Project: The Association Between Commuting Time and Physical Health and the Mediating Role of Health-Related Behavior: Evidence from the American Time Use Survey

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Short abstract:

Previous research has repeatedly shown that long commutes are negatively related to physical health. While existing literature suggests that the additional time spent commuting is at the expense of time used on health-related behaviors, research investigating how long commutes are linked to health is limited. The present study examines the relationship between commuting time and physical health as well as the mediating effect of health-related behaviors in this relationship. We used data collected during three waves from the American Time Use Survey (ATUS) in the years 2014 - 2016 as that included the assessment of general physical health and body mass index (BMI). Commuting time is conceptualized as the sum of all travel time in minutes for any purpose from the time the respondent leaves home until their arrival at work, and vice versa. It was observed that with increasing commuting time, the odds of suffering from poor general physical health and obesity increase. In the next step, we will investigate whether the time spent on physical activity, eating, food preparation, and sleeping, as well as the prepared food consumption, mediate the relationship between commuting time and the considered physical health outcomes. It is expected that commuting time is significantly associated with poorer physical health and that the examined health-related behaviors mediate a significant proportion of this association.

Extended abstract:

Background

For many working individuals, commuting – regularly recurring travel between one's residence and place of work - is an integral part of their daily life, and for many it takes up a significant portion of their available time. Prior to the COVID-19 pandemic, there was a clear upward trend toward increasingly longer commutes (Burd, Burrows and McKenzie, 2021), which, after an initial drop due to the pandemic, is continuing again (United States Census Bureau, 2025b). In 2024, the average commuting time in the US was 27.2 minutes per trip (United States Census Bureau, 2025b), and about 9.3% of working individuals commuted for more than an hour every day (United States Census Bureau, 2025c). The most common mode of travel to work in the US is by car (Burrows and Burd, 2024).

Studies have repeatedly shown that long commutes have negative effects on a range of health outcomes. It has been found that longer commutes are associated with an increased number of general health complaints (Künn-Nelen, 2016; Urhonen, Lie and Aamodt, 2016), more sick days (Gimenez-Nadal, Molina and Velilla, 2022), more visits to the general practitioner (Künn-Nelen, 2016), lower self-rated general health (Echeverría, Gimenez-Nadal and Molina, 2023) and increased mortality (Sandow, Westerlund and Lindgren, 2014). A frequently studied characteristic of physical health is body weight. Studies consistently report that long commutes are linked to increased body weight and a higher risk of overweight and obesity (Hoehner *et al.*, 2012; Yang and French, 2013; Raza *et al.*, 2021; Parise, Abbott and Trankle, 2022; Echeverría, Gimenez-Nadal and Molina, 2023).

One key way through which long commutes can negatively impact health is limited time resources. Having long travels to work may mean that commuters have less time and energy to follow daily routines, including eating balanced meals, getting a good night's sleep, and exercising. Christian (2012) showed that longer commuting times often come at the expense of time spent on health-related activities, including physical activity, eating, food preparation, and sleeping. Research in general has shown that long commutes are negatively related to physical activity (Christian, 2012; Hoehner *et al.*, 2012; Halonen *et al.*, 2020; Raza *et al.*, 2021), sleeping (Hansson *et al.*, 2011; Christian, 2012; Raza *et al.*, 2021), and dietary habits (Christian, 2012; Oostenbach *et al.*, 2022; Costa, Mululo and Araujo, 2025). These health-related behaviors are established lifestyle factors strongly related to major chronic conditions and can have long-term health impacts (Zick, Stevens and Bryant, 2011; Grandner, 2017; Vajdi and Farhangi, 2020; Dhuli *et al.*, 2022).

To date, only a few studies have examined the mediating role of health behaviors in the relationship between commuting time and physical health, and the evidence is mixed. Gan and Zhang (2025) showed that physical activity is a significant mediator in the association between commuting time and subjectively perceived general health in a Chinese study population. Another study conducted in the Nepean Blue Mountains region in Australia by Parise, Abbott and Trankle (2022) found that the mode of transport, but not physical activity, alcohol consumption, and the consumption of convenience foods, was a significant mediator in the relationship between commuting time and obesity. One limitation of this study is a small sample size, which may underestimate the mediating role of lifestyle behaviors.

Given the negative consequences of commuting time on physical health and a widespread prevalence of long commutes among U.S. workers, it is very important to explore and better understand the underlying mechanisms of these relationship. This study aims to investigate the relationship between commuting time and general physical health and overweight and obesity and to explore whether the amount of physical activity, the time spent eating, the time spent on food preparation, the consumption of prepared food, and the duration of sleep mediate the relationship between commuting time and health outcomes.

Methods

Study population

The current study utilizes data from the American Time Use Survey (ATUS). The ATUS is an annual, nationally representative, cross-sectional time-use survey administered by the Bureau of Labor Statistics, which has been conducted since 2003. Respondents fill out a time-use diary for one day,

in which they record their activities in chronological order in detail. A diary day covers 24 hours, beginning at 4 a.m. and ending at 4 a.m. the following day. Respondents report only those activities they classify as primary activities, while other activities performed simultaneously and considered secondary are not recorded. On the day following the diary day, an interview is conducted to gather further information about general characteristics of the respondent (United States Census Bureau, 2025a).

We limited our study to the three waves in 2014-2016, as the Eating & Health Module was conducted during these waves, providing additional information on health outcomes and behaviors.

A total of 32,990 individuals participated in the ATUS survey in all three waves from 2014 to 2016. From the initial sample, we removed individuals below the age of 18 years (N = 1,127), not participating in the labor market (N = 12,918), and participants who did not take part in the Eating & Health module (N = 479). Since the commuting time can only be recorded for individuals who worked on the diary day, all individuals who worked for less than 1 minute on this day were dropped from the sample (N = 6,856). Furthermore, individuals with irregular commuting patterns, i.e., who started or ended their diary day at work or for whom only one direction of the commute (outward or return journey) was recorded in the diary, were excluded (N = 2,102). We also dropped individuals who actively commuted to work (on foot or by bicycle) (N = 783). To limit our sample to commutes that can reasonably be done in one day, we removed individuals with total commuting times ≥ 360 minutes (N = 10). Finally, all observations with missing values in control variables and outcomes were removed (N for BMI sample = 523; N for general health sample = 188). The final analytical sample comprised 8,192 persons for the BMI models and 8,527 observations for the general physical health models.

Measures

Commuting time is measured at the diary day. It is conceptualized as the sum of all travel time for any purpose from the time the respondent leaves home until their arrival at work, and vice versa. To facilitate the interpretation of the results, we measured commuting time in a 5-minute unit increase.

The key health question asked interviewees to evaluate their general physical health was: „In general, would you say that your physical health was excellent, very good, good, fair, or poor?“, rated on a 5-point Likert scale. Responses were recoded into a dichotomous variable: “excellent”, “very good”, and “good” were categorized as good health, while “fair” and “poor” were categorized as poor health (Manor, Matthews and Power, 2000).

Obesity and overweight are determined using the body mass index (BMI). The BMI is calculated in ATUS based on the self-reported weight and height of each individual using the formula „$BMI = \frac{Body\ weight\ in\ kg}{(Hight\ in\ m)\text{^}2}$“. Based on the continuous measure, we created two outcome variables. Obesity was defined as a BMI ≥ 30, and overweight as a BMI ≥ 25, following the guidelines of the American Heart Association (2024). As no relationship between commuting time and overweight could be observed, these results are not reported.

Controls for several sociodemographic characteristics that are likely to be related to both commuting time and health were also included. We considered gender (men, women), age and age squared, and ethnicity/race (White, Black, Hispanic, and Other).

In addition, aspects of socioeconomic status and working conditions were considered, including the highest level of education attained (< high school, high school, some college, college degree), household income divided into tertiles (low, medium, high), occupation (white collar, pink collar, blue collar), employment type (government employee, private employee, self-employed), hours worked on the diary day, and residence in a metropolitan area (yes, no). Occupation was classified using 22 occupational codes based on the U.S. Census occupation classification system. White-collar occupations include professional, managerial, and administrative roles; pink-collar occupations cover primarily service-oriented jobs; and blue-collar occupations refer to manual and trade work.

Finally, family-related characteristics were controlled for, including partnership status (partnered, unpartnered) and age of the youngest child living in the household (no child or child above age 18, < 18 years, 0–6 years, 7–17 years).

Mediators

We consider time spent on physical activity, time spent eating, time spent preparing food, consumption of prepared food, and sleep duration as potential mediators in the relationship between commuting time and health.

The time a person has spent on physical activity is measured in minutes and is calculated from the sum of three components: the time spent on 36 individual sports and exercise activities, the time spent on activities with a metabolic equivalent of task (MET) of 3,0 or higher, and the time spent traveling with a bicycle.

Time spent eating is measured in minutes and calculated as the sum of minutes recorded for eating as a primary activity and minutes reported as eating while engaged in another activity (secondary eating).

The time spent on preparing food, measured in minutes, is defined as the sum of the time spent on food and drink preparation and presentation.

Consumption of prepared food was recorded based on whether the person ate any prepared food from a deli, carry-out, delivery food, or fast food on the diary day. This variable has binary values (Yes/No).

Sleep duration was defined as the number of minutes that the respondent reported sleeping.

Analytical strategy

To estimate the relationship between commuting time and general physical health and overweight/obesity, we made use of logistic regression models. The models progressed in several stages. We first explored the relation between commuting time and health outcome, controlling for gender, age, and ethnicity. We then added education, household income, occupation type, employment type, number of hours worked on the diary day, and metropolitan status to Model 2. The third and final model also included family-related characteristics. Due to space limits, here we present only the final fully-adjusted models.

Results

The average commuting time was ca. 45.5 minutes. Only 9% of respondents reported having poor physical health, and 29% were classified as obese. The preliminary results from the logistic regression analyses are presented in Table 1. It shows that an increase in commuting time by five minutes is related to 0.9% (95% Confidence Interval (CI): 1.000; 1.017) increase in odds of reporting poor general physical health and to 0.7% (95% CI: 1.001; 1.012) increase in odds of obesity net of all other characteristics.

Table 1. The associations between commuting time with poor general physical health and obesity.

	Poor general physical health (OR [95% CI])[a]	Obesity (OR [95% CI])
Commuting time / 5	1.009 * [1.000; 1.017]	1.007 * [1.001; 1.012]
Gender: Men (ref.)	-	-
Women	1.151 [0.976; 1.358]	0.817 *** [0.735; 0.908]
Age	1.017 [0.982; 1.055]	1.078 *** [1.051; 1.105]
Age^2	1.000 [1.000; 1.000]	0.999 *** [0.999; 1.000]
Ethnicity/Race: White (ref.)	-	-
Black	1.661 *** [1.327; 2.068]	1.808 *** [1.550; 2.108]
Hispanic	1.629 *** [1.319; 2.004]	1.168 * [1.006; 1.354]
Other	1.238 [0.835; 1.778]	0.364 *** [0.264; 0.491]
Education: < High school (ref.)	-	-
High school	0.708 * [0.528; 0.953]	1.155 [0.907; 1.475]
Some college	0.712 * [0.530; 0.961]	1.141 [0.897; 1.457]
College degree	0.408 *** [0.295; 0.566]	0.701 ** [0.545; 0.904]
Household income: Low (ref.)	-	-
Medium	0.681 *** [0.566; 0.819]	0.930 [0.822; 1.051]
High	0.537 *** [0.422; 0.679]	0.696 *** [0.601; 0.806]
Occupation type: White collar (ref.)	-	-
Pink collar	1.190 [0.953; 1.479]	0.971 [0.833; 1.130]
Blue collar	1.184 [0.956; 1.462]	0.944 [0.818; 1.089]

Employment type: Government (ref.)	-	-
Private	0.946 [0.765; 1.177]	0.835 ** [0.731; 0.955]
Self-employed	0.985 [0.732; 1.322]	0.574 *** [0.473; 0.695]
Working hours on diary day	0.990 [0.965; 1.016]	0.993 [0.978; 1.009]
Living in a metropolitan area: Yes (ref.)	-	-
No	0.911 [0.727; 1.132]	1.210 ** [1.053; 1.390]
Partner status: Partnered (ref.)	-	-
Unpartnered	1.095 [0.919; 1.305]	0.934 [0.831; 1.049]
Youngest HH-child: no child < 18 years (ref.)	-	-
0-6 years	1.019 [0.813; 1.273]	1.059 [0.917; 1.224]
7-17 years	1.151 [0.942; 1.403]	1.106 [0.970; 1.260]
Intercept	0.086 *** [0.035; 0.210]	0.102 *** [0.054; 0.191]
Number of observations	8,527	8,192

[a] OR - Odds ratio, 95% CI - 95% Confidence interval, ref. - Reference category, HH - household
Significance levels: < 0.05*, < 0.01**, < 0.001***

Next steps

In the further course of the project, we plan to conduct a mediation analysis to investigate whether time spent on physical activity, time spent eating, time spent preparing food, consumption of prepared food, and sleep duration mediate the relationship between commuting time and health outcomes.

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