Neighborhood Commute to Work Times and Self-Reported Caregiver Health Behaviors and Food Access

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Abstract

Objective: Time spent commuting is associated with obesity. The objective of this study was to assess the relationship between neighborhood-level commute to work (CTW) times and self-reported health behaviors and food access.

Methods: We conducted a cross-sectional analysis of caregivers with infants as part of the Greenlight Study, a multisite obesity trial in Chapel Hill, New York City, Nashville, and Miami. ZIP code–based commuting estimates were determined using the US Census American Community Survey. Self-reported health behaviors and food access data were collected by directed interview. Logistic and linear regression models were used to determine associations between neighborhood CTW times and health behaviors and food access.

Results: The average neighborhood CTW time for all ZIP codes was 29 minutes (n = 846). Caregivers in longer CTW time neighborhoods were more likely to endorse fewer food choices (adjusted odds ratio [AOR], 1.39; 95% confidence interval [CI], 1.15–1.69; $P = .001$) and difficulty accessing markets with fresh produce (AOR, 1.51; 95% CI, 1.02–2.25; $P = .04$). Neighborhood CTW time >30 minutes was associated with less caregiver physical activity (AOR, 0.58; 95% CI, 0.34–0.98; $P = .044$). Neighborhood CTW time was inversely related to infant television time (adjusted mean, 399 minutes/day for ≤30 minutes and 256 minutes/day for >30 minutes; $P = .025$). New York families in longer CTW neighborhoods were more likely to report difficulty accessing markets with fresh produce (AOR, 1.80; 95% CI, 1.03–3.14; $P = .039$).

Conclusions: Neighborhood CTW time is associated with several self-reported health behaviors and perceived food access among caregivers with children. Neighborhood CTW times may represent city-specific features, including transportation infrastructure, which may impact the health of families.

Keywords: commuting; obesity; physical activity; urban planning

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What's New

Commuting times in the United States are increasing, raising concerns about the health effects of commuting. We show that neighborhood-level commute to work time is associated with obesogenic health factors, including physical activity and perceived food access.

Place of residence confers both health risks and benefits for children.[1] Although much of the neighborhood-level research related to childhood obesity has focused on the food environment and proximity to recreational opportunities, other elements of the built environment, such as street connectivity and residential density, may also contribute to childhood obesity.[2–4]

In the United States, the average commute to work (CTW) time, defined as the time required to travel to work one way via personal vehicle or public transit, has increased significantly over the past 25 years.[5] In 1980, <12% of individuals commuted longer than 45 minutes 1 way to work, whereas in 2016, 17% did so.[5] Moreover, CTW times are not equitably distributed. Low-income and minority neighborhoods are more likely to lack nearby jobs and thus have longer neighborhood CTW times.[6,7]

Longer individual CTW times are associated with decreased adult physical activity, as well as reduced time for family activities and food preparation, but little is known about the association between caregivers' CTW times and their health behaviors and perceived food access.[8,9] On a neighborhood level, areas with longer average CTW times and a higher dependency on vehicles tend to have a higher prevalence of obesity.[10,11] The association between CTW time and obesity is thought to be mediated by the reallocation of time from physical activity and other potentially healthy behaviors to the sedentary, often stressful task of commuting.[12] Noting the potential for neighborhood CTW times to impact families, particularly low-income, minority families, which are disproportionately affected by obesity,[13,14] we sought to explore associations between neighborhood CTW times and self-reported health behaviors and food access using a diverse cohort of caregivers with infants.

METHODS

We conducted a secondary cross-sectional analysis of the relationship between neighborhood CTW time and self-reported health behaviors and food access. Data collection occurred at the 2-month well-child check, the baseline enrollment time point of the Greenlight Study, a randomized childhood obesity prevention trial conducted at 4 pediatric clinics in Miami, Nashville, New York City, and Chapel Hill.[15] The methodology of the Greenlight Study has been described in detail previously.[18] Children were enrolled in the study if they were age 6 to 16 weeks, their caregiver spoke English or Spanish, and had no plans to leave the clinic for the next 2 years. Infant exclusion criteria included infants born before 34 weeks of gestational age, with a birth weight <1500 g, and with a diagnosed chronic medical problem that could affect growth. A detailed behavior assessment was performed by trained providers and research assistants at each site as part of the study protocol.[15] Questions were designed by an expert consensus team and adapted from validated measures, including the National Health and Nutrition Examination Survey physical activity and dietary survey and the Infant Feeding Style Questionnaire.[16–18] Caregivers provided written and verbal consent according to Institutional Review Board protocols approved at all 4 sites.

Outcome variables were selected for analysis based on the hypothesis that neighborhood CTW time may decrease the time available for leisure activities, such as tummy time and screen time. We also hypothesized that neighborhood CTW time may affect perceived food choices and access. Many of these factors are associated with obesity and are included in the current recommendations for the prevention of childhood obesity from various organizations, including the Institute of Medicine and the American Academy of Pediatrics.[19,20]

Each outcome measure was based on a single survey item. Caregivers were asked to estimate the minutes per day on a typical day that their infant spent being active on his or her tummy while awake (tummy time) and the amount of time the television was on with the infant in the room (infant passive television time). Caregivers were also asked on how many days in the previous 7 days they were physically active. There were 2 items assessing food access and food choice: "I have difficulty getting to a market where I can buy fresh fruits or vegetables for my child" and "I can make few choices about the food my child eats," with Likert scale responses (strongly disagree, disagree, neutral, agree, and strongly agree).

Similar to a previous study of CTW at the population level, we used aggregate travel time to work data to estimate neighborhood CTW time.[10] Neighborhood CTW time was determined based on each caregiver's place of residence using the mean one-way travel to work time for the corresponding ZIP code tabulation area from the US Census American Community Survey (2011–15).[21] These data are self-reported and include individuals using both private and public transportation. Caregivers were excluded from this analysis if they did not provide a ZIP code of residence, or if that ZIP code was located outside the states in which the study sites were located.

Demographic and neighborhood commute characteristics of the sample were described cumulatively and by site. Owing to variable distribution, Likert scale questions were dichotomized for analysis, comparing participants who agreed strongly, agreed somewhat, were neutral, and disagreed somewhat with the given statement to participants who strongly disagreed with the given statement. We initially performed bivariate analyses to determine the unadjusted relationships between self-reported health behaviors and food access and neighborhood CTW times (data not shown). Outcomes with statistically significant bivariate relationships were included in multivariate models. Stepwise linear or logistic regression models were used to determine the beta coefficient or odds ratios (ORs) for the association of neighborhood CTW time with the outcomes. Caregiver and infant age, infant sex, hours per week in childcare, household income, caregiver race/ethnicity, caregiver employment status, caregiver education, and site were included in the initial model as covariates owing to their potential association with caregiver health behaviors and perceptions.[18] After fitting a model that included neighborhood CTW time and all covariates, we used change-in-effect to remove variables from the model. Covariates that changed the fully adjusted odds ratio (AOR) by >10% when dropped from the model were considered confounders and retained in the final model. AOR and 95% confidence interval (CI) for the association of neighborhood commute time and health behaviors were calculated from the final model. Outcomes were modeled cumulatively and by site. Owing to concerns for geographic clustering, the multivariate analysis was repeated using generalized estimating equations, which demonstrated similar results to the initial analysis. Data were analyzed using Stata version 14 (StataCorp, College Station, Tex). For all analyses, a P value <.05 was considered statistically significant.

RESULTS

There were 865 total caregiver-infant dyads across the 4 study sites. Neighborhood CTW estimates were available for 846 of the dyads (98%). The average infant age was 9.3 ± 1.8 weeks (range, 5.7−15.6 weeks) (Table 1). This was a racially and ethnically diverse sample that was largely low income. Thirty-two percent of caregivers were employed, and 73% of caregivers reported having employed partners.

The average neighborhood CTW time for all participant ZIP codes was 29 ± 8.1 minutes (Table 1). Mean neighborhood CTW times ranged from 25 ± 5.7 minutes for white, non-Hispanic participants to 31 ± 8.8 minutes for Hispanic participants ($P < .005$). By household income level, neighborhood CTW times ranged from 30 ± 8.2 minutes for households earning <$10,000 per year to 27 ± 7.5 minutes for those earning >$40,000 per year ($P < .005$). On site-specific analysis, New York residents had a mean CTW time of 40 5.2 minutes, whereas mean neighborhood CTW times at the other sites were <30 minutes ($P < .005$).

In the multivariate analysis, caregivers residing in areas with longer CTW times were more likely to endorse fewer food choices (AOR, 1.39; 95% CI, 1.15−1.69; $P = .001$) and difficulty accessing markets with fresh produce (AOR, 1.51; 95% CI, 1.02−2.25; $P = .04$) (Table 2). Neighborhood CTW time was inversely related to self-reported infant passive television time (adjusted mean, 399 minutes/day [95% CI, 366−430 minutes/day] for CTW time ≤30 minutes and 256 minutes/day [95% CI, 213−298 minutes/day] for >30 minutes; $P = .025$). Neighborhood CTW time >30 minutes was associated with less frequent self-reported caregiver physical activity (AOR, 0.58; 95% CI, 0.34−0.98; $P = .044$). Infant tummy time was not associated with neighborhood CTW time (AOR, −0.74; 95% CI, −8.82 to 7.45; $P = .860$).

In site-specific analysis, New York site caregivers with longer neighborhood CTW times were more likely to report difficulty accessing markets with fresh produce (AOR, 1.80; 95% CI, 1.03−3.14; $P = .039$). No other site-specific associations were found.

DISCUSSION

The findings of this study suggest important associations between neighborhood CTW times and several health factors: caregiver-perceived food choice and access, infant passive television time, and caregiver physical activity. Although in most cases, these differences were small in magnitude, the cumulative effect of these small differences is unknown as CTW times increase across the country. Longitudinal studies may improve our understanding of these associations over time.

Neighborhood CTW times are considered a proxy for job proximity and local transportation infrastructure.[6,7] Although we note that the majority of our caregivers were mothers who were unemployed at the time of data collection, 73% of the caregivers had employed partners. Longer neighborhood CTW times may affect families via caregivers or their partners through longer travel times to work or local errands.

Cumulatively, the data from this study support the hypothesis that neighborhood CTW time may affect child health, perhaps by displacing the available time for family leisure time activities whether healthy (caregiver physical activity) or unhealthy (infant passive television time). However, these associations also may be attributed to other aspects of the built environment not measured in this study, including the proximity of neighborhood food and recreational resources.[2,4]

Our results reinforce another tenet of place-based health research: the importance of site-specific differences in associations between environmental factors and family health behaviors. On site-specific analysis, the association between neighborhood CTW times and difficulty accessing markets with fresh produce was limited to New York. New York City has the nation's longest CTW times and the greatest reliance on public transit.[22,23] Thus, New York's unique transportation infrastructure may be more likely to demonstrate commute times as a barrier to market accessibility. This echoes similar findings indicating that associations between obesity and neighborhood CTW times vary by level of urbanization.[11]

Describing associations between aspects of the built environment, such as neighborhood CTW times and health factors provides data to support efforts to improve the built environment to facilitate healthy behaviors.[24] For health care providers, understanding associations between the neighborhood environment and health behaviors may allow for environmentally tailored counseling and interventions.[25] Owing to its association with obesity in adults, as well as potential associations with caregiver health behaviors, CTW in particular may be an important factor to consider when providing diet and lifestyle counseling.[8,9] Future research should include examination of associations between family diet and activity and self-reported caregiver CTW times.

Because we used neighborhood-level commuting data as opposed to caregiver-reported data, this study is subject to common limitations of an ecological analysis. We cannot infer individual-level, causal relationships between neighborhood CTW times and health factors. However, because many features of urban design are ecological in nature and act at a population level, ecologic data are valuable and should prompt additional analyses. Study strengths include a large sample size from 4 urban sites in the United States and detailed health data. Study limitations include the use of some unvalidated measures and self-reported outcomes. Finally, health behavior data were collected from only 1 caregiver and might not reflect the practices of other caregivers with whom the infant spends time.

Table 1. Demographic Data and Neighborhood CTW Characteristics, All Sites (n = 846)

	All Sites		Chapel Hill		Nashville		New York		Miami	
Characteristic	N (%) or Mean (SD)	Average Neighborhood CTW Time, min, Mean (SD)	N (%) or Mean (SD)	Average Neighborhood CTW Time, min, Mean (SD)	N (%) or Mean (SD)	Average Neighborhood CTW Time, min, Mean (SD)	N (%) or Mean (SD)	Average Neighborhood CTW Time, min, Mean (SD)	N (%) or Mean (SD)	Average Neighborhood CTW Time, min, Mean (SD)
All	846 (100)	29 (8.1)	254 (27)	23 (3.2)	224 (27)	24 (3.2)	223 (26)	40 (5.2)	145 (17)	29 (3.5)
Child age, wk	9.3 (1.8)	...	9.9 (1.7)	...	8.9 (1.6)	...	9.2 (1.7)	...	8.9 (1.9)	...
Child sex, girl	433 (51)	...	126 (49)	...	120 (52)	...	124 (54)	...	73 (49)	...
Caregiver, mother	822 (96)	...	241 (94)	....	219 (98)	...	217 (97)	...	134 (92)	...
Caregiver race/ ethnicity										
Hispanic	423 (50)	31 (8.8)	97 (38)	23 (3.2)	78 (34)	24 (3.0)	180 (79)	40 (5.1)	76 (51)	28 (4.0)
Black, non-Hispanic	238 (28)	26 (6.1)	85 (33)	22 (2.4)	74 (32)	24 (3.9)	22 (9.6)	40 (5.9)	58 (39)	29 (2.1)
White, non-Hispanic	154 (18)	25 (5.7)	64 (25)	23.5 (2.9)	73 (32)	24 (2.8)	16 (7.0)	40 (4.3)	11 (7.3)	23.6 (3.7)
Other, non-Hispanic	31 (4)	30 (9.3)	10 (3.9)	22 (3.2)	5 (2.2)	24 (2.1)	11 (4.8)	40 (7.8)	5 (3.3)	31 (1.7)
Caregiver employed	277 (32)	26 (6.5)	97 (38)	23 (3.5)	91 (40)	24 (2.8)	35 (15)	40 (4.0)	53 (36)	28 (3.8)
Caregiver with employed partner	619 (73)	29 (8.6)	191 (75)	23 (3.1)	150 (66)	24 (2.9)	191 (83)	40 (5.1)	87 (60)	28 (3.8)
Household income										
<$10,000	296 (35)	30 (8.2)	79 (31)	23 (3.0)	62 (27)	25 (3.8)	91 (40)	40 (5.3)	72 (48)	29 (3.1)
$10,000–$19,999	223 (26)	28 (8.4)	70 (27)	22 (3.0)	77 (34)	23 (3.3)	56 (25)	40 (5.0)	25 (17)	29 (2.5)
$20,000–$39,999	198 (23)	29 (7.8)	59 (23)	23 (3.0)	61 (27)	24 (2.8)	57 (25)	39 (5.5)	25 (17)	28 (3.2)
≥$40,000	129 (15)	27 (7.5)	48 (19)	23 (3.7)	30 (13)	24 (2.5)	25 (11)	40 (5.1)	28 (19)	27 (4.9)

CTW indicates commute to work.

Table 2. Adjusted Association of Neighborhood CTW Times and Self-Reported Caregiver Health Behaviors and Food Access (n = 846)

Health Behavior/Perception	AOR or Beta Coefficient for Every 10 min of CTW Time (95% CI); *P*	AOR or Adjusted Mean for CTW Time >30 min (95% CI), *P*
How much is the television on each day when [child's first name] is in the room (even if [child's first name] is "not watching")? (min/day)	−22.53 (−85.53 to 40.46); .483	>30 min: 256 (213−298) ≤30 min: 399 (366−430); .025
On most days, how much total time does [child's first name] typically spend being active on his or her tummy while awake? (min/day)	−0.74 (−8.92 to 7.45); .860	>30 min: 29.59 (24.28−34.90) ≤30 min: 31.80 (27.82−35.78); .524
During the past 7 days, on how many days were you physically active for a total of at least 30 minutes per day? (days/week)	0.83 (0.57−1.21); .345	0.58 (0.34−0.98); .044
I can make few choices about the food my child eats.	1.39 (1.15−1.69); .001	1.78 (1.30−2.45); <.001
I have difficulty getting to a market where I can buy fresh fruits or vegetables for my child.	1.51 (1.02−2.25); .04	1.23 (0.71−2.13); .468
New York site (n = 223)		
I have difficulty getting to a market where I can buy fresh fruits or vegetables for my child.	1.80 (1.03−3.14); .039	1.94 (0.33−11.43); .462

CTW indicates commute to work; AOR, adjusted odds ratio; and CI, confidence interval;
Stepwise linear or logistic regression with initial covariates: caregiver and infant age, infant sex, hours per week in childcare, household income, caregiver education, caregiver race/ethnicity, caregiver employment status, and site.

Conclusions

This is one of the first studies to assess the relationships of neighborhood CTW times to caregiver health behaviors and perceived food access. Our findings provide insight into how neighborhood CTW times may have family health effects potentially owing to a trade-off between time spent in transit and leisure time. Future studies should focus on individually assessed CTW times and their effect on the health behaviors of families with children. As CTW times increase across the United States, particularly in poor and minority communities, elucidating the relationship between commuting and family health behaviors may inform diet and lifestyle counseling and public health efforts to create neighborhoods more conducive to healthy behaviors.

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