Critical Factors for Active Transportation to School Among Low-Income and Minority Students

Evidence from the 2001 National Household Travel Survey

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Background: Walking to school may be an important source of daily physical activity in children's lives, and government agencies are supporting programs to encourage walking to school (e.g., Safe Routes to School and the CDC's KidsWalk programs). However, little research has looked at differences in behavior across racial/ethnic and income groups.

Methods: This cross-sectional study used data from the 2001 National Household Travel Survey to document rates of walking and biking to school among low-income and minority youth in the U.S. (N=14,553). Binary models of the decision to use active transport to school were developed to simultaneously adjust for trip, individual, household, and neighborhood correlates. All analyses were conducted in 2007.

Results: The data showed that low-income and minority groups, particularly blacks and Hispanics, use active travel modes to get to school at much higher rates than whites or higher-income students. However, racial variation in travel patterns is removed by controlling for household income, vehicle access, distance between home and school, and residential density.

Conclusions: Active transportation to school may be an important strategy to increase and maintain physical activity levels for low-income and minority youth. Current policy interventions such as Safe Routes to School have the opportunity to provide benefits for low-income and minority students who are the most likely to walk to school.

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Introduction

Active transportation to school may provide a means of reintroducing regular physical activity into the lives of today's children.[1–3] This is particularly important given the tripling in rates of overweight children and adolescents in the U.S. between 1980 and 2002.[4] Recent policy initiatives such as Safe Routes to School (SR2S) and the CDC's KidsWalk program provide support to increase walking and biking, and *Healthy People 2010* identified increasing the proportion of children walking and biking to school as a national health goal.[5]

Studies have found that active transportation to school is associated with higher levels of physical activity[6–8] and higher levels of energy expenditure.[9] Associations between active transportation and BMI, and active transportation and total physical activity are less clear. A study of 5-year-old British boys found no association between active transportation and overall physical activity.[10] While an association between active transportation and lower BMI was found for fourth- and fifth-grade boys,[11] other research has shown no relationship[12] or a positive association with BMI.[8]

While there have been several recent studies of children's active school travel,[13–20] none has focused on differences in walking and biking to school by racial/ethnic group and income. Because minorities have higher levels of obesity in the U.S.,[4] it is important to consider how behavior may differ across racial/ethnic groups. This study fills the research gap by presenting rates of active travel by racial/ethnic group and income and estimating models of active transportation by racial/ethnic group to ascertain whether there are significant behavioral differences across groups.

Methods

The 2001 National Household Travel Survey is a population-based survey conducted by the U.S. Department of Transportation that collects information on all trips undertaken by members of selected households on a randomly assigned survey day. Household members report information on all trips (defined as a change of address), including purpose,

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mode, and travel time. Data are collected on the demographic characteristics (e.g., age and gender) of all household members. Race and ethnicity are collected only for the adult respondent, generally a parent or guardian. The 2001 survey had a 34.1% weighted person–level response rate and utilized a nonclustered, list-assisted random-digit-dial sample stratified by geographic area.[21] For this analysis, trips are considered to be for school if (1) the respondent is aged 5–18, (2) the trip occurs on a weekday, and (3) the purpose is "go to school as a student."[a] The total number of individuals meeting all these criteria was 14,553 students.

Estimates of the prevalence of walking and biking were calculated for each racial/ethnic group and standardized to the overall distribution by age using *svy: mean* command in Stata, version 9.2. All analyses were conducted in 2007. Replicate weights accounting for the complex survey design and post-stratified to Census population estimates by geographic area, race, and time of year were used to project from the sample to national averages and calculate appropriate standard errors.

Binary models of whether youth walked or biked to school were developed to simultaneously control for individual, household, and trip correlates of active transportation to school for whites, blacks, and Hispanics. Relative risks, or prevalence ratios, were utilized because previous research has shown that ORs overstate the risk when the outcome is relatively common, generally considered more than 10%.[23,24] Relative risks were calculated with the *svy: poisson* command in Stata. Relative risks were compared across groups to evaluate whether the effect of each variable differed by race using Wald tests. In addition, a pooled model was created and dummy variables for race were tested for significance. The models controlled for trip distance (self-reported); individual and household factors (age, gender, race, household income, driver status, and vehicle availability); and neighborhood factors measured at the block group level from Census 2000 data (population density, neighborhood disadvantage, and an indicator that much of the housing was built before 1940). Only youth with trips to school of 2 miles or less were included in the models because active transport is rarely used for longer trips.[22,25] Models were constructed for whites (n=4614), blacks (n=270), and Hispanics (n=510) if they had valid values for all explanatory variables.

[a]Previous analyses[22] used a more general trip purpose (School/Church) and restricted the sample to morning trips to facilitate comparison across survey years.

Results

The average unweighted age of respondents was 11.4 years, and 49.0% were female. Distance to school varied significantly among racial groups ($p<0.001$) with 35% of Hispanics, 22% of blacks, and 16% of whites living less than 1 mile from school. Forty-five percent of white children lived in households earning at least $60,000 annually, but the share in black (29%) and Hispanic (19%) households was lower.

Rates of active transportation varied significantly by racial/ethnic and income groups (Table 1). Hispanics had the highest rate of active transportation (27.7%), followed by non-Hispanic blacks (15.5%), Asian and Pacific Islanders (13.4%), respondents reporting more than one race (12.2%), and whites (9.4%). Significant differences existed between whites and blacks ($p=0.012$), whites and Hispanics ($p<0.001$), and blacks and Hispanics ($p=0.001$). Students from families earning less than $30,000 walked more than twice as much as students from households earning more than $60,000 ($p<0.001$). High school students had the lowest rates of active transport across all income and racial groups.

The model showed that living within a half-mile of school greatly increased the likelihood of walking or biking to school across all groups, even after controlling for individual and neighborhood covariates (Table 2). For example, rates of walking to school were 2 times higher for Hispanic youth living within a half-mile of their school than the reference category of between 1 and 2 miles. For blacks, such proximity increased rates of active transport 6 times. The effect was lower for Hispanics than other groups because they

Table 1. Standardized[a] active transportation rates by race and income

		Active transportation rates			
	Unwgted. N	**All (aged 5–18)**	**Elem. (5–11)**	**JHS (12–13)**	**HS (14–18)**
Racial/ethnic group					
Non-Hispanic white	11,611	9.4	10.3	10.9	7.2
Non-Hispanic black	893	15.5	18.2	17.9	10.2
Hispanic	1,145	27.7	30.8	30.3	21.6
Asian/Pacific Islander	504	13.4	14.6	21.3	7.7
Multiracial	326	12.2	15.2	10.9	8.1
Missing	74	9.0	4.5	18.0	11.4
Annual household income level ($)					
0–29,999	2,526	20.5	22.9	23.7	15.2
30,000–59,999	5,088	12.6	13.9	12.7	10.5
≥60,000	6,267	8.1	8.9	10.6	5.8
Missing	672	21.5	31.2	18.7	7.9

[a]Standardized to the 2001 distribution by age.
Elem, elementary; HS, High school; JHS, junior high school; Unwgted, unweighted.

Table 2. Adjusted[a] prevalence ratios of active transportation to school by racial/ethnic group

	White	Black	Hispanic	All
Distance to school				
≤0.50 miles	4.97*** (3.87–6.38)	6.03*** (2.39–15.25)	2.02** (1.31–3.09)	3.93*** (3.11–4.98)
0.51–1.00 miles	0.92 (0.64–1.34)	2.34 (0.86–6.43)	1.30 (0.79–2.13)	1.20 (0.87–1.64)
1.01–2.00 miles [Ref]				
Age (years)	1.05** (1.01–1.09)	1.09* (1.01–1.18)	1.01 (0.97–1.06)	1.04** (1.02–1.07)
Licensed driver	0.52** (0.34–0.78)	0.26 (0.06–1.11)	0.58 (0.22–1.57)	0.52*** (0.36–0.74)
Female	0.93 (0.78–1.12)	1.09 (0.66–1.82)	0.94 (0.71–1.25)	0.93 (0.81–1.07)
Annual household income ($)				
0–29,999 [Ref]				
30,000–59,999	1.03 (0.76–1.39)	0.78 (0.41–1.48)	0.74 (0.46–1.17)	0.94 (0.75–1.17)
≥60,000	0.68* (0.48–0.96)	1.23 (0.61–2.52)	0.68 (0.40–1.15)	0.74* (0.57–0.96)
Missing	0.73 (0.31–1.69)	2.96* (1.01–8.74)	1.13 (0.64–1.99)	1.17 (0.77–1.80)
Household vehicles per driver	0.99 (0.77–1.27)	1.17 (0.58–2.36)	1.15 (0.79–1.69)	1.03 (0.86–1.23)
Median year built before 1940	1.25 (0.93–1.67)	0.74 (0.29–1.93)	0.93 (0.64–1.34)	1.02 (0.79–1.30)
Density (people per sq. mile)				
<4,000 [Ref]				
4,000–9,999	1.08 (0.85–1.37)	2.07 (0.94–4.56)	1.18 (0.62–2.24)	1.20 (0.96–1.51)
10,000–24,999	1.59 (0.99–2.54)	2.59* (1.15–5.86)	1.73 (0.87–3.43)	1.66** (1.16–2.38)
≥25,000	2.05* (1.03–4.08)	3.35* (1.24–9.04)	1.64 (0.91–2.97)	1.39 (0.97–1.99)
Neighborhood disadvantage[b]	1.03 (1.00–1.07)	0.98 (0.95–1.02)	1.03* (1.01–1.06)	1.03* (1.01–1.05)
Black				0.95 (0.64–1.39)
Hispanic				1.18 (0.86–1.61)

Note: Numbers in parentheses represent the 95% Confidence Interval.
[a]Adjusted for all variables in model.
[b]Computed as the sum, at the residential block group level, of percentage of individuals living below the poverty line (standardized), percentage female-headed households (standardized), percentage receiving public assistance (standardized), and percentage unemployed (standardized).
*$p<0.05$; **$p<0.01$; ***$p<0.001$.

had higher rates of active transport in the reference category.

Several other factors had significant associations with walking and biking to school. Age had a moderate positive effect for whites and blacks. White students with driver's licenses had rates of active transport that were nearly half that of students without licenses. The effects of income were inconsistent across racial groups, but there was evidence that higher-income whites were less likely to walk or bike to and from school. Neighborhood effects, particularly density, suggest that walking was more common in denser areas, but the effects were significant only for whites and blacks. Higher levels of neighborhood disadvantage were associated with more walking for Hispanics, but the effect was relatively small, with a 1SD increase in disadvantage increasing rates of walking and biking by a factor of 1.03.

Bonferroni-adjusted Wald tests of differences across groups for each factor in the model showed no significant pair-wise differences. In a pooled model that combined data for whites, blacks, and Hispanics, the dummy variables for race were not significant (Table 2).

Discussion

Using a nationally representative sample, this analysis showed that there were significant differences in rates of active transport to school by racial and income groups. However, models controlling for several individual and neighborhood covariates found no differences among racial groups. This suggests that differences in observed rates of active transportation result from differences in the underlying distribution of explanatory factors rather than varied behavior patterns across racial groups. For example, whites have the lowest rates of walking and biking to school largely because they are the least likely to live within a half-mile of school, have higher incomes and high levels of vehicle access, and live in lower-density areas. The strong association between distance and active transport found in this study confirms findings from previous research in Australia,[14] Oregon,[15] Florida,[16] California,[17] the U.S.,[25,26] and England.[18] However, most previous research did not consider the association by racial group.

One implication of these findings is that SR2S programs, which improve safety around schools, have the potential to strongly benefit minority and low-income students because those students are more likely to live near the schools they attend. One caveat is that these benefits will accrue only if SR2S projects are distributed equitably. Because most state Departments of Transportation require individual localities to apply for SR2S grants, there may be a bias toward areas with greater capacity to plan projects and write proposals. With this in mind, states should consider the equity implications of their SR2S-funding decisions.

An important limitation of this analysis is that it is cross-sectional and does not explicitly account for endogeneity of residential location and preferred school commute mode (i.e., self-selection bias). In addition, the

national scope of this study precluded the use of detailed geographic descriptors, particularly the availability of sidewalks and the mixed-use nature of the neighborhood, which other research[12,16,17,20] has shown to be significant. These factors are likely to be correlated with the built-environment variables used here—density and median construction year of neighborhood housing—but are more easily linked to policy changes.

Conclusion

In a nationally representative sample, rates of walking and biking to school differed greatly across racial and income groups, with minorities and low-income children having higher rates of active transportation. Models of school travel showed that differences in observed rates of walking and biking resulted from minority and low-income students' living closer to school, having lower household incomes, and less vehicle access. These findings suggest that walking and biking to school may be a means of increasing or maintaining physical activity for minority populations. Safe Routes to School projects, assuming they are equitably distributed, will particularly benefit low-income and minority students who are the most likely to walk to school.

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