computer using a normalized difference vegetation index formula (NDVI) to classify the areas with trees and shrubs. The amount (square feet) of tree/shrub cover (greenery) located within a school walk zone was calculated and recorded in the database.

Cul-de-sac: The location of house was given a value of one (1) if on a cul-de-sac or dead end and zero (0) in all other cases.

RESULTS

Commute to School

The majority children commute to and from school by car. About 55% of intermediate school children and 50% of middle school children ride a car to and from school. About 20% of intermediate school children walk to and from school while more than 31% of middle school children walk to and from school. Particularly in the afternoon more children walk home from school than walk to school in both intermediate and middle schools. About 16% of children bike to and from school in both school levels.

Table 3. Comparison of commute modes to and from school by two different school levels (i.e.: intermediate and middle school).

	To School		From School		To/From School	
	N	Percentage	N	Percentage	N	Percentage
Intermediate School						
Walking	11	11.6	21	20.6	22	19.8
Biking	17	17.9	18	17.6	18	16.2
Car/Car Pool	60	63.2	53	52.0	61	55.0
School Bus	7	7.4	10	9.8	10	9.0
Total	95		102		111	
Middle School						
Walking	23	18.7	47	35.6	48	31.4
Biking	24	19.5	23	17.4	24	15.7
Car/Car Pool	73	59.3	57	43.2	76	49.7
School Bus	3	2.4	5	3.8	5	3.3
Total	123		132		153	

We also looked at the commute modes by gender. Female children use motorized commute modes (62%) more than male children (50%). Particularly male children (20.7%) bike more than female children (13%). Walking more in the afternoon is a similar trend for both genders.

Table 4. Commute to school by gender

	To School		From School		To/From School	
	N	Percentage(%)	N	Percentage(%)	N	Percentage(%)
Female						
Walking	16	15.8	30	27.5	31	25.2
Biking	16	15.8	15	13.8	16	13.0
Car/Car Pool	64	63.4	56	51.4	68	55.3
School Bus	5	5.0	8	7.3	8	6.5
Total	101		109		123	
Male						
Walking	14	15.1	33	32.4	34	29.3
Biking	23	24.7	24	23.5	24	20.7
Car/Car Pool	54	58.1	41	40.2	54	46.6
School Bus	2	2.2	4	3.9	4	3.4
Total	93		102		116	

Commute Frequency by Mode

Among 10 possible commute times per week, middle school students walk significantly more often than intermediate school children. There are no significant differences using other commute modes (e.g., biking, car/car pool, and school bus) between the two school levels.

Table 5. Mean frequency of commute mode per week by school level

	Intermediate		Middle		Mean Difference	t-value
	N	Mean (SD)	N	Mean (SD)		
Walking	80	1.20 (2.52)	99	2.44 (3.21)	-1.23	-2.863***
Biking	80	1.75 (3.51)	99	1.74 (3.45)	0.01	0.020
Car/Car Pool	80	6.17 (4.26)	99	5.51 (3.92)	0.66	1.084
School Bus	80	0.79 (2.43)	99	0.31 (1.48)	0.48	1.550

**p < .01

Male children bike significantly more often per week than female children. However, female children ride cars more often than males although the relationship is marginal.

Table 6. Mean frequency of commute mode per week by gender

	Male		Female		Mean Difference	t-value
	N	Mean (SD)	N	Mean (SD)		
Walking	74	2.03 (2.90)	85	1.79 (2.93)	0.241	0.519
Biking	74	2.56 (4.00)	85	1.28 (3.04)	1.287	2.258*
Car/Car Pool	74	5.11 (4.08)	85	6.31 (3.97)	-1.200	-1.878†
School Bus	74	0.30 (1.52)	85	0.56 (1.93)	-0.260	-0.935

†p <.10, *p < .05

Commute Distance by Mode

Among children who walk to and from school, the mean walking street distance is .71 miles while the mean biking distance is approximately .9 miles. Beyond one mile, children tend to ride in a car or school bus.

Compared to intermediate schools, a slightly shorter trend exists for middle schools with respect to mean walking, biking, car/carpool, and school bus ridership distances. This may be influenced by the location of the school as can be seen in Figure 1. The middle school is more centrally located while the intermediate school is located at the edge of the school zone. The only significant mode difference between the two schools is the car/car pool driving distance.
.

Table 7. Mean street distance to school by school level

	Total		Intermediate		Middle			
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	Mean Difference	t-value
Walking	66	0.71 (0.44)	21	0.75 (0.46)	45	0.70 (0.43)	0.06	0.51
Biking	39	0.93 (0.41)	18	1.02 (0.44)	21	0.85 (0.38)	0.17	1.26
Car/Pool	126	1.08 (0.51)	55	1.29 (0.52)	71	0.92 (0.42)	0.38	4.30***
Bus	13	1.44 (0.68)	8	1.54 (0.83)	5	1.28 (0.35)	0.25	0.47

* Unit of all distances is mile

Compared to females, male children walk longer distances ($t = 1.77$, $p < .10$ (two tailed), $d = .20$). Otherwise, there are no significant mean distance differences between male and female children.

Table 8. Mean street distance to school by gender

	Male		Female			
	N	Mean (SD)	N	Mean (SD)	Mean Difference	t-value
Walking	33	0.82 (0.43)	28	0.62 (0.45)	0.20	1.77†
Biking	22	0.96 (0.37)	15	0.82 (0.45)	0.14	1.01
Car/Pool	52	1.14 (0.45)	61	1.01 (0.56)	0.13	1.32
Bus	4	1.03 (0.57)	7	1.56 (0.75)	-0.53	-1.21

* Unit of all distances is mile

Parent's Perceived Barriers: Walkers vs. Non-Walkers

A T-test was run to investigate the difference between walkers and non-walkers. The mean differences of parents' perceived concerns for non-walkers are much higher than for walkers (see Table 9). The means of non-walkers' concerns are significantly higher nine (9) of fifteen (15) items including traffic volume, speed, walking/biking alone, sidewalk/bikeway distances to traffic, absence (or inadequate) sidewalks/bikeways, lack of time, after school schedule, distance, and heavy backpack.

Table 9. T-tests between walkers vs. non-walkers for parents' perceived concerns

Parents' Concerns	**Walkers**			**Non-walkers**			Mean	
	Mean	SD	N	Mean	SD	N	Difference	t-value
much traffic	2.92	1.03	66	3.30	0.86	104	.37	2.56*
speed	2.80	1.10	66	3.16	0.95	105	.36	2.19*
crime	2.52	0.95	65	2.69	1.08	103	.17	1.02
weather	2.52	0.95	66	2.62	0.99	102	.10	0.60
heavy backpack	2.51	1.19	65	3.16	1.04	102	.65	3.61***
walking/biking alone	2.37	1.17	67	2.81	1.08	102	.44	2.52*
CSW/bikeways' closeness	1.96	1.05	67	2.52	1.11	100	.57	3.28***
convenience	1.95	1.22	62	1.78	1.12	100	-.17	0.91
children's unwillingness	1.77	1.02	64	1.97	1.15	98	.20	1.15
no CSW/bikeways	1.76	1.07	66	2.14	1.18	103	.38	2.19*
parking	1.61	1.03	64	1.45	0.91	98	-.16	-1.01
not enough time	1.46	0.88	67	2.06	1.14	102	.60	3.83***
after-school schedule	1.42	0.92	64	1.76	1.08	102	.34	2.18*
distance	1.30	0.74	66	2.21	1.19	103	.91	6.14***
store bike	1.20	0.57	64	1.32	0.75	100	.12	1.13

*p<.05, **p<.01, ***p<.001

Parent's Perceived Barriers: Bikers vs. Non-Bikers

There are 3 (out of 15) significant mean differences for parents' perceived concerns between bikers and non- bikers (see Table 10). The parents of non-bikers' are more concerned about distance, lack of time, and children's unwillingness.

Table 10. The mean differences of perceived concerns between bikers vs. non-bikers

	Bikers			**Non-bikers**			Mean	t-value
	Mean	SD	N	Mean	SD	N	Difference	
distance	1.55	1.01	40	1.95	1.14	129	.40	2.00*
not enough time	1.35	0.77	40	1.97	1.12	129	.62	3.95***
children's unwillingness	1.53	0.89	38	2.00	1.14	124	.47	2.67**

Who Tends to Walk or Bike?

As shown in Table 11, correlational analysis indicates that children who frequently walk to school tend to live on a gridded street rather than cul-de-sac and live closer to school. Walkers also tend to be tall and have more other children in their household. Their school walk zone has fewer sidewalks and bike lanes, but more trees and shrubs, a higher housing density, and a greater mix of land uses. In addition, middle school children are more likely to walk than intermediate school children.

Table 11. Correlations among commute mode, personal and household information, and built environment variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Walking	1																					
2. Biking	-.22**	1																				
3. Car/Pool	-.46***	-.62***	1																			
4. Bus	-.16*	-.14†	-.27***	1																		
5. School	.21**	-.00	-.08	-.12	1																	
6. Age	.12	.04	-.06	-.13	.83***	1																
7. Gender	-.04	-.18*	.15†	.07	.03	.06	1															
8. Height	.20*	-.01	-.12	-.03	.46***	.48***	.02	1														
9. Weight	.10	-.01	-.05	-.08	.39***	.40***	-.10	.61***	1													
10. Income	.04	-.01	-.01	-.04	-.12	-.08	.12	-.02	-.26**	1												
11. Education	-.10	.02	.05	-.00	-.04	-.02	-.07	-.06	-.22*	.41***	1											
12. Fam Mem	.11	-.01	-.15*	.17*	-.05	-.04	-.06	-.04	-.13	.11	-.03	1										
13. Children #	.23**	-.02	-.20**	.09	.03	.04	-.11	.04	.01	-.03	-.09	.78***	1									
14. Cars	-.03	-.05	.03	.07	.05	.10	.05	.07	.02	.40***	.13	.32***	.15*	1								
15. Driver #	-.06	-.04	.03	.08	-.01	.06	-.03	.11	-.06	.32***	.07	.47***	.27***	.77***	1							
16. Distance	-.51***	-.09	.33**	.27***	-.38***	-.32***	-.04	-.18*	-.10	-.25**	-.10	-.03	-.15†	-.13	-.04	1						
17. Intersection	-.14†	-.07	.08	.14†	-.77***	-.60***	.01	-.26**	-.18*	.00	-.01	.15†	.13†	-.11	.02	.37***	1					
18. Sidewalk	-.23**	.14†	-.03	.16*	-.35***	-.35***	.09	-.19*	-.28**	.19*	.03	-.22**	-.31***	.00	-.09	.27***	-.01	1				
19. Bike lane	-.16*	-.05	.08	.15*	-.80***	-.63***	.02	-.28**	-.20*	.02	-.01	.12	.10	-.11	.01	.39***	1.00**	.09	1			
20. Housing	.20**	-.15*	.05	-.12	.16*	.20*	-.08	.12	.23**	-.19*	-.03	.25**	.33**	-.02	.09	-.18*	.23**	-.97**	.14†	1		
21. Land Mix	.26***	-.12	.01	-.19*	.54***	.51***	-.09	.26**	.32***	-.18*	-.02	.17*	.26***	.03	.08	-.37***	-.27***	-.96***	-.36***	.88***	1	
22. Greenery	.19*	.03	-.07	-.17*	.83***	.67***	-.04	.30***	.24**	-.05	.00	-.08	-.05	.11	.01	-.43***	-.97***	-.25**	-1.00***	.02	.50***	1
23.Cul-De-Sac	-.13†	-.13†	.21**	-.04	.03	.02	.08	-.02	-.10	.11	.02	-.07	-.04	-.02	-.02	.21**	-.07	.15*	-.05	-.17*	-.13†	.03

†p < .10, *p < .05, **p < .01, ***p < .001, 5. S L (0: I , 1: M), 7. G (0: M , 1: F), 12. F , 13. N C , 14. N C , 15. N L D , 17-20, , 21. L U M

Children who bike more frequently tend to live on a gridded street rather than on a cul-de-sac. They also tend to live in a school walk zone with marginally higher sidewalk density and with significantly lower housing density.

Who Tends to Ride a Car or Bus?

As shown in Table 11, children who frequently ride in a car to school tend to live on a cul-de-sac street that is located farther away from school. They also have fewer household members and fewer other children in their households.

Children who frequently ride a school bus tend to live farther away from school and have a greater number of household numbers. They also tend to live in areas with high intersection density, and more sidewalks and bike lanes. Their school walk zones have fewer trees and shrubs and a lower mix of land uses.

DISCUSSION

The average percentage of children walking to school in our study is higher than the national average (13%). About 20% of intermediate school children walk to and from school while more than 31% of middle school children walk to and from school. These numbers may be higher because not all the children in the district were included in the study. That is, children residing outside the walk zone were not included.

The results suggest that a 2 mile walk zone might not be practical distance for the intermediate and middle school children. Different distance considerations should probably be made for different age groups and the actual distance threshold should be determined using a more scientific approach.

School location within the walk zone may influence the distance traveled by mode. The centrally located school resulted in consistently lower travel distances than the peripherally located school. However, this study only examined two schools so conclusions have limited generalizability.

It is interesting to note that walking is positively related to the amount of greenness. Since Texas is known for its heat, shade from the trees may provide some protection from the heat for children who walk to and from school.

Another interesting finding is that sidewalk density is related more to biking than to walking. It seems that children may prefer using sidewalks for biking rather than the bike lanes. In addition, bike lanes have no significant influence on biking. It is possible that the bike lanes are not conveniently located or are perceived to be too dangerous.

.

CONCLUSION

This research investigates how physical attributes in the pedestrian environment influence children's walking and biking to school.

Our results indicate that distance to school, street pattern (grid vs. cul-de-sac), land use mix, greenery, sidewalks, bike lanes, intersections, housing density have significant impacts on children’s walking and biking to school. These findingscan be used to shape better school walk zone transportation infrastructure that may have lasting health consequences for young school children.

REFERENCES

American Obesity Association. (2004). *AOA Fact Sheets: Obesity in Youth*. Retrieved December 22, 2004, from http://www.obesity.org/subs/fastfacts/obesity_youth.shtml

American Obesity Association. (2000). *Objectives for Achieving and Maintaining a Healthy Population*. Retrieved November 10, 2004, from http://www.obesity.org/subs/advocacy/HealthyWeight_2010.shtml

CEFPI: The School Building Association. (2003). *School Site Size: How Many Acres Are Necessary?*. Retrieved December 1, 2004, from http://www.cefpi.org/pdf/state_guidelines.pdf

Centers for Disease Control and Prevention. (2002, August 16). Barriers to Children Walking and Biking to School --- United States, 1999. *MMWR Weekly*, 51(32), 1-6.

Cervero, R., & Duncan, M. (2003). Walking, Bicycling, and Urban Landscapes: Evidence from the San Francisco Bay Area. *American Journal of Public Health*, 93(9), 1478-1483.

Cooper, A.R., Page, A.S., Foster, L.J., & Qahwaji, D. (2003). Commuting to School: Are Children Who Walk More Physically Active?. *American Journal of Preventative Medicine*, 25(4), 273-276.

Ewing, R., Schroeer, W., & Greene, W. (2004) *School location and student travel: analysis of factors affecting mode choice.* Transportation Research Record, 1895, 55-63.

Frank, L.D., Schmid, T.L., Sallis, J.F., Chapman, J. (2005). Linking objectively measured physical activity with objectively measured urban form. *American Journal of Preventitive Medicine, 28* (2S2), 117-125.

Kweon, B., Naderi, J. R., Maghelal, P., & Shin, W. (2004). *Correlates of environmental constructs and perceived safety enhancements in pedestrian corridors adjacent to urban street*. College Station, TX: Texas A&M University. (NTIS No. PB 2004105727)

Rivara, F.P., Bergman, A.B., & Drake, C. (1989). Parental Attitudes and Practices Toward Children as Pedestrians. *Pediatrics*, 84(6), 1017-1021.

Staunton, C., Hubsmith, D., & Kallins, W. (2003). Promoting Safe Walking and Biking to School: The Marin County Success Story. *American Journal of Public Health* 93: 1431-34.
Surface Transportation Policy Project. (2003, September). *Can't Get There from Here: The Declining Independent Mobility of California's Children and Youth.* Retrieved November 15, 2004, from http://www.transact.org/ca/

U.S. Department of Health and human Services. (2001). *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*. Retrieved October 2, 2004, from http://www.surgeongeneral.gov/topics/obesity/calltoaction/fact_adolescents.htm

U.S. Department of Health and Human Services. (2004). *Nutrition and Overweight: Healthy People 2010 Progress Review*. Retrieved September 15, 2004, from http://www.healthypeople.gov/data/PROGRVW/default.htm#2010

U.S. Department of Health and Human Services Centers for Disease Control and Prevention. (2004). *Kids Walk to School Programs: Fact Sheet*. Retrieved April 28, 2004, from http://www.cdc.gov/nccdphp/dnpa/kidswalk/fact_sheet.htm

U.S. Environmental Protection Agency. (2003). *Travel and Environmental Implications of School Siting* (Publication EPA 231-R-03-004). Retrieved November 3, 2004, from http://www.epa.gov/smartgrowth

Walljasper, J. (2001, September-October). Why Johnny and Jana Can't Walk to School. *Utne Reader*, 5-6.

Ziviani, J., Scott J., & Wadley, D. (2004). Walking to School: Incidental Physical Activity in the Daily Occupations of Australian Children. *Occupational Therapy International*, 11(1), 1-11.

APPENDIX I: Survey Questionnaire

Thank you very much for your participation.

Byoung-Suk Kweon, Ph. D.
Environmental Management Program
Texas Transportation Institute
3135 TAMU
College Station, TX 77843-9988

Department of Landscape Architecture and Urban Planning
Texas A & M University
College Station, TX 77843-3137
E-mail: bsk@archone.tamu.edu
Tel: 979-458-1133

Survey on

Children Walking or Biking to School

(Source: http://www.walktoschool.org)

Texas A & M University
Department of Landscape Architecture & Urban Planning

Texas Transportation Institute

Funded by the Southwest Region University Transportation Center

Information about Children

We would like to ask you for some background information about your children. Please answer the following questions.

1. How many children do you have attending A&M Consolidated Middle School?
   _______1 _______2 _______3

2. Please fill in the following for each of your children who is attending A&M Consolidated Middle School.

Gender			
Age			
Grade			

3. For each child, write the **average number of times** your child travels **to** school and **from** school **within one week**.

- **To School**

1

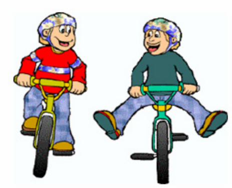
14

Let's walk/Bike to School

- **From School**

4. What is your perception of the overall safety of the environment for your child/children to walk to school?
   ☐ Not at all safe
   ☐ A little
   ☐ A medium amount
   ☐ Quite a bit
   ☐ Very much safe

(Source: http://www.iwalktoschool.org)



13

2

Walking/Biking Environment to School

We would like to know your thoughts about your child/children walking or biking to school. Please answer the following questions.

5. What concerns do you have about your child/children walking to or from school? (Please place the appropriate number by each according to the following scale)

1 = Concerns me greatly   2 = Concerns me somewhat
3 = Concerns me a little   4 = Not a concern

______ Crime
______ Traffic – too much traffic
______ Speed – cars drive too fast through the neighborhood
______ No (or inadequate) sidewalks/bikeways on the route to school
______ Sidewalks/bikeways are too close to traffic
______ Distance – school is too far away
______ Time – not enough time
______ Child/children's after-school schedule does not allow
______ Convenience – it is easier to drop off child/children on the way to work
______ Child/children would be walking/bicycling alone to school
______ Child/children do not want to/like to walk or bicycle to school
______ Parking at/near school is not available
______ No place to store bike
______ Weather (e.g. heat, rain, etc)
______ Backpacks too heavy (e.g. projects or musical instruments, etc)
Others (Please explain) ______________________________

6. If your child/children does not already walk or bicycle to school, what would make you more likely to allow your child/children to walk or bike to school? (Check all that apply)

______Crime watch
______Less traffic
______More sidewalks/bikeways/crosswalks
______Accompanied by other children
______Accompanied by adults or parents
______More crossing guards
______Safety training for students

3

12

Comments for Walking/Biking to School

- **Would you like to say anything else about your children's walking or biking to school? Do you have any additional comments on what is needed for your child to walk or bike to school?**

____

____

____

____

____

____

____

____

____

____

____

____

______More distance between street and sidewalks
______Improved sidewalks and bike lanes (beside roads)
______Lower speed limit
______Secure bike storage available
______Bike paths and walkways separated from traffic
______More shade (i.e. trees, overhead structure)
______Attractive and pleasing walking environments
______Safe-route-to-school map provided by school
Others (Please explain) ____________________________

7. If this school has a walk-to-school program, would you allow your child/ children to participate in the program in your neighborhood?
   ☐ Yes ☐ No ☐ Unsure

8. Would you be interested in walking to school with a group of children one or more times a week?
   ☐ Yes ☐ No ☐ Unsure

9. Would you be interested in volunteering to help plan a walk-to-school program in your neighborhood?
   ☐ Yes ☐ No ☐ Unsure

10. Can you suggest any particular improvements to make walking or biking to school more likely?
    ____
    ____

11. What do you consider to be an appropriate "walking distance" for your child to walk to school?
    ☐ Less than 0.5 mile
    ☐ 0.5 – 1 mile
    ☐ 1 – 2 miles
    ☐ More than 2 miles

12. What do you consider to be an appropriate "biking distance" for your child to bike to school?
    ☐ Less than 0.5 mile
    ☐ 0.5 – 1 mile
    ☐ 1 – 2 miles
    ☐ More than 2 miles

Walking/Biking in Neighborhood

We would like to know more about your children's outdoor activities.

13. How often do your children walk or bike to the following places within one week? (Please check each place)

Place	None	Once / week				
Friend's houses						
Parks, trails,						

22. Your education level
☐ Less than high school
☐ High school/GED
☐ Community college/Technical school
☐ College degree
☐ Graduate degree

23. Questions about your household

Number of household members	
Number of children	
Number of cars	
Number of licensed drivers	

24. How important is your physical activity to you?
☐ Not at all
☐ A little
☐ A medium amount
☐ Quite a bit
☐ Very Much

25. On average, how often do you exercise (e.g. walking, biking, gym, etc) each week?
☐ None
☐ Once
☐ 2 – 3 times
☐ 4 – 6 times
☐ Everyday

26. How long have you lived at your current address?
_______________year(s)

5

10

Walking/Biking in Neighborhood

We would like to know more about your children's outdoor activities.

13. How often do your children walk or bike to the following places within one week? (Please check each place)

Place	None	Once / week				
Friend's houses						
Parks, trails,						

22. Your education level
☐ Less than high school
☐ High school/GED
☐ Community college/Technical school
☐ College degree
☐ Graduate degree

23. Questions about your household

Number of household members	
Number of children	
Number of cars	
Number of licensed drivers	

24. How important is your physical activity to you?
☐ Not at all
☐ A little
☐ A medium amount
☐ Quite a bit
☐ Very Much

25. On average, how often do you exercise (e.g. walking, biking, gym, etc) each week?
☐ None
☐ Once
☐ 2 – 3 times
☐ 4 – 6 times
☐ Everyday

26. How long have you lived at your current address?

_______________year(s)

Background Information

We would like to ask you for some standard background information. This is an important part of the survey.

16. Your Gender ☐ Male ☐ Female

17. Your Age ___________________

18. Your Ethnicity
☐ African American ☐ Hispanic
☐ Asian ☐ White ☐ Other

19. Your Marital Status
☐ Married
☐ Common-law marriage/living together
☐ Separated/divorced
☐ Widowed
☐ Never Married

20. Parent's Employment Status
Father
☐ Full time ☐ Part time ☐ Not employed

Mother
☐ Full time ☐ Part time ☐ Not employed

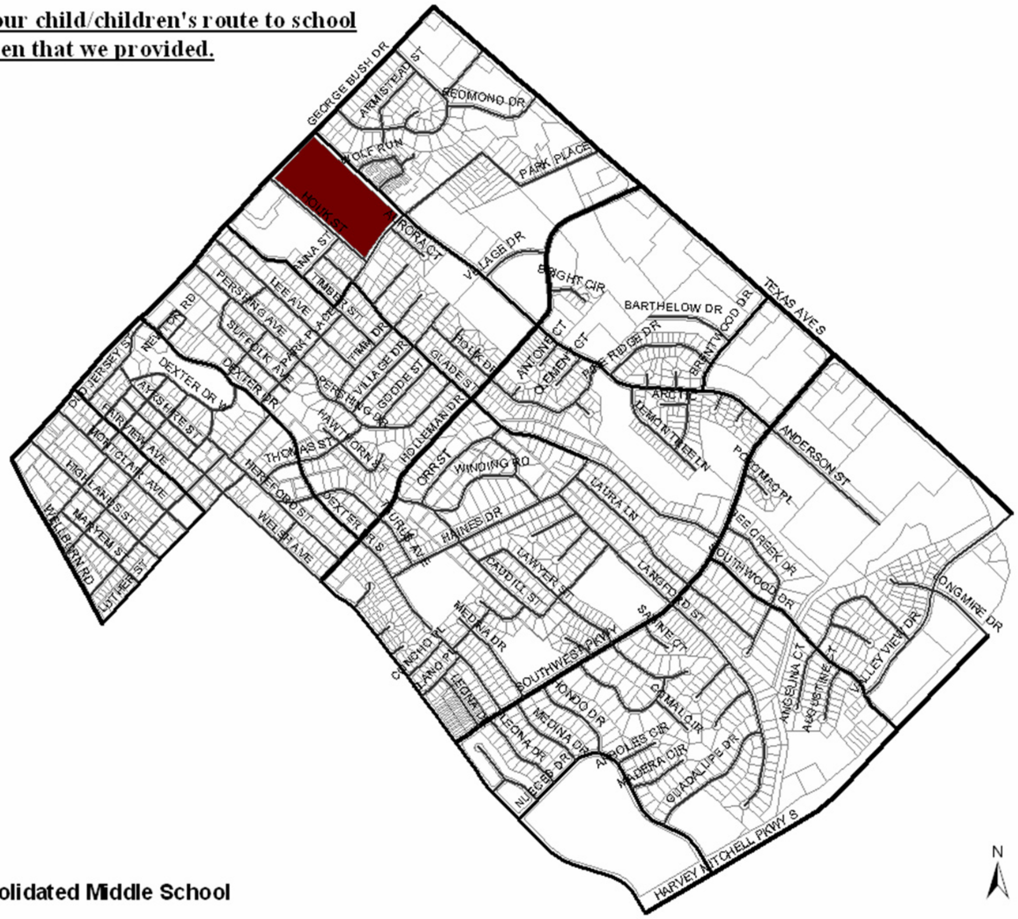
21. Household Income level
☐ Less than $20,000 per year
☐ 20,001-40,000
☐ 40,001-60,000
☐ 60,001-80,000
☐ More than $80,000 per year

14. How important is your children's physical activity to you?
☐ Not at all
☐ A little
☐ A medium amount
☐ Quite a bit
☐ Very Much

15. How often does your child/children exercise (e.g. gym, sports, martial art, dance, water sports, etc) each week?
☐ None
☐ Once / week
☐ 2 – 3 times
☐ 4 – 6 times
☐ Everyday

Walking/Biking Route to School

Please mark your child/children's route to school using the red pen that we provided.



A&M Consolidated Middle School

7

8