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Editorial

## Commuting to work post-pandemic: Opportunities for health?



### 1. Introduction

The COVID-19 pandemic has disrupted lives and livelihoods around the globe. Beyond its direct impacts on health, the pandemic has profoundly impacted work arrangements. Workers and their employers discovered that many work tasks could be done remotely. Impacts of the pandemic on supply chains, coupled with international tensions, labour shortages, and other changes, are further changing work practices in ways that are still unfolding. This is also changing commuting patterns with potentially far-reaching impacts for health. Prior to the COVID-19 pandemic, commuting to work was a necessary, daily activity for many, if not most, workers engaged in modern economic activity.

### 2. The health considerations of commuting

Commuting, like all travel, presents an array of benefits and risks, depending on travel mode, distance traveled, time spent traveling, and context. In general, the negative aspects of travel can include exposure to air pollution and noise, community severance and increased risks for personal and traffic safety (Frank et al., 2019; Glazener et al., 2021). Benefits include opportunities for social interaction and physical activity and the capability to participate in activities of daily life (Frank et al., 2019; Glazener et al., 2021). This includes being able to access employment (Bastiaanssen et al., 2020).

Commuting to work comes with both benefits and risks. Several characteristics of commuting have been linked to indicators of stress and well-being, including impedance, control, predictability, travel time, and travel mode. “Impedance” refers to commuting time, distance, and/or speed and can reflect congestion and has been found to be associated with higher blood pressure and perceived stress (Gottholmseder et al., 2009; Novaco et al., 1979; Sposato et al., 2012). The predictability of the commute (i.e., consistency, timing) and control (e.g., choice about what time to commute) has been linked with perceived stress and cortisol (Evans et al., 2002; Gottholmseder et al., 2009; Sposato et al., 2012; Wener and Evans, 2011). In a number of studies, longer commute times have been linked to higher stress and lower wellbeing (Evans and Wener, 2006; Hilbrecht et al., 2014; Milner et al., 2017; Morris and Guerra, 2015; Stutzer and Frey, 2008) and fatigue that can subsequently affect other activities (Gimenez-Nadal et al., 2019). Using 16 years of panel data from British Household Panel Survey, it has been suggested the long-term effects may be among women only (Feng et al., 2014). A study conducted in Vienna suggests that having control over the commute (choosing what time to leave for the commute and choosing how long the commute will take, for example) has the greatest impact on stress followed by commute time, predictability, and impedance (Sposato et al., 2012). In a study of 11 Latin American cities, longer traffic delays rather than longer uncongested travel time were associated with screening positive for depression (Wang et al., 2019). Excess commuting is sometimes defined as the difference between the actual travel time and minimum possible travel time (Ma et al., 2006).

While the shift to working from home has garnered much attention and discussion, another commuting-related impact of the pandemic has been cutbacks in public transit service. Faced with longer public transit trips and less frequent service and concerns about COVID-19, many workers have been forced to drive to work. In general, commuting by car is perceived as more stressful (Gatersleben and Uzzell, 2007; Rissel et al., 2014; Wener and Evans, 2011) compared to other modes and active travel commuters report more satisfaction with their commutes (Chatterjee et al., 2020; Rissel et al., 2016; Smith, 2017) and increased well-being when switching from an inactive mode to active mode of travel (Knott et al., 2018; Martin et al., 2014). The association between active commuting and stress may be stronger among women (Herman et al., 2021). Despite this, irrespective of mode, commuters tend to report less satisfaction as commute times increase (Chatterjee et al., 2020).

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In addition, a number of cross-sectional studies show that commute time leaves less time for physical activity, leisure, and sleep, serving as mediators to well-being and happiness in some of these studies (Christian, 2012; Hilbrecht et al., 2014; Lorenz, 2018; Nie and Sousa-Poza, 2018). Using the American Time Use Survey, commute time competes the most with time spent engaged in sleep, physical activity, and food preparation among urban workers (Christian, 2012). In a longitudinal study of Swedish workers, and controlling for neighborhood SES and other factors, commuting distance had a dose response relationship with physical inactivity (Raza et al., 2021). These health behaviours can affect weight and studies of in-vehicle time, commute distance, and commute time show associations with BMI or obesity (Carroll et al., 2021; Dunton et al., 2009; Frank et al., 2004; Hoehner et al., 2012; Künn-Nelen, 2016; McCormack and Virk, 2014; Sha et al., 2019; Sugiyama et al., 2020).

This has implications for the development of chronic disease and illness. A prospective study of full-time public sector employees, found that commuting more than 7.5 hours per week was associated with more than 3 medically certified absences compared to those commuting  $\leq 2.5$  hours per week (Ala-Mursula et al., 2006) suggesting that longer commutes may impact one's health in a notable way. The relationship between commute time and doctor's visits and sick days may be greater among women (Künn-Nelen, 2016). Again, this may depend on commute mode. Longer commute times that involve more time spent sitting were associated with poorer self-reported health (Badland et al., 2017). While a meta-analysis of prospective studies on active commuting found associations with decreased risk of myocardial infarction (by 18%) and type II diabetes (by 22%) using a measure that incorporates both duration and intensity of activity (in this case, 11 MET-hours/week) (Raza et al., 2020).

Among the potential benefits of commuting, commutes may provide workers with some personal time and time to transition from work to home (Cornet et al., 2021; Ory et al., 2004). However, pre-pandemic, commuting to work was a chronic activity that, for many, was sedentary with the potential for stress, and a time-use that can compete with other health promoting activities and may lead to time poverty (Giurge et al., 2020).

### 3. What will happen to commuting post-pandemic?

As we write this editorial, the pandemic is still ongoing. The worst appears to be behind us, but the prospect of new strains and uncertainties about our response to emerging threats suggest a long tail. However, when the pandemic ends, there will be a lasting legacy for individuals, populations and our social systems. As we try to discern the effects of the pandemic on work and commuting, it is crucial to keep in mind that the pandemic is but one of many factors influencing these changes. On-going shifts in production and information systems, transitions to service economies, changes in international trade, and the impacts of climate change are all interacting with the COVID-19 pandemic to shape work and commuting.

Commute mode choice and time is influenced by a mix of sociodemographic characteristics and household composition, norms, attitudes, control, residential preferences and affordability, spatial job and housing balance, time budgets, the environment, social

**Table 1**

Early research studies looking at the future of commuting to work.

Post-pandemic commuting practices (a)	Stated preference, expectation, or planned changes
<b>Option to work from home</b>	38% expected telework, 38% expected commute, 24% did not know, Spain (Awad-Núñez et al., 2021) Among new WFH, 23% expect to WFH 1 day and 14% 2+ days; Among those who already WFH, 36% expect to increase, Netherlands, (Kalter et al., 2021)
<b>Days commuting or WFH per week</b>	Mean (SD) WFH days last week at survey; WFH days preferred post-COVID: 3.43 (2.13); 3.02 (1.41) Argentina 1.64 (2.11); 1.77 (1.98) Australia 3.01 (2.15); 3.07 (1.47) Brazil 3.19 (2.17); 2.91 (1.27) Chile 3.09 (2.47); 3.30 (1.59) Colombia 2.84 (2.32); 3.15 (1.48) Ecuador 3.15 (2.44); 3.52 (1.44) Peru 2.31 (2.39); 3.18 (1.97) South Africa (Balbontin et al., 2021)
<b>Number of commuting trips per week</b>	Mean pre-COVID, March–April, May–June, planned next week 7.2, 3.0, 3.8, 5.0, Australia (Beck et al., 2020)
<b>Commute distance or time</b>	Compared to pre-COVID, employees who expect to commute less, the total commuting distance and the distance traveled by car, public transit, and bicycle decreases by 30–40%, Netherlands, (Kalter et al., 2021)
<b>Mode change</b>	Pre-pandemic car (72%) and public transit (28%) commuters: 10% of car and 49% of public transit may change to active UK (Harrington et al., 2022) January–March; April–June: No intention to reduce car 35%; 24% Thinking about reducing car 7%; 9% Reduced car use 24%, 30% Thinking about replacing public transit with active 10%; 12% Thinking about replacing public transit with car 2%; 5% Crete (Tarasi et al., 2021) Compared to pre-COVID, employees with the same travel days intend to increase car (+1%) and active modes (+6%) and decrease public transit (–10%), Netherlands, (Kalter et al., 2021)

WFH = work from home.

(a) Online surveys conducted during March 2020 to December 2020.

issues, workplace support, and other utilities and dis-utilities of commuting (Builing et al., 2002; Cevero et al., 2008; Cusack et al., 2021; Heinen et al., 2010; Giurge et al., 2020; Grudgings et al., 2018; Humagain et al., 2020; Lin et al., 2015; Ortiz et al., 2022; Porter et al., 2019; Susilo et al., 2014; Thorhauge et al., 2016; Xiao et al., 2020; Yang et al., 2015). Now, commuting may also be influenced by new health concerns (Musselwhite et al., 2021). Trends in work, workforce, and arrangements also impact commuting patterns (Chatterjee et al., 2021) and work arrangements are a particularly salient issue right now.

Commute distances and number of commuting trips in industrialized countries were increasing prior to the pandemic but it is less clear what has happened to commute time (Ma et al., 2006; Chatterjee et al., 2021). In England the annual number of commute trips declined from 335 in 2002 to 277 in 2019 and one-way average commute times increased from 26 minutes in 2002 to 30 minutes in 2019 (Chatterjee et al., 2021; ONS, 2019). Among European workers commute times increased from the 2000s to the 2010s in Nordic countries, Anglo-Saxon countries, Spain, Austria, Germany, The Netherlands, Belgium and France; while decreases were observed for Greece, Portugal, and Italy (Giménez-Nadal et al., 2022). In the U.S., one-way average commute times have been increasing for the past decade to nearly 28 minutes in 2019 and approximately 10% of commutes have one-way commutes of an hour or more (Burd et al., 2021).

The COVID-19 pandemic eliminated commutes for employees who were able to work from home. A U.S. sample indicated 71% of workers were working from home all or most of the time (Pew, 2020). For some workers, this change was temporary, for others this may be a permanent change. As summarized in Musselwhite's editorial a year ago (Musselwhite et al., 2021), early in the pandemic in the UK nearly half of those employed did some work from home and a majority (86%) of those were due to the pandemic (Musselwhite et al., 2021). Car traffic in England was around 10% below pre-pandemic levels during 2021 with notable significant falls in peak time congestion (Anable et al., 2022). This is largely due to fewer people commuting for work, with an increase in the number of people working from home compared to pre-pandemic levels. As a result, people were traveling 34% less for work in January 2021 compared to January 2020 in the UK (Musselwhite et al., 2021). As Anable et al. (2022) note that even if people working from home travel into work for half a week, there will be a reduction in 16% in car commute miles.

While the research on this topic is still emerging, several online surveys conducted in 2020 show stated preferences, expectations, and planned changes about work arrangements and commuting (see Table 1). Across several different countries, participants appear to prefer to maintain their current work from home days and some changes in telework were expected to be maintained (Awad-Núñez et al., 2021; Balbontin et al., 2021; Kalter et al., 2021). The number of commuting trips and distances are expected to be less than pre-COVID-19 (Beck et al., 2020; Kalter et al., 2021). Some commuters are willing or considering changing to more active modes and replacing public transit with other modes (Harrington et al., 2022; Kalter et al., 2021; Tarasi et al., 2021).

## 4. Opportunities for health?

### 4.1. Working from home, schedule control, and commuting

It seems that some working from home will continue, potentially benefitting the health of many workers. Among new telecommuters in Chicago, the leading benefit of working from home is no commute time (82%) (Shamshiripour et al., 2021). For example, Ford et al. (2021) found among software developers with an average daily commute time of 67 minutes, a leading benefit of working from home is less time spent commuting as cited by 96% of workers. There may be benefits of reduced time spent commuting but differing responses to reduced commuting time have different implications for health. Cross-sectional surveys of U.S.-based knowledge workers during the summers of 2019 and 2020 found an average decrease in time spent commuting by 41 minutes per day. Employees without management duties reallocated most of that time to personal activities while managers tended to work longer hours (Kun et al., 2020). In Australia, commute time was reallocated to paid and unpaid work and leisure (Hensher et al., n.d.). It has been suggested that the COVID-19 pandemic and the related restrictions on mobility may be similar to major life events that provide an opportunity to change health behaviours and norms (Musselwhite et al., 2021). This could be an opportunity to reallocate time to health promoting activities for example.

In addition to changes in the number of hours working outside the home and time spent commuting, post-pandemic work may give some workers more flexibility in when they need to come to work. Flexibility in working hours has been shown to decrease stress and work-family conflict (Moen et al., 2016). It may also change commute departure times and "peak travel" times on roadways, resulting in less congestion but possibly longer "peak" travel hours. The early evidence suggests reduced traffic may have implications for commute time, commute experience, and risks for other exposures (Anable et al., 2022).

### 4.2. Unintended consequences of mode change and increased disparities

While options for remote work and flexibility in work hours have the potential to benefit health, these options are not available to all (Bick et al., 2020; Musselwhite et al., 2021) and even for those who have these options, there can be unintended consequences. Some have suggested the shifts in working from home may not be enough to counter the mode shifts to car from public transit, resulting in new congestion patterns (Currie et al., 2021). In addition, reductions in public transit ridership due to work from home and mode changes (Eisenmann et al., 2021; Thombre et al., 2021) can continue to have impacts to the public transit systems through less commuter driven revenue (Pew, 2022) and exacerbate disparities in access.

Public transit is vital to many cities and developing countries. Public transit ridership plummeted early in the pandemic as a result of travel restrictions and has been slower to recover than car use. Depending on the timepoint, ridership was reduced by 40% to more than 90% in many countries (Gkiotsalitis et al., 2021; Musselwhite et al., 2021; Subbarao et al., 2022). In the U.S. public transit

ridership is still only 55% of what it was prior to the pandemic (U.S. Bureau of Transportation Statistics, 2022) as a result of continuing work from home policies for some workers and other workers for whom it is an option to choose automobile travel to avoid crowded places. Sales of used cars in the U.S. shot up during the pandemic for a variety of reasons, but one factor was increased demand for privately owned automobiles as an alternative to crowded public transit systems (Winkless, 2022). For public transit services that depend on farebox revenue, declines in public transit ridership have necessitated cutbacks in service, triggering further declines in ridership (He et al., 2022). In the U.S., people with lower income, without cars, and with disabilities continued to use public transit during the pandemic (He et al., 2002). With fewer travel options, lower wage workers, workers with disabilities, and other public transit-dependent populations for whom remote work is not an option are facing fewer employment options and plethora of health impacts related to unemployment and underemployment (Mack et al., 2021).

#### 4.3. Opportunities

There may be lasting impacts of favoring private car use over public transit. Ways to address this going forward can include identifying areas with inequitable access to opportunity; engaging riders and re-orienting services for those needs; considering different adaptive service strategies and pricing; and long-term planning and partnering (APTA, 2021).

As we emerge from the worst of the COVID-19 pandemic, whatever that might mean in a world with endemic COVID, we have the opportunity to restructure work and daily transport in ways that better serves human well-being and global sustainability, as well as for health. Although the COVID pandemic has created many difficult policy challenges across the World (Gaskell et al., 2020), people in different countries have demonstrated remarkable capacity for adaptation and innovation in their communities, neighborhoods, their work, play and mobility, from remote education strategies to retail and restaurant businesses moving online and outdoors. However, one of the lessons from COVID is that the capacity to adapt and decrease risk is not equally available to all segments of society. Unfortunately, those individuals and communities with the least adaptive capacity, also tend to bear disproportionately heavy burdens of health risks. To avoid exacerbating these inequities, technical innovation and public programs and policies could prioritize the public transit and health needs of these groups.

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