Children’s Active Commuting to School:  
The Role of Demographics, Distance, and Urban Form

INTRODUCTION

According to McDonald (2007), the number of children walking and biking to school has plummeted over the past 40 years. In 1969, 40.7% of children walked and biked to school, as opposed to only 12.9% in 2001. At the same time, the number of children driven to school has dramatically increased. In 1969, about 17% of children in the United States were driven to school, compared to 55% in 2001.

This change in school commute mode matters for several reasons. First of all, decreased rates of walking and biking mean decreased opportunities for physical activity, leading to concerns about children’s health. Second, the increased use of cars leads to increased traffic congestion, increased pollution, and a higher risk of vehicle-pedestrian accidents — all around children’s schools.

In recent years, a great deal of research has examined children’s commute modes to school, particularly non-motorized modes like walking and biking. Common terms used in the literature to describe these non-motorized modes are active commuting, active transportation, and active transport to school (ATS). In this literature review, I will most often use the term “active commuting.” Common variables that have been studied in relation to active commuting include demographics, parental beliefs and perceived barriers to active commuting, distance, urban form, weather and topography, and obesity / health / physical activity.
I will begin this literature review with an overview of the rates and characteristics of active commuting to school found in the literature. Next, I will closely examine three of the above factors — demographics, distance, and urban form — and their relationship with active commuting to school. (The other factors, while very important, are too numerous to cover in a paper of this length.) In my conclusion, I will summarize which of these factors have been found to correlate with active commuting. I will also describe some of the problems with the studies themselves, and I will outline areas of research that warrant further investigation.

MAIN THEMES AND DEBATES

Findings on Rates of Active Commuting

Active commuting rates vary widely. In the United States, rates of active commuting to school ranged from 5% to 33% of children (Boarnet, Anderson, et al. 2005; Braza, Shoemaker, and Seeley 2004; Bungum et al. 2009; Dellinger and Staunton 2002; Evenson et al. 2003; Fulton et al. 2005; Heelan et al. 2005; Kerr et al. 2006; Martin and Carlson 2005; Martin, Lee, and Lowry 2007; McMillan et al. 2006; Schlossberg et al. 2006; Sirard et al. 2005; Timperio et al. 2006). Rates of active commuting found in other countries were much higher, usually falling between 30% and 60% (DiGuiseppi et al. 1998; Larsen et al. 2009; Merom et al. 2006; Mota et al. 2007; Salmon et al. 2007; Yeung, Wearing, and Hills 2008). This discrepancy in active commuting rates is likely a result of the more spread-out nature of development in the United States, which makes active commuting more difficult.

Quite a few of the studies found a difference in active commuting rates based on time of day, with afternoons being heavier active commuting times (Heelan et al. 2005; Larsen et al. 2009; Merom et al. 2006; Schlossberg et al. 2006). To explain this finding, Larsen et al. (2009)
suggest that parents often drive children to school in the mornings on the way to work, but that in the afternoons, many parents are at work and cannot leave to pick up their child. This theory and its implications for future research will be discussed in the conclusion of this literature review.

The Role of Demographics, Distance, and Urban Form

This section outlines the findings on the relationship between active commuting to school and the following three factors: demographics, distance, and urban form.

I. Demographics

Age, gender, ethnicity, and socioeconomic status are the most common demographic variables studied in relation to active commuting to school. The major findings to date follow.

Age

The findings on the correlation between age and active commuting to school are mixed, with some studies finding a negative correlation, others finding no correlation, and still others finding a positive correlation. Five studies found a negative relationship between age and active commuting, meaning that the younger a child was, the more likely they were to walk or bike to school (Evenson et al. 2003; Fulton et al. 2005; McDonald 2008; McMillan et al. 2006; McDonald 2007). Two studies found no correlation (Kerr et al. 2006; Merom et al. 2006). Finally, three studies found a positive correlation between age and active commuting; the older children in these studies walked and biked to school more often than the younger children (Martin, Lee, and Lowry 2007; Salmon et al. 2007; Yeung, Wearing, and Hills 2008).

Several things could explain these mixed findings. First of all, the age groups in the studies varied greatly; for example, in one study, “older” children were ages 11–13 (Martin, Lee,
and Lowry 2007) and in another they were ages 14–18 (McDonald 2007). This lack of consistency could easily result in mixed findings. Also, there are many factors other than age, although still age-related, that could be influencing the findings. For example, the finding that older children are less likely to actively commute might be because some older children have driver’s licenses and are driving themselves to school. On the other side, the finding that older children are more likely to actively commute might be more a function of maturity and lessening parental fears than of age alone. These examples show that age is a broad factor that is influenced by many other age-related factors. While age is still a worthwhile variable to examine on its own, it would be wise to isolate and study the related factors as well.

**Gender**

The majority of studies examining gender have found clear gender differences in active commuting behavior, with boys more likely to walk or bike to school than girls. Six studies found this higher active commuting rate in boys (Bungum et al. 2009; Fulton et al. 2005; Larsen et al. 2009; McDonald 2007; McMillan et al. 2006; Yeung, Wearing, and Hills 2008). Not only were boys found to actively commute more often than girls, but several studies found that within active commute modes, boys were more likely than girls to bike to school (Bungum et al. 2009; Hume et al. 2009; Merom et al. 2006).

Two additional studies found that boys were more likely to actively commute than girls, but they only found this difference in middle-school-aged children, which suggests that age might be a factor in the gender finding. Evenson et al. (2003) found that middle-school boys were more likely to bike or walk to school than middle-school girls, but they did not find any gender differences in the high school population. Timperio et al. (2006) found that boys ages 10–12 were more likely to bike than girls of the same age, but they found no gender differences in
very young children (ages 5–6).

Finally, three studies found no gender differences in active commute behavior (Kerr et al. 2006; Martin, Lee, and Lowry 2007; Salmon et al. 2007). One possible factor driving this result could be the culture and characteristics of the neighborhoods studied. It’s likely that some neighborhoods simply have more active girls than other neighborhoods do, whether it’s a function of chance or of the culture of the community itself.

Despite the few studies that found no correlation between gender and active commuting, the majority of studies found that boys were more likely to actively commute to school than girls. Understanding what is behind this gender difference is an important next step. Bungum and colleagues (2009) speculate that girls might bike to school less than boys because they worry that wearing a bike helmet will mess up their hair. Considering how appearance-focused girls become as they approach adolescence, this is a reasonable theory and might be applicable to all active commute modes. Such modes can result in a less “together” appearance, whether due to wind, rain, or perspiration. Whether this appearance theory holds weight or other factors are involved, researchers should work to uncover the reasons why girls actively commute less than boys. Once these factors are known, effective ways of engaging girls in active commuting can be found.

Ethnicity

In all the studies I examined, black children and Hispanic children were found to actively commute to school in greater numbers than white children (Braza, Shoemaker, and Seeley 2004; Evenson et al. 2003; Fulton et al. 2005; Martin, Lee, and Lowry 2007; McDonald 2007; McDonald 2008). Braza, Shoemaker, and Seeley (2004) suggest that this finding can likely be explained by differences in the socioeconomic factors of these groups, rather than because of something directly associated with ethnicity. These researchers were unable to test this theory in
their study, but several other researchers discovered that the difference in ethnicity was no longer present when they adjusted for other variables (Fulton et al. 2005; Martin, Lee, and Lowry 2007; McDonald 2007; McDonald 2008). Unfortunately, the researchers didn’t specify whether these “other” variables were socioeconomic in nature. Nevertheless, this research suggests that there may be other factors causing the ethnicity result. Knowing what they are would enable more direct interventions aimed at increasing biking and walking amongst all children.

**Socioeconomic Status**

In an effort to assess the relationship between active commuting to school and socioeconomic status (SES), the research has examined several factors, including household income, level of parent education, and school SES. Due to the short length of this paper, I am only including the findings on household income, as this factor has been shown to have the strongest relationship with active commuting to school.

**Household Income**

A solid negative relationship has been found between household income and a child’s propensity to walk or bike to school, meaning that as household income increases, a child is less likely to actively commute to school. Three studies found this negative relationship (McDonald 2008; McMillan 2007; McMillan et al. 2006). Another study found this same negative relationship with walking, but found no relationship between household income and biking to school (Ewing, Schroeer, and Greene 2004). A final study found the same negative correlation between household income and walking/biking, but only for the trip home from school (Larsen et al. 2009).

Although it didn’t directly examine household income, a study by Braza, Shoemaker, and
Seeley (2004) provides further evidence of the relationship between income and active commuting. This study found a positive relationship between the percentage of students receiving welfare and rates of active commuting, meaning that the more children who were on welfare at a school, the more children there were at that school who actively commuted. A family’s income must be low to receive welfare. Therefore, in essence, this study found that lower levels of income (more welfare) were linked to higher levels of active commuting. This corroborates the findings of the studies that examined household income directly.

Knowing that children with a higher household income have lower rates of active commuting to school is important because it can inform the creation of programs targeted at this particular population.

II. Distance

Although distance is a function of urban form, it was such a salient aspect of the findings on active commuting to school that I’m including it as its own variable in this literature review.

The distance between a child’s home and a child’s school was found to be the strongest factor to influence active commuting to school: the shorter the distance, the more likely a child was to walk, bike, or use some other active mode of transport to get to school. All twelve studies in my review that examined distance as a factor found this relationship (DiGuiseppi et al. 1998; Ewing, Schroer, and Greene 2004; Larsen et al. 2009; McDonald 2007; McDonald 2008; McMillan 2007; McMillan et al. 2006; Merom et al. 2006; Salmon et al. 2007; Schlossberg et al. 2006; Timperio et al. 2006; Yeung, Wearing, and Hills 2008).

Several of these studies found that living within one mile of school greatly increased a student’s chances of walking or biking to school. McMillan (2007) found that a child who lived within one mile of school was three times more likely to walk than other students. Schlossberg et
al. (2006) found that 52% of children who lived within one mile of school walked to school, compared with 36% of those who lived between 1 and 1.5 miles from school.

McDonald (2007) did an analysis of school commute trends between 1969 and 2001 and found that across these years, the distance between a child’s home and school was the most important factor related to whether they used active transportation to get to school. She also found that over those 32 years, school distances substantially increased, partially as a result of widespread school consolidation. Her study also shows that active commute rates dropped by 27.8% during those same 32 years. Tying these pieces together, McDonald determined that “nearly half of the decline in walking between 1969 and 2001 can be tied to increased distance between home and school during the study period” (2007, 513).

Knowing that distance has the strongest impact on active commuting to school tells us that school location and community design are crucial elements in a child’s commute mode. This has great implications for the siting of future schools; if planners, school boards, and politicians are aware of how school siting can encourage active commuting, they can plan school districts accordingly. By creating districts with a larger number of small schools, instead of a smaller number of large schools, they can help create a built environment that naturally facilitates walking and biking to school.

III. Urban Form

Urban form refers to elements of the built environment, such as buildings, roads, and the design and layout of a community. There are also many factors that are a result of urban form, like population density and land use mix.

Studies have shown that active travel behavior in adults is correlated with certain aspects of urban form, such as neighborhood population density, mixed land use, and the presence of
sidewalks (Transportation Research Board 2005). Understanding which urban form factors correlate with active commuting to school could help inform neighborhood design as a method of increasing walking and biking amongst children.

Below are the findings for the relationship between active commuting to school and the following urban form factors: land use mix, intersection density, sidewalks, and neighborhood population density.

**Land Use Mix**

Several studies have examined how the land use mix of a neighborhood affects children’s active commuting to school. Land use mix refers to the mix of different land use types within a given area; common land use types are residential, commercial, industrial, open space, etc. A neighborhood composed solely of residences would have a low level of land use mix, while a neighborhood with residences, stores, and office buildings would be considered to have a high land use mix.

The research has found a reasonably strong positive relationship between land use mix and active commuting, meaning that the greater the mix of land uses in a neighborhood, the more likely it is that children will actively commute in that neighborhood. Three studies found this positive relationship (Kerr et al. 2006; Larsen et al. 2009; McMillan 2007). A fourth study found no relationship (Ewing, Schroer, and Greene 2004), but this is likely due to methodology. This study only looked at commercial land uses in addition to residential, while at least two of the other studies looked at all other types of uses, including public facilities. It could be that a neighborhood with many recreational facilities, for example, is one in which children are more used to walking and biking, and that commercial uses alone might not be enough of a factor to get children out and about.
**Intersection Density**

Also called “street connectivity” or “street connectedness,” intersection density is the number of intersections in a given area. Researchers study this urban form factor to determine if having more safe places to cross a street and more ways to navigate through a neighborhood leads to more active travel in that area.

The findings on the relationship between intersection density and children’s active commuting to school are mixed, with a skew toward a positive correlation. Three studies found this positive correlation, meaning that the more intersections a neighborhood had, the more likely children were to actively commute to school (Bungum et al. 2009; Kerr et al. 2006; Mota et al. 2007). A fourth study found the same positive relationship between the number of intersections and walking to school, but it found no relationship between intersection density and biking to school (Schlossberg et al. 2006). Finally, two studies found no relationship between intersection density and walking/biking to school (Braza, Shoemaker, and Seeley 2004; Larsen et al. 2009).

The findings that there is no relationship between intersection density and active commuting may be due to the moderating influence of other factors, such as distance and parental concerns about safety, that have been shown to affect active commuting rates. (Parental concerns about safety are not covered in this literature review.)

**Sidewalks**

The findings on the relationship between the presence of sidewalks and children’s active commuting to school are mixed, with a slight skew toward a positive correlation. Three studies found this positive correlation, meaning that the more sidewalks, the greater the likelihood that children would walk/bike to school (Ewing, Schroeer, and Greene 2004; Fulton et al. 2005; Kerr et al. 2006). Two studies found no relationship between sidewalks and active commuting. One of
these looked at sidewalks in general (Mota et al. 2007), while the other looked at the presence of complete sidewalk systems (McMillan 2007).

The California Safe Routes to School program, whose goal is to increase rates of active commuting to school, includes projects that improve transportation infrastructure, like sidewalks. Several studies have looked at the efficacy of such projects, and in particular, have examined whether sidewalk improvements have led to increased rates of active commuting (Boarnet, Anderson, et al. 2005; Boarnet, Day, et al. 2005). These studies found mixed results; some sidewalk projects had a relationship with increased walking and biking, while others did not.

As with the intersection density findings, the mixed findings for sidewalks could be due to the moderating influence of other factors, such as distance and parental concerns about safety.

**Neighborhood Population Density**

Neighborhood population density is the number of people located in a given area. This can be the number of people living in that area (residential density), the number of people working in that area (employment density), or a combination of both. In adult populations, neighborhood density is recognized as a strong positive correlate of active travel (Handy 2003).

The findings on the relationship between neighborhood density and children’s active commuting to school are mixed. Two studies found a positive relationship between neighborhood density and active commuting to school across all populations (Braza, Shoemaker, and Seeley 2004; Kerr et al. 2006), meaning that the more densely populated a neighborhood was, the more likely the students were to walk or bike to school. A third study found this same positive relationship, but only in white students and black students (McDonald 2008). In contrast to the positive correlation findings, another study found a negative relationship between density and active commuting, but only for the trip home from school (Larsen et al. 2009). Finally, there
was one study that found no relationship between density and active commuting (Ewing, Schroeer, and Greene 2004).

These mixed findings are not a surprise, as density is likely made up of many smaller factors that are related to active commuting, such as the presence of transportation infrastructure, eyes on the street, and an increased number of destinations (Handy 2003). It might be more productive if researchers broke density down into its component parts and studied them directly to better understand the relationship of such factors to active commuting to school.

CONCLUSION

The research has found strong and clear correlations between active commuting to school and distance, the demographic variables of gender and household income, and the urban form variable of land use mix. Also, there is evidence that moderate relationships may exist between active commuting and several other urban form variables, including intersection density and the presence of sidewalks. Before I discuss why it is important to know which variables are related to a child’s commute to school, I will outline problems with the existing literature, as well as areas that need further research.

The studies I examined had inconsistent methodologies, which made findings hard to compare. First, most of the studies measured active commuting differently; for example, one study defined active commuting as walking/biking at least once a week, while another based the measure of active commuting on students’ responses to the question “I usually walk/bike to school.” Also, the studies didn’t examine the same variables, or if they did, they didn’t necessarily define these variables in the same way. For example, for studies that examined neighborhood density, some measured residential density while others measured employment density. Furthermore, there was no consistency in the age groups that were studied; e.g., some of
the research looked at 4–10 year olds, some looked at 4–11 year olds, while other research looked at 5–18 year olds. Also, the studies examined geographical areas of differing sizes, meaning that distance to school varied across the studies. For example, some studies only looked at commuting by children who lived within one mile of school, while others went out further. These many areas of inconsistency across studies are likely a major reason that some of the findings for the different variables were mixed. Standardization of variables could lead to truly robust and effective findings in the field.

Another problem in the methodology of the studies I examined was in the basic definition of active commuting. Most studies looked solely at walking and biking, and not at a full range of active commute modes, which could include skateboarding, rollerblading, and riding a scooter. Some of the studies didn’t specify what they meant by “active commuting,” so they may have included modes other than walking and biking, but there was no way to know. Further studies should examine the full range of active commute modes, and if they don’t, they should be explicit about which modes they are studying.

There are many areas in the active-commuting-to-school literature that need further research. In terms of urban form variables, there are many variables of the built environment upon which little research has been done, including the following: bike lanes and bike infrastructure; the level of traffic or presence of major roads along the route to school; the directness of the route to school; the presence of dead ends and/or complete streets; the number of street trees; and the presence and quality of traffic signals, crossing signals, and crosswalks. Examining these additional variables will help round out our knowledge about how urban form impacts a child’s commute to school.

In terms of demographic variables, research should be done to determine what’s driving
the ethnicity and gender findings. Why are boys actively commuting to school more frequently than girls? Why are black and Hispanic children actively commuting to school more frequently than children of other ethnicities? Getting at the factors underlying these findings will help us increase rates of active commuting in the populations whose numbers are low.

On a related note, the variables of age and density seem to be broad variables that are influenced by more specific variables. As discussed earlier, the age findings might be influenced by factors like teen driving or parental fears of safety. The density findings might be a result of more eyes on the street or a greater presence of transportation infrastructure. More specific variables like these should be extracted from age and density so they can be studied on their own.

Another important variable to examine is parental commute-to-work habits. The finding that active commuting is less common in the morning suggests that parents are dropping children off at school on the way to work, which shows how much a parent’s commute to work may affect a child’s commute to school. More research on parents’ commute habits would help determine if there is a significant correlation between their commute and their children’s commute, thus shedding light on another variable that could be targeted in programs that seek to change children’s commute habits.

Finally, my review of the literature revealed a relatively unexamined variable that may be impacting rates of active commuting to school: school policies. Two studies found that between 6% and 7% of parents believed that school policies were significant barriers to their children actively commuting to school (Dellinger and Staunton 2002; Martin and Carlson 2005). In another study (Ahlport et al. 2008), parents shared details about the specific school policies that they felt were problematic. Some schools had policies that only allowed children of a certain age to bike or walk to school. Other schools didn’t allow children to walk or bike home from school.
unless they had a parent’s note. Another problem cited by parents was the lack of storage space at school for items like bike helmets and wet clothes. Not one of the studies I looked at directly examined the existence of such school policies and their relationship to rates of active commuting. Future research should address this overlooked, but potentially important, variable.

Even with its limited scope, this literature review has shown that many factors impact a child’s commute to school. Knowing what these factors are is important because it allows the creation of targeted efforts to increase active commuting rates. A good example of such an effort is the California Safe Routes to School program. To increase rates of active commuting to school, the program funds improvements to the built environment, like installation or repair of sidewalks, as well as child and parent education around active commuting (Caltrans 2009).

While some Safe Routes to School programs address only one factor, like infrastructure, other programs are more comprehensive, like the Safe Routes program in Marin County, California (Staunton, Hubsmith, and Kallins 2003). Between 2000 and 2002, this program instituted bike and pedestrian skills training, walking programs like a walking school bus, parent and student education, and infrastructure improvements. The results were phenomenal. Over these two years, the community saw a 64% increase in the number of children who walked to school.

The results of the Marin County Safe Routes to School program are inspiring. In order to create more programs like it, we need to continue to uncover the correlates of active commuting to school. With such knowledge, we can design increasingly effective programs that encourage children to actively commute to school.
References


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