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Telework: more sleep but more sleep inequalities

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Main contributions

1. **Although sleep is a core component of wellbeing, data shows that our society is not getting the rest it needs.** Short sleep is associated with multiple negative health outcomes, while also increasing the risk of injury and impairing social behavior. At the same time, on the average night, 18% of the working population does not get the sleep they need.
2. **This paper evaluates telework as a workplace arrangement that can lead to increased sleep duration among workers.** Using data from the American Time Use Survey and the Current Population Survey, I tested whether teleworkers sleep longer on Work-From-Home days than they do on Work-Away-From-Home days. I then explored three mechanisms that link telework to sleep duration: the reallocation of telework-induced time savings, the realignment of social and circadian rhythms, and changes in sleep efficiency. Finally, I looked at how increasing telework adoption affects sleep inequalities across different demographic and SES groups.
3. **Teleworkers sleep longer (+30 minutes) and are less likely to be short sleepers (-78% odds) on Work-From-Home (WFH) days than on Work-Away-From-Home days (WAFH).** Teleworkers are able to sleep for longer on WFH days thanks to the time they save on traveling (-84 mins) and personal care (men: -9.8 mins, women: -22.8 mins). This newfound temporal budget is not fully reallocated to sleep. WFH workers also eat/drink for longer (+14 mins), they do more housework (+30 mins), and they spend more time on discretionary activities (+44 mins, mostly watching TV and other forms of leisure). Changes in care work vary by gender (men: +20 mins, women: -9)
4. **Teleworkers wake up 20 minutes later on WFH days than on WAFH days, which makes them less likely to experience social jetlag.** Telework allows workers to save time on activities that take place in the earlier part of the day, reducing time pressure in the morning and thus allowing for delayed wake-up times (which also explain most of the increase in sleep duration). The ability to wake up later also implies that a larger range of circadian preferences can be accommodated on WFH days, reducing the risk of social jetlag.
5. **Ceteris paribus, telework will increase sleep (and health) inequalities by race and education.** Being White/Asian or having a college degree predicts having greater access to telework at the workplace than being Black or having a high school diploma or less, while the relationship between race/education and insufficient sleep goes the opposite way. Consequently, those groups who are already better off in terms of sleep duration will have a greater chance to access the sleep-related benefits that come with teleworking.
6. **This paper contributes to the existing literature on telework and sleep** by offering an overview of the mechanisms linking the place of work to sleep duration. A more accurate methodology to identify teleworkers and unpaid overtimers in time use data is also introduced. Finally, a domain that has received little empirical attention so far is explored: the redistributional implications of increased telework adoption in terms of sleep inequalities.

Introduction

In the Iliad, Homer defines sleep as the brother of death. While the association between sleep and death is a common topic in literature, it might be more accurate to say that sleep is the brother of life, or better, of a happy life.

To understand this, let us take a step back. Buysse (2014) defines five dimensions of sleep health: sleep duration, sleep efficiency, timing, alertness/sleepiness, and satisfaction/quality. As a large body of literature has shown, sleep health is related to multiple determinants of wellbeing.[1] For starters, insufficient sleep is associated with a range of adverse health outcomes. Fragmented sleep, short sleep duration, and sleep disorders are correlated with a higher risk of all-cause mortality, obesity, diabetes, cancer, and chronic heart disease, cancer, and metabolic syndrome (Redline, Redline, and James, 2019). At the same time, those who are sleep deprived put their own safety and that of those surrounding them at risk. In the workplace, workers with sleep problems are significantly more likely to injure themselves (Uehli *et al.*, 2014), while, on the road, driving after a four to five hours night of sleep doubles the risk of a car crash in comparison to those driving after having slept eight hours or more (Sprajcer *et al.*, 2023). Those around sleep deprived individuals are exposed to "second-hand sleepiness", or the increased risk of injury caused by the actions of a sleep deprived person (e.g., a pedestrian being hit by a drowsy driver) (Lockley and Foster, 2012). At the societal level, a sleep deprived society is a more fragmented society: sleep loss harms social interactions by diminishing emotional expressivity and impairing emotional recognition (Beattie *et al.*, 2015), while lower sleep quantity is associated with increased unethical behavior (Barnes *et al.*, 2011), Overall, higher sleep quality has been associated with higher life satisfaction (Shin and Kim, 2018).

Although sleep is a core component of multiple determinants of wellbeing, data consistently show that our society is not getting the rest it needs. Experts recommend that adults should sleep between 7 and 9 hours per night in order to avoid the adverse health outcomes associated with shorter sleep durations (Consensus Conference Panel *et al.*, 2015; Hirshkowitz *et al.*, 2015). Throughout the paper, the terms "short sleep duration" and "insufficient sleep duration" are used interchangeably to refer to those nights in which an individual has slept less than 7 hours.[2] Looking at cross-sectional data from the American Time Use Survey, we can see that, in 2023, 18% of US workers fell short of meeting the recommended sleep duration guidelines on the average working day (Table 0). While the share of short sleepers is showing a downward trend (it was 20% in 2021), this is still a substantial number of workers. Given the negative impact that sleep has on multiple determinants of wellbeing, action should be taken to make sure that as many workers as possible can sleep for as long as they need.

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[1] Within the framework of the OECD's Better Life Index, for instance, 11 determinants of wellbeing are identified : housing, income, jobs, community, education, environment, civic engagement, health, life satisfaction, safety, work-life balance (Durand, 2015)

[2] It should be noted that throughout the paper I also refer to those who sleep less than 7 hours per night as short sleepers or insufficient sleepers. While the suffix -er in the phrase conveys the idea of agency, it should be made clear the use of this word does not imply that sleep is considered as a fully volitional behavior.

With this in mind, this paper investigates the potential of telework as a workplace arrangement that can increase sleep duration among workers.

Allen, Golden, and Shockley (2015) define telework as :

> "a work practice that involves members of an organization substituting a portion of their typical work hours (ranging from a few hours per week to nearly full-time) to work away from a central workplace—typically principally from home—using technology to interact with others as needed to conduct work tasks."

It is important to understand the effect of teleworking on sleep duration for multiple reasons. Over the years, the relationship between telework and sleep duration has become an increasingly relevant topic for research. Firstly, more and more people are working from home. In the last few years, the share of US workers in this type of arrangement has been increasing steadily, moving from 18% in October 2022 all the way up to 23% in March 2024 (Kaynas, 2024). Next to that, there are multiple mechanisms associated with teleworking that can both increase or decrease total sleep duration. On the one hand, factors like increased schedule flexibility or reduced time spent traveling might result in a sleep premium for teleworkers, at least on those days when they work from home. On the other hand, the erosion of the physical boundary between the office and home might deteriorate workers' work-life balance, leading them to spend more time at the desk and less on the bed. On top of this, teleworking is not an option for everyone. According to the classification system created by Dingel and Neiman (2020), only 37% of occupations in the U.S. are teleworkable (i.e., can be fully performed from home).[3] Consequently, a more widespread adoption of teleworking arrangements might benefit groups that are already well off in terms of sleep outcomes, increasing sleep inequalities, and with that, health inequalities more broadly.

Given all this, the growing popularity of telework should be accompanied by a better understanding of its impact on sleep duration and sleep inequalities, in order to make sure that adequate measures are taken to promote its positive outcomes, while also limiting its negative consequences.

With this in mind, this paper asks three questions :

(A) Does teleworkers' sleep duration change on work-from-home days in comparison to work-away-from-home days?
(B) What are the mechanisms linking telework to sleep duration?
(C) What are the redistributional implications of telework in terms of sleep inequalities?

To answer these questions, I analyze cross-sectional, nationally representative, time use data from the American Time Use Survey (ATUS) and the Leave and Job Flexibilities module (LJF), in combination with survey data from the Current Population Survey (CPS). Using the LFJ module in combination with ATUS data from 2017 and 2018, I identify wage and salary workers who telework at least once per week and estimate how their sleep duration differs

[3] Throughout the remainder of this paper the word teleworkable is used to define any that can be fully performed from home according to Dingel and Neiman (2020)'s classification

between Work-From-Home (WFH) and Work-Away-From-Home (WAFH) days. Then, using the same data, I investigate three mechanisms that help us understand how telework and sleep are related: telework-induced time savings and their reallocation, the realignment of social and circadian rhythms, and changes in sleep efficiency. Finally, I use the ATUS data (waves 2021-2023) in combination with CPS data (Oct. 2022 - Jan. 2025) to investigate the relationship between telework and sleep inequalities.

The results of my investigations suggest that :

(1) Teleworkers sleep 30 minutes longer and have 78% lower odds of being insufficient sleepers on WFH days than on WAFH days
(2) Teleworkers are able to sleep for longer on WFH days because they save time on traveling and grooming. These time savings are also reallocated to eating/drinking, housework, discretionary time and (for fathers) to care work
(3) Teleworkers wake up 20 minutes later on WFH days than they do on WAFH days, meaning that they are less likely to experience social jetlag. There is no evidence of a change in sleep efficiency
(4) Black and lower education workers are more likely to be sleep deprived than White/Asian and college educated workers, but they are also less likely to have access to telework at their job. Ceteris paribus, promoting the adoption of telework will increase sleep (and health) inequalities.

The remainder of the paper is structured as follows. First, an overview of the existing theoretical and empirical literature investigating the relationship between telework and sleep is provided. This review is also used as an opportunity to discuss the strengths and weaknesses of different methodological approaches and data sources. Then, an overview of the data, variables and identification strategy used in this paper is presented. Results are then described and discussed.

Literature review

In this section, I review the existing evidence on the three topics of inquiry of this paper. I also explore the different methodological approaches that have been used to investigate the relationship between teleworking and sleep, highlighting their strengths and limitations.

Telework and sleep: theories and their predictions

Three theoretical approaches offer us insights into the possible effects of telework on sleep duration: role theory, boundary theory, and the job demand-resources framework. Gender roles are also likely to mediate the relationship between telework and sleep.

Role theory has received a lot of attention in the telework literature, mainly due to its contributions to the field’s understanding of work-home conflict. Insights from this framework suggest different ways in which sleep might be affected by telework. Kahn et al. (1964) define the concept of roles as follows :

> "Associated with each office is a set of activities, which are defined as potential behaviors. These activities constitute the role to be performed, at least approximately, by any person who occupies that office" (Kahn *et al.*, 1964)

According to this framework, being a worker, partner, parent or friend is associated with a set of expectations that define an individual's role in each of those settings (Kylin, 2007). These expectations, however, are not always evident. In those cases when an individual does not have access to sufficient information about the expectations that are associated with the role they are covering, role ambiguity emerges (Sardeshmukh, Sharma and Golden, 2012). When working from home, workers' role ambiguity is likely to increase due to physical separation and reliance upon electronic communication media. On the one hand, physical separation from co-workers might increase feelings of isolation and being cut off from the rest of the team. On the other hand, digital communication systems are not able to transfer the same range of social cues as in-person interactions, making it harder to interpret interpersonal exchanges. This state of uncertainty can be further compounded by inexperience with teleworking arrangements and co-worker presenteeism (Suh and Lee, 2017). Telework-induced role ambiguity might increase the time it takes workers to achieve their tasks and thus increase the risk of overtime work. If that time is taken from sleep, then telework might reduce sleep duration through increased role ambiguity.

Another dimension of role theory that relates to telework and sleep is inter-role conflict, which arises when there is a conflict between the expectations associated with one domain and the expectations associated with another domain (Kylin, 2007). An aspect of role conflict is time-based conflict, i.e., a situation where "time pressures associated with membership in one role make it physically impossible to comply with expectations arising from another role" or those pressures produce "a preoccupation with one role even when one is physically attempting to meet the demands of another role" (Greenhaus and Beutell, 1985). A manifestation of inter-role conflict that has been investigated extensively is work-family conflict[4]. Within this framework, work and family are defined as two conflicting domains that compete for an individual's finite time resources (Kylin, 2007). When these opposing role pressures become mutually incompatible, work-family conflict arises. When time awake is not enough to meet work and family role pressures, sleep is sometimes willingly restricted to allocate more time to these activities. For instance, becoming a parent – i.e., having new role pressures from the family domain – significantly reduces sleep duration, increases the number of daily activities and increases the likelihood of sacrificing sleep to do something else (Rauch, 2022). As may be expected, higher levels of work-home conflict are associated with shorter sleep duration (Golsch and Adams, 2025). In this context, the time savings brought by telework (e.g., because

[4] A more inclusive term to define this concept would be work-home conflict, which encompasses any type of conflict individuals experiencing when faced with role pressures from the work and private domain, without making the normative assumption that the private domain has to take the shape of a family. Nonetheless, a large portion of the literature on the topic uses the term work-family conflict, so I decided to also stick to it for the sake of clarity and comparability. An even less normatively charged term would be work/non-work conflict, which does not reduce a person's private life to the domestic sphere.

of not having to commute) offer new temporal resources that can be allocated to both domains to reduce work-family conflict, limiting the need to draw time from sleep to meet role pressures, and thus increasing overall sleep duration.

From the perspective of boundary theory, telework may also affect work-family conflict by blurring the physical and temporal lines between the two domains. Boundaries can be defined as "structural phenomena imposed by the spatial and temporal separation between work and family life" (Standen, Daniels and Lamond, 1999). When work is performed exclusively at the office, there is a clear geographical divide between the work and family role, and transition from one role to the other happens through commuting, which acts as a "boundary land" in terms of time, space and activity between the two domains (Hall and Richter, 1988). Working from home erases the physical boundary between home and work, increasing the permeability[5] of the temporal boundary between the two domains (Kylin, 2007). In other words, teleworkers can more easily perform role transitions, such as pausing work to do a laundry load, or work at night after having put a child to sleep. These transitions can have a divergent effect on work-family conflict and sleep. This increased flexibility in the timing of work allows workers to more easily accommodate demands from the family domain, reducing work to family conflict.[6] At the same time, increased susceptibility to family role pressures removes temporal resources from the work domain, thus increasing family to work conflict (Delanoeije, Verbruggen and Germeys, 2019).[7] If workers make up for this time lost to housework by postponing the end of their workday, sleep duration may be reduced.

Another important aspect to consider is that the specific expectations associated with different roles vary by gender. As gender can be defined as "the activity of managing situated conduct in light of normative conceptions of attitudes and activities appropriate for one's sex category" (West and Zimmerman, 1987), and given that the division of labor at home, as well as workplace dynamics, are gendered phenomena, one can expect that the effect that telework has on role conflict, and more specifically work-family conflict, will not be the same for male and female workers. Indeed, previous research supports these considerations, as telework has been found to reduce work-family conflict only for male workers (Beckel *et al.*, 2023), and, as we will see later on, to increase gender inequalities in housework.

A third, and final, conceptual framework that offers some theoretical insights on the possible effects of telework on sleep is the Job Demands-Resources (JDR) model. The model proposes that workers are faced with job demands, which are "aspects of the job that require sustained physical or mental effort" and have access to job resources, which are those aspects of the job that facilitate the achievement of work goals, reduce job demands and stimulate personal growth (Demerouti *et al.*, 2001). While this model was originally designed to explain burnout, the changes in demands and resources brought about by telework are likely to have an impact

[5] Permeability refers to "the ease with which psychological or behavioral aspects of other life roles can cross these boundaries"
[6] Work role pressures interfering with the family role pressures
[7] Family role pressures interfering with work role pressures

on sleep as well.[8] In terms of job resources, on teleworking days, workers are predicted to have higher levels of autonomy (Sardeshmukh, Sharma and Golden, 2012). This allows them to plan their schedules in ways that are more optimal for their sleep health, for instance, by timing sleep according to their chronotype. Reduced access to other job resources, such as social support and feedback, might negatively impact sleep by increasing stress. In terms of job demands, telework is likely to reduce time pressure thanks to the time savings associated with not having to commute to work. More free time in the morning means that workers might be able to wake up later on workdays, thus increasing sleep duration. Conversely, higher role conflict and role ambiguity – two job demands in the JRD model – might exert a downward push on sleep duration through the mechanisms explained above (Sardeshmukh, Sharma and Golden, 2012). Given these changes in job demands and resources, the overall effect that telework will have on sleep duration will depend on how the effect of each individual change in demands and resources balances out.

As we can see, different theories predict different outcomes associated with telework. Both role theory and boundary theory predict that telework will affect work-family conflict. Increased temporal resources and schedule flexibility are likely to reduce work-family conflict, thus lowering the need to take time from sleep to live up to the expectations associated with both domains. At the same time, the blurring of the boundary between work and family might increase the risk of family commitments interfering with work commitments, possibly delaying the end of the workday, and consequently reducing sleep duration. The effect of telework on work-family conflict likely varies by gender. Changes in job demands and resources when teleworking might also impact sleep. Higher autonomy and lower time pressure might allow workers to select a sleep schedule that better matches their needs in terms of timing and duration, while lower feedback and social support might negatively impact sleep through higher stress. Within both the JRD and role theory frameworks, role ambiguity is likely to reduce sleep duration.

How to measure sleep duration?

After theory, let us move to empirical evidence. Before jumping to results, however, it is important to discuss measurements. This section explains why time use data is the best fit for the type of questions this paper seeks to answer.

There are multiple ways to measure sleep duration : stylized questions, actigraphy and diary measures (time use diaries or sleep diaries).[9] Measuring sleep duration using stylized questions means asking something on the lines of "How much sleep {do you/does SP} usually get at night on weekdays or workdays?"[10] (Kaplan, Kopp and Phipps, 2020). Sleep diaries ask

[8] As one would expect, given that decreasing sleep health is one dimension of burnout

[9] In this overview I exclude polysomnography, as the technical requirements of this method make it effectively impossible to measure a usual night of sleep.

[10] This question, for instance, was taken from the questionnaire of the National Health and Nutrition Examination Survey, which is available at this link : https://wwwn.cdc.gov/Nchs/Data/Nhanes/Public/2015/DataFiles/SLQ_I.htm#SLD012

respondents to report their bed and wake up time for one or more days, and often include complementary questions on other variables of interest (e.g., alcohol use) (Redline, Redline and James, 2019). Time-use diaries also collect information about wake up and bedtimes. When filling a time-use survey, respondents are asked to list all the activities they took part in on a randomly selected day, together with the timing, duration and location of each activity. As sleep will be part of those activities, this type of data contains information on sleep duration and timing over the 24 hours sampled (Bureau of Labor Statistics, 2024). Finally, actigraphy relies on movement data collected from an actigraph – a watch-like device containing an accelerometer – to classify each "epoch" of the day (usually 15 to 30 seconds long) as "sleep" or "wake". Sleep-wake epochs are then combined to estimate total sleep and wake durations across the recording period (Redline, Redline and James, 2019).

How do these measuring methods compare to each other? For starters, actigraphy produces sleep duration estimates comparable to those of polysomnography (Lehrer *et al.*, 2022). As the latter is regarded as the golden standard for measuring sleep in a laboratory setting, this attests to the accuracy of actigraphy to measure sleep duration.[11] In comparison to actigraphy, there is evidence that time use diaries and sleep diaries produce comparable measures, while stylized questions tend to be systematically lower than both actigraphy and time use diaries (Kaplan, Kopp and Phipps, 2020; He *et al.*, 2021; Breideband *et al.*, 2022). Kaplan *et al.* (2020) define this difference in estimates between stylized questions and other measuring techniques as the "sleep gap". Multiple sources of measurement error can explain this gap. Stylized questions ask respondents to estimate their average sleep duration over a somewhat long period of time, which introduces recall and estimation bias. Respondents may also alter their responses upwards or downwards depending on the context of the study due to social desirability bias. Finally, stylized questions may not contain a clear enough definition of what sleep means, increasing the risk of interpretation bias.

We can thus say with confidence that, whenever feasible, sleep /time use diaries and actigraphy will produce more accurate sleep duration estimates than stylized questions. Nonetheless, when it comes to selecting one between these three alternatives, there is no clearly superior choice, as each method will come with its own advantages and limitations. In the context of this study, time-use data presents some unique features that make it a great choice for studying the effect of telework on sleep. Firstly, time-use diaries provide a complete picture of the respondent's day, and not just of their sleep patterns. This is essential for my investigation because it allows me to identify WFH days and WAFH days, and also to check whether these two types of days differ in the ways workers allocate their time. At the same time, compared to sleep diaries, time-use data does not ask specifically about wake-up and sleep times, reducing the risk of social desirability bias. Finally, time-use data is often nationally representative, something that is much harder to achieve with actigraphy, as data collection in the latter case is more expensive and requires more time to set up. Nonetheless, it is important to acknowledge the limitations

[11] Although, it should be noted that some studies have found that actigraphy systematically underestimates sleep duration in short sleepers and overestimates sleep duration in those with low sleep efficiency, so it is important to keep in mind that wearable devices have their own sets of measurement and user error.

of time-use data. For starters, this type of survey measures total time slept over two half-nights, rather than one full night, meaning that changes in bedtimes on the night before a WFH day cannot be observed. Next to this, sleep diaries, and especially actigraphic measurements, are easier to collect for longer periods of time, meaning that they more often produce longitudinal data that allows for within-person comparisons. Time-use data is usually cross-sectional. Finally, actigraphy offers a more complete picture of other dimensions of sleep health, such as sleep quality.

As this brief overview shows, actigraphy, sleep diaries, and time use diaries have been shown to provide comparable and reliable estimates of daily sleep duration, while time use data better fits the specific purposes of this paper.

Empirical evidence on the association between telework and sleep duration

After having seen which types of measurements can be mobilized to adequately monitor daily sleep durations, this section provides an overview of the literature that has used actigraphy, sleep diaries and time use diaries to produce empirical evidence on the effect of working from home on sleep duration. This review focuses exclusively on those studies that compare sleep duration between WFH days and WAFH days. I filtered out studies that compare overall average sleep durations between teleworkers and non-teleworkers because they are not estimating the effect of working from home on sleep duration, but rather the effect of being able to telework in the first place.

There are some studies which detected an increase in sleep duration on WFH days (Powell and Craig, 2015; Leone, Sigman and Golombek, 2020; Restrepo and Zeballos, 2020, 2022; Pabilonia and Victoria Vernon, 2022; Massar *et al.*, 2023; Wray, 2024; *Who are the hybrid workers? - Office for National Statistics*, 2024). The magnitude of the effects detected varies between 12.3 minutes (Powell and Craig, 2015) and 45 minutes (Restrepo and Zeballos, 2022). The groups compared also vary. Some compared teleworkers on WFH days with non-teleworkers on WAFH days, while others compared teleworkers on WFH days with teleworkers on WAFH days. Some studies suggest that the effect of telework on sleep can vary depending on gender, telework intensity and number of individuals heading the household (Powell and Craig, 2015; Pabilonia and Victoria Vernon, 2022; Restrepo and Zeballos, 2022). One study found that, during the pandemic, the sleep premium on WFH days decreased, and that it was fully eliminated for those being the only head of the household (Restrepo and Zeballos, 2022). Another study also found that the risk of being a short sleeper dropped significantly during Covid among full-time teleworkers, but not among those who kept working away from home (Leone, Sigman and Golombek, 2020). There is also evidence that increased location and schedule flexibility[12], as well as increased training on work flexibility, are associated with longer sleep duration (Moen *et al.*, 2011; Crain *et al.*, 2019). Next to these, there are also multiple studies that detect no change in sleep duration between WFH and WAFH

[12] These studies are not strictly about telework, but schedule flexibility is one of the features of work-from-home arrangements

days (Nätti *et al.*, 2011; Frazis, 2022; Staller *et al.*, 2023; Okubo, 2024). None of the studies in our review, however, found a negative effect of telework on sleep duration. Consequently, one finding that seems to be consensual in existing literature is that telework does not decrease sleep duration.

The period in which the data was acquired deserves some attention because data collected at different points in time may carry different types of bias. Studies using data from the early 2000s are looking at a population that had much fewer domestic IT resources at their disposal, for instance, in terms of internet speeds, which have increased sixfold between 2006 and 2017 (*Average internet connection speed in the U.S. 2007-2017*). Studies relying on pandemic samples also raise external validity concerns. Covid-related restrictions moved a large portion of the workforce into telework, but they also systematically altered the daily lives of workers in ways that likely affected sleep, namely by restricting movement at night through shop closures and curfews/stay-at-home orders (Piccoli *et al.*, 2023). As such, it is hard to justify the assumption that the sleep behaviors of a worker during Covid are comparable to those of a worker during "normal" times. Finally, the stark increase in the number of teleworkers after the Covid-19 pandemic raises concerns about whether pre-pandemic and post-pandemic samples are comparable. The Socio-Economic Status (SES) of teleworkers has not changed over time : teleworkers are still predominantly high-income, highly educated, white collar workers (Salon *et al.*, 2022). Nonetheless, pre- and post-pandemic populations might differ in terms of other confounders.

Existing empirical research has produced mixed results with respect to the positive effect of working from home on sleep duration. Nonetheless, the majority of the papers reviewed did detect an increase in sleep duration, at least among some populations. At the same time, no paper detected a decrease in sleep duration on WFH days. This leads me to formulate the first hypothesis of this paper :

H1 : Teleworkers sleep longer on WFH days than on WAFH days

The inconclusiveness of the findings from previous literature demands further attention, as it is symptomatic of some of the limitations of the methodological approaches of the existing studies on the topic. In the next section, I explore those limitations, together with the ways in which practices and methods found in previous literature can offer guidance in the design of the empirical strategy of this paper.

Methodological limitations of existing studies

Of the 13 studies described in the previous section, 6 detected a sample-wide effect of WFH days on sleep duration, 3 detected one only for some subpopulations and 4 found no statistically significant change. Of course, there are important differences between these studies in terms of sample size, location, timing and type of data used (cross-sectional/longitudinal). Nonetheless, we can find huge variations in the effect even among papers that are based on exactly the same data. Frazis, (2022), Pabilonia and Victoria Vernon, (2022) and Restrepo and Zeballos, (2020) analyze the 2017-2018 ATUS. The first author found no effect, the second found an effect only among women and the third found an effect on the overall population. One reason behind the inconclusiveness of existing literature lies in the fact that three sources of bias are not sufficiently controlled for: teleworker assignment, unpaid overtime and endogenous workday variation. This section explores these limitations in detail, focusing specifically on studies relying on time use data.

Not everyone in the working population is a teleworker. Some have jobs that cannot be done from home, some have a teleworkable job but do not telework, and then there are those who have a teleworkable job and actually choose to work from home. These three groups are systematically different in ways that are correlated with sleep outcomes.[13] Consequently, it is important to identify whether someone is or not a teleworker in order to account for differences between teleworkers and non-teleworkers that may confound the relationship between working from home and sleep duration. In the literature surveyed, some studies did not assign teleworker status (Restrepo and Zeballos, 2022; Okubo, 2024). Other studies assign teleworker status to those who are contractually eligible or to those who report having teleworked last week (Restrepo and Zeballos, 2020; Wray, 2024). These filters leave in those who can but don't telework and those who telework rarely but happened to work from home last week. Pabilonia and Vernon (2022) use a more robust process, whereby only white-collar workers who report working fully from home at least once every two weeks are considered as teleworkers. While in the context of the author's analysis it made sense to filter only white-collar workers, this reduces the external validity of her findings. At the same time, those who only do unpaid time from home are included as teleworkers because, according to the authors, "all workers are compensated for their work even if it is delayed compensation in terms of a promotion". Frazis (2022) avoids making this assumption by also filtering out anyone who reported not being paid for their work at home, but they do not include any telework frequency threshold.

Not all days worked from home are equal. Some are WFH days that contribute to a worker's salary, while others are Unpaid OverTime (UOT) days. UOT days are not comparable to WFH days. They may be much shorter in duration (e.g., a worker answering a phone call on a holiday), they may happen on days that are not part of the usual work week (e.g., a worker spending a Sunday finishing a work task) or they may be an extension of a WAFH day (e.g., an office worker extending their workday once home). Not controlling UOT days increases noise, thus decreasing the precision of the estimates and raising the risk of type II error. In the literature surveyed, some studies do not include any control for UOT days (Restrepo and Zeballos, 2022; Okubo, 2024). Others assign treatment status only to those days worked fully from home (Restrepo and Zeballos, 2020). This removes UOT days in which workers bring

[13] Non-teleworkable jobs are those where practices highly disruptive to sleep schedules, such as shift work or unpredictable shifts, are more common. Whether or not someone with a teleworkable job will actually telework will depend on a host of unobservable confounders, such as personal preferences, workplace culture or availability of a place to work.

work home from the office but leaves in UOT days fully worked from home. Another option is to set an hour-worked threshold below which a day fully worked from home is classified as UOT (Pabilonia and Victoria Vernon, 2022; Wray, 2024). This still leaves in those UOT days in which a worker does longer spells of unpaid overtime at home. Frazis (2022) sets a minimum hours-worked threshold and includes only those respondents whose diary day was collected on a day in which they usually work. No study filters out UOT days based on the workers' main reported reason for working from home (a variable that is available in the ATUS LFJ module).

Finally, some studies found that work duration is shorter on WFH days than on WAFH days (Restrepo and Zeballos, 2020, 2022; Okubo, 2024). This means that there may be some unobserved factors that are correlated both with WFH/WAFH day assignment and with work duration. For instance, one may work from home because they are sick, or because they have some family commitment to attend, and, for the same reason, may also end up working for less time on that day, making this type of workday not comparable to a "typical" workday. Because workday duration is itself correlated with sleep, not controlling for this source of variation in sleep duration between WFH and WAFH introduces omitted variable bias. Some of the variation observed between WFH and WAFH days may not be explained by where the worker chooses to work on that day, but by the fact that atypically shorter days are more likely to happen when working from home than they are when working away from home.[14] As the goal of this paper is to evaluate how working from home on a usual workday affects sleep duration, endogenous sources of variation should be controlled for. Nonetheless, other papers do not find WFH workdays to be systematically shorter than WAFH days, suggesting that the way in which teleworker status is assigned and WFH are identified might reduce endogenous variation in workday duration (Frazis, 2022; Wray, 2024).

A final point to consider is sample sizes. When investigating the effect of teleworking on sleep duration, researchers are faced with a tradeoff between bias and precision. The more narrowly teleworker status and teleworking days are defined, the lower the risk of bias from the inclusion of non-teleworkers and unpaid overtime in the treatment group. At the same time, tighter selection criteria mean a smaller sample size, which reduces the statistical power of the estimates. The study design of Frazis (2022) is an example of this. By using tight sample selection and treatment assignment criteria, the authors are left with an excessively small sample size,[15] so small that they do not have enough variation in their data to control for covariates when estimating the difference in the outcome variable, making their specification highly susceptible to omitted variable bias.

To conclude, we can see that the existing literature provides some insight on how to control teleworker assignment and UOT when estimating the effect of telework on sleep. Nonetheless, there are ways in which these methodologies can be improved upon. Teleworker status should

[14] One may argue that the higher likelihood of having a shorter than usual workday when working at home is one of the causal paths linking telework with sleep duration. Nonetheless, the purpose of this paper is to evaluate whether a worker who works a typical workday from the office will sleep as much as a worker who works a typical day from home.

[15] Their larger sample has 126 observations

be assigned based on both frequency and remuneration; the main reason for choosing to telework should be added as a filter to remove UOT days and endogenous variation in workday duration should be controlled for.

Mechanisms linking telework to sleep duration

To get a more complete understanding of how working from home affects sleep duration, this paper also looks at three mechanisms linking telework to sleep duration: telework-induced time savings and their reallocation, the realignment of social and circadian rhythms, and changes in sleep efficiency. This section reviews previous research on these topics.

Telework-induced time savings and their reallocation

As a day has only 24 hours, the extent to which workers can sleep longer on a WFH day depends on whether workers save time on some activities when working from home, and on what other activities these potential time savings are associated with.

Mobilizing the JDR framework, we can identify two time-consuming job demands that are not experienced by workers when working from home : commuting and aesthetic labor. The relationship between commuting and WFH is straightforward. As WFH workers can simply work from home, they do not need to spend time going to the office and coming back. In line with this, time use research has produced conclusive evidence on the negative impact of working from home on travel times. On WFH days, workers spend up to 74 minutes less on travel than they do on WAFH days (Wray, 2024).

Aesthetic labor consists in the practice of “taking care and controlling one’s appearance according to the corporate and culture rules” (Karjalainen, 2023). In a home setting, physical interactions with other workers are reduced, and with that, the pressure to live up to an organization’s aesthetic standards. This results in workers spending less time on aesthetic labor when working from home (Karjalainen, 2023). As personal care activities are a central dimension of aesthetic labor, we can expect the time allocated to this activity to decrease on WFH days. This supposition is further supported by the fact that hygienic behavior overall has been found to be driven, at least in part, by impression management (van der Geest, 2015). Existing empirical evidence also backs this hypothesis. On WFH days, workers have been found to spend between 10 and 20 minutes less on grooming (Frazis, 2022; Pabilonia and Victoria Vernon, 2022; Restrepo and Zeballos, 2022; Wray, 2024). As expectations over one’s appearance at the workplace vary depending on gender (Haynes, 2012), we can expect further that the magnitude of this change will be different between male and female workers. Given all this, I formulate the following hypotheses :

> H2 : Teleworkers spend less time traveling and on personal care activities on WFH days than on WAFH days

H3 : The decrease in time allocated to personal care activities will be greater among female teleworkers

The extent to which workers will reallocate any time saved from commuting and grooming to sleep or to other activities will depend on their preferences and needs. As we have seen before, research on whether workers sleep more on WFH days or on work WAFH days has produced mixed results. Nonetheless, some studies have found that, overall, workers sacrifice sleep for longer time spent grooming and commuting. Looking at ATUS data, Christian, (2012) found that, on average, 28% to 35% of the time spent commuting is taken away from sleep, while Basner, Spaeth and Dinges (2014) found that short sleepers spend more time grooming and start grooming earlier in the morning than so-called "normal" sleepers. These conclusions imply that workers are faced with a tradeoff between sleep and grooming/traveling. Consequently, it is reasonable to expect that some of the time saved from commuting and grooming on WFH days will be reallocated to sleep.

Nonetheless, it is unlikely that the entirety of the time saved on grooming and commuting will be reallocated to sleep. The fact that a large share of workers in the US experience work-home conflict – up to 70% according to one estimate – leads us to expect that a part of this gained time will be reallocated to housework and childcare, at least by those workers who do not have the time to perform those same tasks on WAFH days (Schieman, Glavin and Milkie, 2009). Insights from boundary theory also support the hypothesis that workers will do more unpaid labor on WFH days. When the physical boundary between home and work is blurred, family-related role pressures are more likely to interfere with the work domain. Consequently, workers might be more likely to interrupt their workday to deal with family matters when working from home. The blurring of the housework boundary is also likely to translate into longer time spent on secondary care work, i.e., time spent working while also looking after someone else. Empirical evidence supports these speculations. Research using time use data consistently reports that workers spend more time on housework and childcare when working from home (Frazis, 2022; Pabilonia and Victoria Vernon, 2022; Restrepo and Zeballos, 2022; Wray, 2024).

Another domain that might absorb part of this newfound temporal budget is discretionary time. Kalenkoski, Hamrick and Andrews (2011) define discretionary time as "the residual number of minutes that an individual has remaining after he or she performs the basic activities of personal care and paid and unpaid work". Someone is defined as time poor if their daily discretionary time falls below a preset threshold (e.g., 70% of median discretionary time). Overall, employed people have on average 188 minutes less discretionary time per day than those who are not employed. They are also 3% more likely to be time poor (Kalenkoski, Hamrick and Andrews, 2011). Assuming that workers have a desire for discretionary activities,[16] one can expect that a part of the WFH time surplus will be reallocated to this group of activities. While little evidence has been produced on the effect of working from home on discretionary time, many sources agree that workers spend more time on leisure activities – a

[16] Discretionary activities are all those activities that fall under the category of discretionary time, i.e., those activities that do not consist in paid/unpaid work or personal care

component of discretionary time – when working from home (Frazis, 2022; Pabilonia and Victoria Vernon, 2022; Restrepo and Zeballos, 2022; Wray, 2024).

Given the gendered nature of the division of unpaid labor within the household, it is reasonable to expect that the relationship between WFH and housework/care work will not be the same between men and women. Looking at housework, Wray (2024) found that both male and female workers increase time spent on housework by roughly the same amount, while Lyttelton, Zang and Music (2022) and Pabilonia and Vernon (2022) found evidence of a greater increase in time spent on housework among women than among men. When it comes to care work, these three studies agree that fathers increase their contribution more than women on WFH days. Household labor inequalities and time poverty are also correlated. Women in industrialized countries are more likely than men to be time poor, in part due to the longer time female workers spend doing unpaid housework (Rodgers, 2023). Consequently, we can expect that the relationship between place of work and discretionary time will also be mediated by gender.

Combining the theoretical and empirical insights presented in the paragraphs above, I make two additional hypotheses :

> H4 : Teleworkers will spend more time on housework/care work labor and on discretionary activities on WFH days than they do on WAFH days
>
> H5 : The relationship between place of work and time devoted to housework, childcare and discretionary activities is moderated by gender

Time saved on commuting and grooming might also allow workers to adjust the timing of their sleep in ways that increase overall sleep duration. I explore this mechanism in the next section.

Realignment of social and circadian rhythms and decreased social jetlag

If, by not needing to commute, teleworkers have more time in the morning on WFH days, this means that they can wake up later than they would on a WFAH day. If that is the case, then teleworking might increase sleep duration by allowing workers to better align their sleep schedule with their circadian rhythm.

Human daily life is structured around three clocks (Klerman, Rahman and St. Hilaire, 2020) :

(1) A solar clock : the light/dark schedule set by the sun
(2) A social clock : local time shown by a watch
(3) A biological clock : the time of the endogenous circadian clock

Working hours are generally defined in terms of the social clock. For instance, an employee might be contractually required to show up to work at 9 am and to remain there until 5 pm. Sleeping preferences, however, are regulated by the circadian clock. While an in-depth explanation of how circadian rhythms work physiologically is beyond the scope of this paper, it suffices to say that individuals differ in the time at which they become active in the day

(Montaruli *et al.*, 2021). These preferences can be grouped into two so-called chronotypes. Morning types (also known as "larks") tend to wake up and retire early, reaching peak physical and mental performance earlier in the day. Evening types (also known as "owls") wake up and go to sleep later, achieving the most in the second part of the day. Quantitatively, chronotype can be identified by measuring mid-sleep points on free days (Fischer *et al.*, 2017). Data suggests that morning and evening types make up 20% of the population each, with the rest falling somewhere on a spectrum between the two (Montaruli *et al.*, 2021). Sex and age predict chronotype. Evening types are more common among males and morning types among females. As individuals become older, their chronotype shifts from a later to an earlier one (Adan *et al.*, 2012).

As typical work schedules start earlier in the day, they are best suited for the sleep timing preferences of earlier chronotypes, but they also significantly increase the risk of insufficient sleep duration among later chronotypes : late bedtimes (controlled by the circadian clock) followed by early wake up times (controlled by the social clock) lead this latter group to build up a substantial sleep debt on workdays (Roenneberg, Wirz-Justice and Merrow, 2003; Wittmann *et al.*, 2006; Adan *et al.*, 2012; Montaruli *et al.*, 2021). For instance, Wittmann *et al*. (2006) found that, during the week, sleep onset time is 2 hours later for late chronotypes than for early chronotypes, but their wake-up times differ only by 30 minutes : owls sleep systematically less than larks during the week and compensate for that on weekends. It is interesting to note that early chronotypes can accumulate a similar sleep debt on free days due to social pressures to stay up late. This misalignment between one's biological clock and social demands is defined as social jetlag and can be quantified by taking the absolute value of the difference between mid-sleep[17] on those days when the social constraint is not binding and mid-sleep on those days in which it is (Wittmann *et al.*, 2006). Social jetlag is not a niche phenomenon : one study estimates that as much as 60% of the US population is at risk of experiencing some amount of social jetlag, together with the associated sleep losses (Fischer *et al.*, 2017).

Telework can make work schedules more compatible with the sleep-timing needs of later chronotypes. Thanks to the time savings on commuting, WFH workers have more time to sleep in the morning and can consequently wake up at a time that is better aligned with their biological clock. One study found that during Covid those who did any amount of remote work slept on average 17 minutes longer and had a 21-minute shorter social jetlag than those who did not (Peltoniemi, 2023). Similarly, another study found that chronotype predicted shorter sleep duration among full-time office workers but not among fully remote ones (Salfi *et al.*, 2022). When teleworking, evening types went to bed at around the same time as their office colleagues, but they also woke up later. The resulting increase in sleep duration closed the sleeping gap between evening types and morning types within the fully remote group. These findings led the authors to conclude that eveningness constitutes a risk factor for insufficient sleep duration only among office workers. Some evidence also shows that remote work might

[17] Mid-sleep is calculated as the halfway point between sleep onset and sleep offset (Fischer et al. 2017, pg. 3)

alter one's circadian rhythm due to the reduction in light exposure associated with a lower amount of time spent outside (Gao and Scullin, 2020).

Building on these insights from circadian theory and its related empirical research, I advance the following hypothesis :

> H6 : Teleworkers are less likely to experience social jetlag on WFH days than on WAFH days

Together with timing, another dimension of sleep health that might be affected by where work is performed is sleep efficiency. The next section reviews existing evidence on the topic.

Changes in sleep efficiency

A third mechanism that could contribute to a change in sleep duration on WFH days is a change in sleep efficiency.[18] Existing research has produced mixed evidence on the effect of telework on sleep efficiency. Some studies have shown a decrease in sleep efficiency when working from home (Garbarino *et al.*, 2025), while others did not detect any effect (Massar *et al.*, 2023). The effect of teleworking on sleep duration is determined by a complex combination of interacting mechanisms.

One way in which teleworking might affect sleep efficiency is through its effects on work stress. Work stress "encompasses the detrimental reactions that arise when job demands surpass an individual's capacities, resources, or requirements" (Mao, Raju and Zabidi, 2023). There is evidence that increased levels of stress are associated with longer sleep latency[19] (Shrivastava *et al.*, 2014; Thorsteinsson, Brown and Owens, 2019). The link between work stress and longer sleep latency seems to be rumination : work stress measured at the end of the day leads to increased work-related ruminative thinking during the evening, which is in turn positively correlated with longer sleep latencies (Vahle-Hinz *et al.*, 2014; Thorsteinsson, Brown and Owens, 2019).

Approaching this question from the perspective of the JRD framework, the job resources workers lose access to, combined with the job demands they are exposed to, are likely to increase stress. In terms of job resources, workers are less likely to receive feedback and social support when working from home (Sardeshmukh, Sharma and Golden, 2012). In terms of job demands, workers experience higher levels of role ambiguity and are required to use more technological tools when working from home. A key factor driving these changes in demand and resources is physical separation. Because they are not in the same room as their co-workers, teleworkers have to communicate via electronic media, which is less rich than face-to-face interactions, and yields lagged respon. This restricts flows of information, leading to lower

[18] Sleep efficiency is defined as the share of the total time spent in bed actually asleep. Holding time in bed constant, the higher the sleep efficiency, the longer the sleep duration (Reed and Sacco, 2016).
[19] Which is a measure of how long it takes someone to fall asleep after lights out (and thus is a dimension of sleep efficiency)

feedback, and in turn, role ambiguity. Physical distance also erodes relationship quality, reducing social support. Finally, being required to use information technology to interact with co-workers might lead to technostress, especially in those situations where digital systems are complicated, the phase of change is fast, and co-workers are not responsive (Suh and Lee, 2017).

Together with stress, sleep efficiency might also be affected by differences in levels of activity between WFH days and WAFH days. When working from home, workers tend to be more sedentary. Research has shown that WFH days are associated with longer time spent sitting and fewer steps walked (Massar *et al.*, 2023; Wahlström *et al.*, 2023). Remote workers also engage in less light-intensity[20] and moderate-to vigorous[21] physical activity during work hours (Fukushima *et al.*, 2021). At the same time, there is evidence that both physical activity and walking increase sleep efficiency, at least in the middle-aged population (Dolezal *et al.*, 2017; Sullivan Bisson, Robinson and Lachman, 2019). Consequently, the increase in sedentary behavior associated with working from home might decrease sleep efficiency and, indirectly, also sleep duration.

As these findings suggest, workers are exposed to job demands and resources on WFH days that might increase their stress levels. They are also likely to move their body less and do less physical activity. As both of these dynamics are associated with lower sleep efficiency, I hypothesize that :

H7 : Teleworkers' sleep efficiency will be lower on WFH days than on WAFH days

This section has explored three mechanisms that link telework to sleep duration. Workers save time when working from home, and the activities to which they reallocate that time will determine if, and to what extent, they will have the temporal resources to increase their sleep duration on WFH days. Secondly, higher scheduling flexibility, combined with the commuting/grooming time savings in the morning, might allow workers to choose a wake-up time that is better aligned with their circadian rhythm, reducing social jetlag and increasing sleep duration. Finally, working from home is likely to expose workers to new stressors. This, combined with the increase in sedentary behavior associated with teleworking, might decrease workers' sleep efficiency on WFH days.

Telework and sleep inequalities

Thus far, my analysis has been focused on the way teleworking affects the sleep outcomes of teleworkers. Nonetheless, it is important to acknowledge that not everyone in the working population can be a teleworker. According to the classification system created by Dingel and Neiman (2020), only 37% of occupations can be worked fully remotely. This means any potential benefit in terms of sleep health that is associated with working from home will be

[20] E.g., standing
[21] E.g., walking and engaging in heavy labor

experienced only by those who have access to a telework arrangement in the first place. Consequently, increased adoption of telework will have redistributional consequences in terms of sleep inequalities. It is important to report on these because sleep is tightly interlinked with general health, meaning that a change in sleep inequalities can contribute to widening or closing pre-existing and amply documented gaps in health outcomes across different demographic and SES groups.

So far, little attention has been given to the potential redistributional implications of telework adoption in terms of sleep inequalities. In this section, I review the existing evidence on who is most likely to be a short sleeper and who is most likely to have access to a telework arrangement.

Who is most at risk of insufficient sleep?

The existing literature provides evidence that belonging to different demographic and SES groups is associated with a differential risk of insufficient sleep.

A demographic factor commonly associated with sleep duration is race. Multiple studies suggest that Black populations are significantly more likely to be sleep deprived than White populations. Data from the National Health Interview Survey shows that Black respondents are significantly more likely to report sleeping less than 6 hours per night than White respondents, and that this gap has increased in size between 2004 and 2017 (Sheehan *et al.*, 2019). Findings on the risks of sleep deprivation among Hispanics are more inconclusive. Some found that their sleep patterns are comparable to those of White people, while others detect a negative correlation between being Hispanic and sleep duration (Johnson *et al.*, 2019; Sheehan *et al.*, 2019). While some of these differences can be explained at the physiological level, these considerations are beyond the scope of this paper. Another important dynamic behind this trend is the fact that many of the social factors that negatively impact sleep health disproportionately concern Black people, such as financial stress, racial discrimination and residential segregation (Robbins *et al.*, 2019). At the same time, Black workers are overrepresented in jobs involving shift work and unpredictable schedules or in the gig economy (Robbins *et al.*, 2019). These forms of employment constitute risk factors for short sleep duration. Interestingly, there is also evidence that Black individuals experience more adverse health consequences due to short sleep duration (Robbins *et al.*, 2019).

Together with race, another central social determinant of sleep duration is occupational category. The requirements of some occupations make it harder for workers to get as much sleep as they need. Jobs that require shift work, such as nursing, security services, or taxi driving, are an example of this. Shift work refers to any job that is worked between 19h00 and 6h00 for at least a portion of the daily shift (Wickwire *et al.*, 2017). This work arrangement imposes a social wake-sleep schedule that is highly likely to conflict with the worker's circadian clock, as well as with the dark/light zeitgeber[22] sent by the solar clock, and is associated with higher risk of insufficient sleep duration (Wickwire *et al.*, 2017; Hulsegge *et al.*, 2023). Similar considerations can be made for workers in the gig economy, especially for services available at night, like food delivery or ridesharing. Another occupation-level job characteristic that is associated with adverse sleep health outcomes is schedule unpredictability, a common practice in the retail and food service sectors. An unpredictable schedule, often shared with the worker with little advance, has been found to decrease self-reported sleep quality as much as having a newborn child or working a night shift (Harknett, Schneider and Wolfe, 2020).

Income is another factor that might be associated with sleep duration, but research thus far has produced mixed evidence with respect to the significance and direction of this relationship (Grandner, 2019). Multiple studies have found that, as household income rises, the risk of short sleep duration also goes up, but some have found that the relationship goes in the opposite direction : more family income means less sleep (Grandner *et al.*, 2015). One possibility is that there might be a U-shaped relationship. On the one hand, higher income earners might report shorter than average habitual sleep as a consequence of a busy and overscheduled lifestyle. On the other hand, low-wage workers might be pressured to work longer hours to make ends meet or due to other factors associated with increased financial hardship (Grandner, 2019). There is also some evidence of a relation between sleep and education. One study found that very short sleep (less than five hours) is five times more common among those who do not have a college degree compared to those who do (Whinnery *et al.*, 2014). Interestingly, some evidence suggests that education reduces the variability in sleep outcomes, making the distribution of sleep durations more clustered towards the center among college graduates (Grandner, 2019). Gender also predicts differences in sleep duration, as men tend to sleep less than women across the lifespan (Jonasdottir, Minor and Lehmann, 2021). Nonetheless, women's sleep tends to be more fragmented than men's, especially in early to middle adulthood (Jonasdottir, Minor and Lehmann, 2021). Childrearing is also associated with shorter sleep durations. One study found that each additional child in the household decreases parents' sleep duration by 13 minutes when they are under the age of two, by 9 minutes when they are two to five years old, and by 4 minutes when they are between six and eighteen (Hagen *et al.*, 2013).

As we can see, multiple demographic and SES factors predict short sleep duration, such as race, occupation, income, education, gender and number of children. These findings help us sketch a portrait of those who are most sleep deprived across each characteristic analyzed.

How likely are those groups who are most sleep deprived to have a teleworkable job?

As previous research efforts have shown, there are important differences in the degree to which different socio-demographic groups are able to work in telework arrangements. Nonetheless,

[22] "Zeitgebers" refer to environmental and social cues that provide input to the circadian system and help to synchronize biological rhythms (Quante *et al.*, 2019)

little attention has been paid to whether this makes telework a policy instrument that reduces or reproduces inequalities.

As the data shows, at the population level, telework is out of reach for most of the population. Overall, 25% of the US working population was classified as a teleworker in the first quarter of 2024 (Kaynas, 2024). Demographically and SES-wise, teleworkers do not look much like those who are most likely to be short sleepers. Looking again at BLS data from the 1st quarter of 2024, we can see that 23% of white workers teleworked, but only 17% of black workers and 12% of Hispanic workers did the same. 35% of those with a bachelor's degree or higher teleworked, but only 7.3% of high school graduates, and 2.5% of those with less than a high school degree did so (Kaynas, 2024). In terms of teleworkability, industries like accommodation and food services, manufacturing and retail have below-average rates of teleworkability, while the top three most teleworkable industries are educational services, finance and professional (Government of Canada, 2024). At the same time, telework is much more common in senior and professional occupations, as opposed to so-called "elementary" occupations (Office for National Statistics, 2024). Finally, couples with children are less likely to telework than those without (Allen, Golden and Shockley, 2015; Zhang *et al.*, 2020).

The empirical evidence reviewed in this section suggests that demographic and SES predictors of short sleep and access to telework may not overlap. In light of this, I state the following hypothesis :

> H8 : Demographic and SES groups who are more likely to be insufficient sleepers are also less likely to have a teleworkable job

Contributions of this paper to existing research

Building on the theoretical and methodological insights highlighted in this review, this paper contributes to the existing literature on the relationship between telework and sleep duration in three ways :

(1) It evaluates whether teleworkers' sleep duration changes between WFH and WAFH days using an identification strategy that assigns teleworker status and filters out UOT days with greater accuracy than previous works.
(2) It provides an account of three mechanisms that link telework and sleep duration : the reallocation of telework-induced time savings, the realignment of social and circadian rhythms and changes in sleep efficiency.
(3) It combines data on insufficient sleep and access to telework to evaluate the redistributive implications of increased adoption of teleworking arrangements in terms of sleep inequalities.

Data, measurements and methods

In the following section I will provide an overview of the data, variables and identification strategy on which my analysis is based.

Data sources : CPS, ATUS, LFJ module

This study is based on two nationally representative surveys administered in the United States by the U.S. Census Bureau : the Current Population Survey (CPS) and the American Time Use Survey (ATUS).

The CPS is a longitudinal survey that collects labor force statistics in the United States. Each month, a sample of 60000 occupied households is selected into the survey. One individual per household is interviewed once a month for four consecutive months, once a year for two years (thus monthly interviews follow a 4-8-4 pattern). To be eligible for inclusion in the CPS, individuals must be 15 or older, not in the Armed Forces and non-institutionalized. There is no upper age limit. One person responds for every eligible member of each selected household. This paper uses the CPS monthly samples from October 2022 to January 2025 to test whether selected demographic and SES covariates predict workers' ability to telework (Census Bureau, 2024). This timeframe has been chosen because questions about telework not related to Covid were introduced in the CPS starting from October 2022 (and January 2025 is the most recent month for which this data is available at the time of writing).

The ATUS is a cross-sectional, continuous time-use survey. Its main goal is to report how individuals distribute their time across life's activities. A household becomes eligible to be randomly selected into the ATUS sample two months after it has completed its 8^{th} CPS interview. Each month, 2200 households are selected into the ATUS sample, for a total of 26400 households per year. One person per household is interviewed. 10% of respondents are interviewed on each weekday, while 25% of the respondents are interviewed either on Saturday or on Sunday. Sample selection is stratified by race, presence and age of children and number of households (in adult-only households). Each respondent is asked to describe how they used their time on the day before the interview takes place, from 4 a.m. till 4 a.m. of the day after. Respondents report each activity they engaged in, where they were, when did the activity take place and who they were with. While demographic information for each respondent is also available, most of it is taken from earlier CPS interviews, with only some variables being updated during the ATUS interview. This paper uses the 2017 and 2018 waves of the ATUS to investigate the effect of working from home on teleworkers' sleep duration and to explore three mechanisms likely to link telework with sleep duration. It also uses the 2021, 2022 and 2023 waves to identify which demographic and SES groups are most at risk of being short sleepers.[23] One thing to be aware of about the ATUS is that the response rates have been declining steadily

[23] These three waves are used to answer this question because they are the most recent ones at the time of writing

in the last few years. Across the waves used in this study, response rates range between 35.8% (2022) and 45.6% (2017) (Bureau of labor statistics, 2024).

The first two research questions are investigated using data from the 2017 and 2018 ATUS waves because, over these two years, the Leave and Job Flexibilities (LFJ) module was fielded.[24] As the name suggests, the LFJ module includes questions concerning the availability and use of unpaid and paid leave and the degree of work schedule flexibility. These questions were only asked to wage and salary workers. The LFJ module is of interest to my analysis because it provides a detailed account of respondents' access to teleworking arrangements, including questions concerning ability to telework, frequency of full teleworking days, main reason for teleworking, and whether hours worked from home are compensated or not (Bureau of labor statistics, 2024).

All data used were obtained from the Integrated Public Use Microdata Series database. CPS data was collected from the IPUMS CPS database and ATUS data was collected from the IPUMS Time Use database (Flood *et al.*, 2023, 2024).

Selection of the sample, descriptive statistics and treatment assignment

This section describes the criteria used to define the samples on which the analyses of this paper are based. Descriptive statistics for each sample are also reported.

Effect of telework on sleep duration and mechanisms linking the two (ATUS_1718 sample)

Hypotheses 1 to 7 are tested using the same sample. Moving forward, I will refer to this as the ATUS_1718 sample.

The ATUS_1718 sample is composed of every respondent from the 2017 and 2018 waves of the ATUS that I classify as a teleworker. I restrict my sample just to teleworkers in order to control for any unobserved variation between teleworkers and non-teleworkers that may confound the effect of working from home on sleep duration.

A teleworker is defined as someone who :

(1) Has worked on the day of the ATUS interview
(2) Is a wage or salary worker
(3) Works at least one day per week fully from home
(4) Has worked at least 4 hours on the day of the interview
(5) Declares being paid at least for part of their work from home
(6) And does not cite unpaid overtime as being their main reason for working from home

Out of the 19816 people who participated in the ATUS in 2017 and 2018, 6778 worked on the day of the interview and 5471 worked at least 4 hours. Among them, 359 reported working

[24] It should be noted that a "Leave" module was also fielded in 2011, but the two are not comparable

from home at least once a week and working at least in part for pay. After removing 25 workers who reported working from home mainly to finish or catch-up work, the final sample is composed of 334 workers.

One might argue that these criteria for inclusion are quite strict. Nonetheless, thanks to these filters, the risk of having included in the sample someone who is not a teleworker, or who teleworks rarely, becomes quite low. As we saw in the literature review, Frazis (2022) and Pabilonia and Victoria Vernon (2022) had the most robust sub-sampling strategies to filter non-teleworkers out. The criteria described here build upon their work by combining the strengths of each approach. Like Pabilonia and Victoria Vernon (2022), I only include as teleworkers those who work at least a certain number of days per week (and I raise that threshold from once every two weeks to once per week). Like Frazis (2022), I exclude workers who report never being paid for their work at home. These selection criteria also lower the risk of including someone who did a full UOT day from home on the day of the interview. Like Pabilonia and Victoria Vernon (2022), Wray (2024) and Frazis (2022), I only include workers who have worked at least a certain amount of time, but I take their approach one step further by excluding anyone who reports working from home to "finish or catch-up work". Unlike Frazis (2022), I do not filter out those who reported working on a day on which they usually do not work. Nonetheless, as we will see later, I include a weekend/holiday dummy in the regression models.

Table 1 reports the descriptive statistics for this sample. The final sample is predominantly white (73%), college educated (72%), high income (55%), living with a partner (67%) and working in a white-collar occupation. This is coherent with the findings of the literature review on the demographic and SES predictors of telework. 55% of the sample work three or more days per week from home (home-based teleworkers), 45% two or one (occasional teleworkers). The majority of the sample teleworks because they want to (64%), not because they are required by their employer (34%). Workers in the sample slept 464 minutes per night on average and 23% of them reported sleeping less than 7 hours.

Treatment assignment is determined by the place of work. In the ATUS, any period spent working on one's primary occupation is coded as 050501. Any activity performed at home is assigned the location code 0101. A Work From Home (WFH) day is defined as any day on which the respondent worked on their primary occupation exclusively from home (i.e., every activity in the diary coded as 050501 has a location code of 0101) . A Work-Away-From-Home (WAFH) day is defined as any day on which the respondent worked on their primary occupation only from the office or from any other place that is not their home (i.e., every activity coded as 050501 in the diary has a location code that is not 0101). Finally, a Hybrid Work (HW) day is defined as any day on which the respondent worked on their primary occupation both from home and away from home (i.e., some activities in the diary coded as 050501 have a location code of 0101, but not all of them).

Those who had a WFH day are assigned to the treatment group and those who had a WAFH day are assigned to the control group. As those who had an HW day are likely to be unpaid overtimers, they are assigned to a third group in order not to bias the estimates of the analysis.

Because the day of the interview is randomly assigned, whether or not someone works from home on the day of the interview will also be random. Nonetheless, home-based teleworkers will be more likely to be in the WFH group than occasional teleworkers. These two groups are likely to vary in terms of unobservables correlated with sleep outcomes. Because my sample is too small to control for frequency of telework, the estimates of this analysis should be interpreted as conditional correlations, rather than causal effects. Future research should use a larger sample of teleworkers to control for the frequency of telework as a potential confounder.

Finally, it should be noted that workers might also have a secondary job. Time spent working on a secondary occupation is labeled as 050502. Because the LFJ module only provides information about respondents' main job, in my analysis I do not consider this type of work activity when defining a respondent's place of work. Consequently, in my analysis a respondent who worked fully from home for their primary occupation but who worked away from home for their secondary occupation is still classified as someone who had a WFH day. I chose to do this because the number of people who reported working on a secondary occupation was quite small (8 respondents).

Redistributional implications of telework on sleep inequalities (ATUS_2123 sample and CPS sample)

Hypothesis 8 is answered using data from the ATUS (2021, 2022 and 2023) and from the CPS (October 2022 – January 2025). The redistributional implications of telework on sleep inequalities could have been evaluated using the 2017 and 2018 waves of the ATUS as well. Nonetheless, given that this part of the analysis does not require the LFJ module, using these two sources instead allows me to evaluate more recent data, increasing the external validity of my findings.

The 2021, 2022 and 2023 waves of the ATUS are used to estimate whether being part of certain socio-demographic groups predicts being a short sleeper on workdays. This dataset contains a total of 25771 observations. In this case, everyone who is employed and who has worked on the day of the interview is included in the sample analyzed (8404 observations). From now on I will refer to this as the ATUS_2123 sample. Summary statistics for this sample can be found in Table 2.

CPS data is used to evaluate whether respondents' demographic characteristics and SES predict having access to telework at their job. This dataset contains a total of 4146203 observations. Observations from those who are not employed or who did not work on the week of the CPS interview are removed from the sample, leaving 1273746 data points. As the CPS is a longitudinal dataset, I control for individual-level variation by randomly selecting one observation per participant. Using a fixed effect model would have been a more appropriate choice, but the computational limitations of the device used to perform my data analysis did not make this a viable option. After applying this final filter, I am left with a sample of 363192 observations. Table 3 provides descriptive statistics. From now on, I will refer to this sample as the CPS sample.

Empirical Strategy

This section describes the empirical strategies used to answer the research questions of this paper. In each section, I describe the model specification and the operationalization of the outcome variables of interest. All the models described here are estimated using R in combination with the "survey" package.[25] Parameters are estimated using the ATUS LFJ survey weights, unless otherwise indicated.

(A) Does teleworkers' sleep duration change on work-from-home days in comparison to work-away-from-home days?

To test hypothesis 1, the following OLS model is fit to the ATUS_1718 sample :

$$[1]\ Y_i = a + b_1 WFHD + b_2 HWD + b_4 Z_i + e_i$$

The dependent variable Y_i represents daily sleep duration, which is defined as the total duration of all activity intervals coded as "sleeping" (activity code 010101) on the diary day. [26] While the ATUS lexicon does not provide an exact definition of what sleeping means, it provides a list of examples that coders should label as sleeping : falling asleep, dozing off, napping, getting up, waking up, dreaming, cat napping, getting some shut eye, dozing and, of course, sleeping. Like every other activity in the analysis, time spent sleeping is measured in minutes.

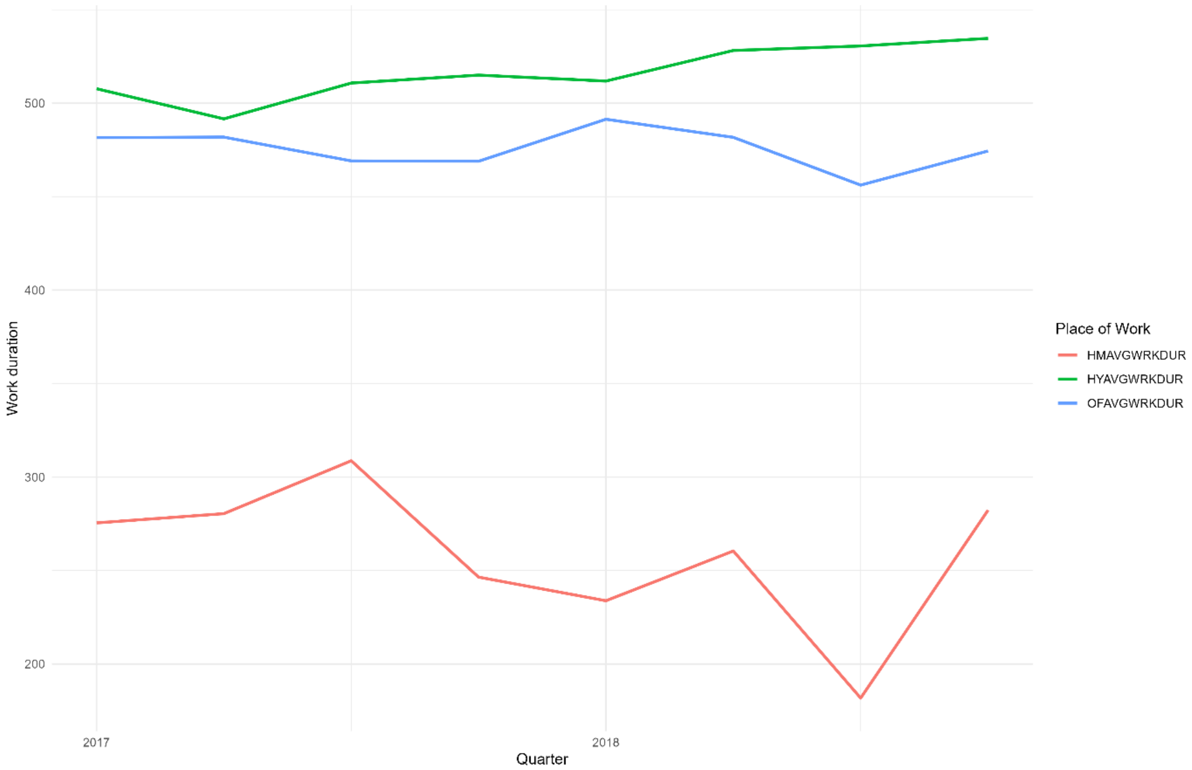
WFHD and HWD identify the place where the respondent worked on the diary day. WFHD takes the value 1 if the diary day is a WFH day, and zero otherwise. HWD takes the value 1 if the diary day is an HW day, and zero otherwise. WAFH days are the reference category. For an explanation of how WFH, WAFH and HW days are defined, check the section above. b_1 indicates the average difference in sleep duration between teleworkers who worked exclusively from home on the diary day and teleworkers who worked away from home on the diary day. This is the outcome of interest in this regression model. b_2 indicates the average difference in sleep duration between teleworkers who worked in part from home and in part away from home on the day of the interview and teleworkers who worked entirely away from home on the day of the interview.

When we compare average workday durations between different places of work including every respondent who worked on the day of the ATUS interview, we can see that WFH days are significantly shorter than WAFH days (Figure 1). Nonetheless, once the sample is restricted only to teleworkers, and unpaid overtime is filtered out, this difference becomes statistically insignificant (-3.6 minutes, p = 0.8, Table 6). Consequently, the analyses presented here do not control for endogenous variation in workday duration. This simplifies the interpretability of the

[25] The full R code used for this analysis is available on github (https://github.com/Pietro-Pietro/Telework_sleep)
[26] It should be noted that the ATUS contains both a "duration" and a "duration extended" variable. Duration extended reports the total duration of the last activity recorded in the diary, even if that activity is terminated after 4 a.m. of the next day. Because I am interested in total sleep duration over the span of 24 hours, total sleep duration is computed using the "duration" and not "duration extended.

model and increases sample sizes.[27] As a robustness check, I also fitted models [1] to [7] including a control for this confounder. All results are comparable in terms of significance, magnitude and direction. As other studies using the same data source as this one did find a difference in workday duration between WFH days and WAFH days, what this shows is that using a more robust methodology to filter out non-teleworkers and UOT days significantly reduces endogenous variation in workday duration, at least when using 2017 – 2018 ATUS data. Whenever that might not be the case, the variable described in Annex 1 can be used as a control.

Figure 1 : Weighted average work duration by place of work, 2017 - 2018



Finally, Z_i is a vector of controls included in the model to reduce the risk of omitted variable bias. Z_i includes a quadratic polynomial in age, and multilevel categorical variables for quarter (reference : first quarter), year (ref. : 2017) and day of the diary day (<u>weekday</u>, weekend/holiday), attendance of college while working (<u>not enrolled</u>, high school, college), occupation category (10 groups, ref. : Service occupations), industrial sector (19 groups, ref. : Public administration), multiple job holder (ref. : no), sex (ref. : Male), race (<u>White</u>, Black, Asian, Hispanic, Other), education (less than high school, high school, some college[28], <u>bachelor's and above</u>), family income (less than 40000$/year, <u>between 40000$ and 100000$/year</u>, more than 100000$/year), presence of a partner/spouse in the household (ref. : no partner/spouse present), region of the household (<u>Northeast</u>, Midwest, South, West).[29] The

[27] 14 respondents did not provide their usual hours worked per week

[28] Some college means : anyone who has attended college but did not graduate, those who hold an associate's degree and those who went to a professional school

[29] Underlined levels are the reference category

number of household kids and the number of weekly hours worked are also controlled for as continuous variables. b_4 is a vector of coefficients to be estimated.

To test hypothesis 1, I also check whether those who worked from home on the diary day are less likely to be short sleepers than those who worked away from home. To do this, I estimate the following logit model :

$$[2] \quad Y_i = a + b_1 WFHD + b_2 HWD + b_4 Z_i + e_i$$

The dependent variable Y_i represents the log odds of being a short sleeper on the diary day. A person is defined as a short sleeper if their daily sleep duration is less than seven hours. All the other variables are the same as in model [1]. In this case, the outcome of interest is b_1 which indicates the change in the log odds of being an insufficient sleeper between those who worked from home on the diary day and those who worked away from home on the diary day.

(B) What are the mechanisms linking telework to sleep duration?

In the literature review, I identified three mechanisms linking telework to sleep duration : the reallocation of telework-induced time savings, the realignment of circadian and social rhythms and changes in sleep efficiency. I evaluate these mechanisms by fitting three models to the data.

Hypotheses 2 and 4 are tested by fitting the following OLS regression to the ATUS_1718 sample :

$$[3] \; Y_{ik} = \; a + b_1 WFHD + b_2 HWD + b_4 Z_i + e_i$$

The dependent variable Y_k represents the minutes allocated to activity k on the diary day. This value is estimated for all 17 activity categories of the ATUS.[30] Each activity has a 6-digit code. The first two digits represent the activity category. Total time spent in an activity category is equal to the sum of the durations of all the periods spent engaging in activities that belong to the same category (i.e., that share the first two digits of their activity code). This same model is also used to estimate the total time spent on three more specific activities : watching TV, leisure (excluding watching TV) and socialization. Finally, the same model is also used to estimate respondents' discretionary time.[31] The outcome of interest is b_1 which indicates the

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[30] Personal care activities (excluding sleep), household activities, caring for household members, caring for non-household members, work and related activities, education, consumer purchases, professional and personal care services, household services, government services and civic obligations, eating and drinking, socializing, relaxing and leisure, sports, exercise and recreation, religious and spiritual activities, volunteer activities, telephone calls, traveling

[31] Kalenkoski, Hamrick and Andrews (2011) define discretionary time in the ATUS as any activity that falls within the following categories : education, consumer purchases, professional and personal care services, household services, government services and civic obligations, household services, caring for and helping non-household members, eating and drinking, socializing, relaxing and leisure, sports, exercise and recreation, religious and spiritual activities, volunteer activities, telephone calls

difference in time allocated to activity k between teleworkers who worked from home on the diary day and teleworkers who worked away from home on the diary day. The rest of the model is the same as those described above. To test hypotheses 3 and 5, treatment assignment is interacted with the sex of the respondent.

Hypothesis 6 is tested with the following OLS regression :

$$[4]\ Y_{ik} = a + b_1 WFHD + b_2 HWD + b_4 Z_i + e_i$$

In this case, the dependent variable Y_k is either the worker's wake-up time or bedtime. Following Knutson and Lauderdale (2009)'s methodology, wake-up time is defined as the time at which the first sleep period of the diary day ends. Wake-up time is estimated only for those who were asleep at the beginning of the diary day. Bedtime is estimated as the time at which the last sleep period of the diary day begins. Bedtime is estimated only for those who were asleep at the end of the diary day. The outcome of interest b_1 represents the difference in wake-up times (bedtimes) between those who worked from home on the diary day and those who worked away from home on the diary day.

Finally, hypothesis 7 is tested with the following OLS model :

$$[6]\ Y_i = a + b_i WFHD + b_2 HWD + b_4 Z_i + e_i$$

The dependent variable Y_i represents the total number of minutes the respondent reported being in a state of sleeplessness (activity code 010102) on the diary day. Examples of activities coded as sleeplessness in the ATUS include insomnia, lying awake, tossing and turning and counting sleep. Because this is not an exact measure of sleep efficiency, the results from this model should be considered as exploratory. b_1 in this case describes the difference in total number of minutes spent sleepless between those who worked from home on the diary day and those who worked away from home on the diary day.

(C) What are the redistributional implications of telework in terms of sleep inequalities?

To test hypothesis 8, I use the ATUS_2123 sample to model the probability of different demographic and SES groups of being insufficient sleepers and the CPS sample to model the probability of those same groups having access to telework at their job. I then compare the two sets of predictions to see if the profile of those who are more likely to be insufficient sleepers overlaps with the profile of those who are more likely to have access to telework at their job.

While making this comparison using data from two different sources might seem a bit unorthodox, it should be noted that the ATUS and CPS samples come from the same universe. On top of this, all the variables of interest to this analysis are collected in both surveys. Their definition, coding and related questions are identical. Consequently, the boundaries of each demographic and SES category are the same in both surveys, which means that predictions based on CPS and ATUS data can be compared. For instance, let us assume that Black respondents in the CPS are less likely to have access to telework than White respondents, and that Black respondents in the ATUS are more likely to be short sleepers on workdays than White respondents. Because we know that being Black and being White mean exactly the same thing in both datasets, we could conclude that Black workers are both more likely to be short sleepers and less likely to have access to telework at their job.

To estimate how different socio-demographic characteristics predict the probability of being a short sleeper on a workday, I fit the following logit model to the ATUS_2123 sample :

$$[7]\ Y_i = a + b_1 X_i + e_i$$

The dependent variable Y_i is the log-odds of being a short sleeper on a workday. Short sleeper status is assigned following the same criteria used for model [2]. X_i is a vector of SES and demographic covariates that might predict short sleeper status. These include : family income (less than 40000$/year, between 40000$ and 100000$/year, more than 100000$/year), age, race (White, Black, Hispanic, Asian, other), sex (reference : male), education (less than high school, high school, some college, bachelor's degree or above), number of kids, metropolitan area (metropolitan within central city, metropolitan outside of central city, metropolitan with city status not identified, nonmetropolitan, not identified), hours worked, occupational category (13 categories, reference : service occupations) and citizenship status (US-born, naturalized, not a citizen).[32] b_1 is a vector of coefficients describing the changes in the log odds of being a short sleeper across the different levels of each variable in the vector X_i. The model is estimated using regular ATUS weights.

The probability of having access to a telework arrangement is estimated by fitting the following logit regression to the CPS sample:

$$[8]\ Y_{ik} = a + b_1 X_i + e_i$$

The dependent variable Y_i represents the log odds of having access to telework at the job. Anyone who reported having teleworked for pay in the week before the CPS interview is classified as having access to telework at their job. X_i is the same vector of covariates described in model [7]. b_1 is a vector of coefficients describing the changes in the log odds of having access to telework across the different levels of each variable in vector X_i. This operationalization of the concept of accessibility to telework is quite strict, as it excludes anyone who chooses not to telework while being in an occupation that can be teleworked or anyone who usually teleworks but did not telework last week. Consequently, I also fit the same model using teleworkability of the occupation as the dependent variable. A worker is classified as having a teleworkable occupation if their 4-digit Census Occupation Code has been labeled

[32] Underlined levels are the reference category

as teleworkable by Dingel and Neiman (2020).[33] In both cases, the model is estimated using CPS person-level weights.

Results

This section reports the results of the empirical strategy defined in the section above.

(A) Does teleworkers' sleep duration change on work-from-home days in comparison to work-away-from-home days?

Table 4 reports the results of model [1]. As we can see, teleworkers slept on average 30 minutes longer on WFH days than they did on WAFH days ($p = 0.007$; 95CI = 8.3, 52). This increase in sleep duration is also accompanied by a decrease in the likelihood of insufficient sleep. On WFH days, teleworkers had 78% lower odds of being insufficient sleepers than on WAFH days ($p < 0.001$; 95CI = 0.10, 0.51, Table 5).[34] The evidence reported supports the hypothesis that teleworkers sleep longer on WFH days than they do on WAFH days (H1).

(B) What are the mechanisms linking telework to sleep duration?

The results of models [3] to [6] provide evidence that workers allocate their time differently on WFH days and that they are less likely to be experiencing social jetlag. I found no evidence of a change in sleep efficiency.

Reallocation of telework-induced time savings

Teleworkers used their time in significantly different ways on WFH days in comparison to WAFH days. These changes are summarized in Table 6. Workers travelled less and spent less time on personal care activities. Part of this newfound temporal budget was allocated to sleep. The rest was used for housework, eating and drinking and discretionary activities. Changes in personal care time and care work are moderated by gender.

When working from home, workers in our sample spent on average 16 minutes less on personal care activities ($p < 0.001$; 95CI = -25, -7.5) and 84 minutes less traveling ($p < 0.001$; 95CI = -101, -68) than their WAFH colleagues. These results support the hypothesis that teleworkers spend less time on personal care activities and traveling on WFH days than on WAFH days (H2).

The time saved from these two activities was only partially reallocated to sleep. WFH workers also increased their time spent doing housework (+30 minutes; 15, 44; $p < 0.001$), they ate and

[33] It should be noted that Dingel and Neiman (2020)'s classification actually uses Standard Occupational Classification codes, but the Bureau of Labor Statistics provides a walkthrough table to convert SOC to OCC
[34] For easier interpretability, for all logit models, coefficient are exponentiated and the odds ratio is reported, rather than the additive change in log odds

drank for longer (+14 minutes; $p = 0.004$; 95CI = 4.7, 24) and they spent more time on discretionary activities (+44 minutes; $p < 0.001$; 95CI = 20, 69). If we decompose this increase in discretionary time into subgroups, we can see that most of it is attributable to more time spent watching TV (+ 20 minutes; $p = 0.056$; 95CI = -0.51, 40) and engaging in other leisure activities (+19 minutes; $p = 0.024$, 95CI = 2.5, 36). Time spent socializing did not change significantly ($p = 0.4$; 95CI = -24, 9.8). Looking at care work, while the main effect of place of work was insignificant ($p = 0.5$; 95CI = 8.2, 18),[35] those with at least one kid aged 13 or younger in the household spent on average 100 minutes more on secondary childcare on WFH days ($p < 0.001$; 95CI = 56, 144).[36] These results support the hypothesis that teleworkers spend more time on housework and discretionary activities on WFH days than on WAFH days (H4).

Aggregate data does not support the hypothesis that teleworkers spend more time on care work on WFH days. Nonetheless, gender is missing from the picture. Once an interaction term for gender is included in the model (Table 7), we can see that female workers spent on average 9 minutes less on care work on WFH days than they did on WAFH days ($p = 0.041$; 95CI = -57, -1.3), while male workers spent 20 minutes more ($p = 0.015$; 95CI = 3.9, 36). Changes in time allocated to personal care also vary by gender. On WFH days, male workers spent 9.8 minutes less grooming ($p = 0.063$; 95CI = -20, 0.52), while female workers saved 22.8 minutes ($p = 0.083$; 95CI = -29, 1.8). No other interaction term was statistically significant. These results support the hypotheses that female teleworkers save more time on personal care on WFH days (H3) and that the relationship between place of work and time devoted to care work is mediated by gender (H5). Nonetheless, in my analysis I found no evidence of gender playing a mediator role when it comes to housework and discretionary activities. The small size of the sample may have played a role here.

Realignment of social and circadian rhythms

Looking at the timing of sleep, WFH workers delayed their wake-up times on regular workdays, but not on short workdays (Table 9).

On regular workdays, those who worked from home woke up on average 20 minutes later than those who worked away from home ($p = 0.013$; 95CI = 4.3,36). Delayed wake-up times on regular workdays are consistent with the hypothesis that WFH workers are less likely to experience social jetlag on WFH days (H6). On regular days, WFH workers are able to wake up later than WAFH workers. This delay in average wake-up times implies that a larger range of circadian wake-up preferences can be accommodated on WFH days than on WAFH days, meaning that more people will wake up at a time that suits their biological clock. As the share of people who wake up at a circadian-optimal time increases, the share of people who experience social jetlag will decrease.

[35] Even when the dataset is filtered only to those with at least one kid below 13 in the household
[36] In Table 6 only the coefficient for this group is reported because those without a child under 13 are not asked about secondary childcare

As a robustness check, I also compared average wake-up times between those workers who would qualify as WFH or WAFH workers, were it not for the fact that they worked less than two hours on the diary day. These two groups woke up at around the same time (+4.2 minutes; p = 0.9; 95CI = -45, 53), suggesting that, when work schedules are less binding, place of work does not affect their likelihood of experiencing social jet lag.

Bedtimes showed no significant change between the WFH group and the WAFH group on regular workdays (-15 minutes; p = 0.2; 95CI = -37,7.5), suggesting that most of the increase in sleep duration on WFH days is attributable to later wake-up times before the workday, and not to earlier bedtimes after the day is over.

Changes in sleep efficiency

The data analyzed does not provide any evidence of a change in sleep efficiency on WFH days (Table 8). Workers did not spend more time sleepless on WFH days than they did on WAFH days (-0.74 minutes; p = 0.4; 95CI = -2.5, 1.0). These findings contradict hypothesis 7. Nonetheless, given that this measure is only a proxy for sleep efficiency, this result should only be considered as exploratory.

(C) What are the redistributional implications of telework in terms of sleep inequalities?

The coefficients of model [7] and [8] show that there are multiple SES and demographic groups that, when compared to the reference category, have greater odds of being sleep deprived but also lower odds of having access to a telework arrangement at their job.

In terms of insufficient sleep on workdays (Table 10), we can see that Black workers have 56% greater odds of not sleeping enough on a workday than White workers (p < 0.001; 95CI = 1.34, 1.81), while Asian workers have 21% lower odds (p = 0.064; 95CI = 0.61; 1.01t). Those who have a bachelor's degree or above have 23% lower odds of being a short sleeper than those who have a high school diploma (p = 0.062; 95CI = 0.75, 1.01), while those with less than a high school diploma and those with some college have greater odds of being a short sleeper (respectively : + 30%; p = 0.011; 95CI = 1.06,1.58 and +17%; p = 0.024; 95CI = 1.02,1.35). Each additional child living in the household of the respondent increases their odds of being a short sleeper by 9% (p = 0.001; 95CI = 1.03, 1.14). Those working in production occupations and installation, maintenance and repair occupations have greater odds than those who live in the service sector of being a short sleeper (respectively +42%; p = 0.017; 95CI = 1.06, 1.91 and +36%; p = 0.094; 95CI = 0.95, 1.96). Finally, female workers have 25% lower odds than male workers of being a short sleeper (p = 0.002; 95CI = 0.77, 0.94).

When it comes to access to telework, we can see a symmetrical trend.

First, let us look at predictions when access to telework is defined as having teleworked on the week before the CPS interview. As shown in Table 11, Black workers have 20% lower odds than White workers of having access to telework ($p<0.001$; 95CI = 0.72, 0.78), while Asian workers have 17% greater odds ($p < 0.001$; 95CI = 1.12, 1.22). Those with at least a bachelor's degree have 197% greater odds than those with a high school diploma of having access to telework ($p < 0.001$, 95CI = 2.87, 3.08), while those with less than a high school diploma have 39% lower odds ($p < 0.001$; 95CI = 0.56, 0.66). Each additional child in the household decreases the odds of having access to telework by 4% ($p < 0.001$; 95CI = 0.95, 0.97). Those in installation, maintenance and repair occupations have 28% lower odds of having access to telework than those in service occupations ($p < 0.001$; 95CI = 0.63, 0.82), while in those production occupations have 8% lower odds ($p = 0.01$; 95CI = 0.84, 1.02). In terms of gender, female workers have 3% greater odds than male workers of having access to telework at their job ($p = 0.016$; 95CI = 1.00, 1.05). One group that is both more likely to be sleep deprived and more likely to have access to telework than their reference category are workers who attended some college, who have 63% greater odds than those with a high school diploma of having access to telework at their job ($p < 0.001$; 95CI = 1.57, 1.69).

When defining access to telework as having an occupation classified as teleworkable, the direction and significance of the results are comparable, but the coefficients tend to be smaller in magnitude for education (Table 12). The only two cases in which this second conceptualization of access to telework leads to different results are in the case of gender and the number of children. Women have 6% lower odds than men of having a teleworkable job ($p < 0.001$; 95CI = 0.92, 0.96), while each child increases these odds by 1% ($p = 0.037$; 95CI = 1.00, 1.02). Given that in both models the effect sizes for these groups are quite small, these differences might be due to random variation. Another possible explanation is that women are more likely to telework than men when they have a teleworkable occupation, and parents are vice versa. Future research should explore this question further.

Overall, the evidence reported shows that in terms of race and education, access to telework is less common among those groups who are more at risk of being short sleepers. In terms of race, Black workers have higher odds of being short sleepers than White and Asian workers, but lower odds of being in an occupation that can be worked from home. In terms of educational background, workers with a high school degree or less are more likely to be short sleepers but have less access to telework. When it comes to other demographic and SES characteristics, such as income, occupational background or gender, the results of this analysis are less conclusive. Consequently, the evidence shown here supports the hypothesis that demographic and SES groups that are more likely to be short sleepers are also less likely to have access to telework at their job, but only when it comes to race and education (H8).

Summary of the findings

Overall, the empirical evidence analyzed supports most of the hypotheses of this study.

Working from home was associated with longer sleep duration (+30 minutes) and decreased odds of being sleep deprived (-78%). On WFH days, workers spent less time traveling (-84 minutes) and on personal care, with gender moderating the changes in the latter (men: - 9.8 minutes, women: - 22.8 minutes). Time saved was partially reallocated to sleep, but also to housework (+30 minutes), discretionary activities (+44 minutes), eating/drinking (+14 minutes). Women spent less time on care work (-9 minutes) and men more (+20 minutes), while both groups increased the amount of time they worked while taking care of their children (+100 minutes). Gender did not moderate the relationship between place of work and time spent on housework and discretionary time. On WFH days, workers woke up later than on WAFH days (20 minutes later). When wake-up times are delayed, a larger share of circadian time preferences can be accommodated, meaning that WFH workers were less likely to experience social jetlag. No significant difference in sleep efficiency between WFH days and WAFH days was detected.

The racial and educational profiles of those who are most likely to be short sleepers and teleworkers do not overlap. Being White or Asian and having a college degree predicts having greater access to telework at the workplace than being Black and having a high school diploma or less, while the relationship between race/education and insufficient sleep goes the opposite way.

Discussion

The analysis highlights the benefits of telework for sleep duration, but also underscores its limitations, particularly its limited accessibility for certain socioeconomic and demographic groups. The next section explores the implications of these findings.

More sleep, fewer short sleepers

In line with the findings from previous research, the results reported above suggest that teleworkers do not sleep less on WFH days than they do on WAFH days. This paper contributes to the ongoing debate as to whether teleworkers sleep the same or more when working from home by providing evidence in support of the latter stand. Not only did workers sleep on average 30 minutes longer when working from home, but they also became significantly less likely to be short sleepers. This latter finding indicates that telework has the potential to improve the sleep health of those teleworkers who need it the most. The change in sleep duration detected in this study is comparable to the effect estimated by Wray (2024), albeit slightly larger.

While this finding is promising, it is important to keep in mind that the ATUS is a cross-sectional time use survey which records respondents’ activities from 4 am to 4 am of the next day. Only one day per person is recorded. As such, bedtimes on the night before the diary day are not observed. Consequently, we cannot test whether respondents go to sleep later on nights before a WFH day. The later bedtimes were to be postponed, the smaller the actual effect of working from home on sleep duration would be. The conclusion to be drawn from this is that these findings should be considered an upper boundary, but may be lower if workers change their sleep timing based on where they will be working on the next day. Existing evidence using actigraphic data (which records both bedtimes and sleep times) suggests that workers do delay their bedtimes before a WFH day but that they also sleep longer than on WAFH days overall (Massar *et al.*, 2023).

Telework and the (gendered) reallocation of time

The data analyzed shows that workers are able to sleep longer on WFH days thanks to the time they save on traveling and personal care activities.

The decrease in time spent grooming is consistent with the finding from previous literature that hygienic behavior is driven, at least in part, by impression management (van der Geest, 2015). On days in which workers are less likely to interact physically with their colleagues, they spend less time taking care of their appearance. Lower time spent grooming also implies that workers experience a decreased demand to engage in aesthetic labor, a conclusion reached also by Karjalainen (2023) in their qualitative investigation on the topic. In line with the fact that female workers are faced with greater expectations concerning their appearance than male workers, the effect of working from home on personal care time is greater among women than among men. The fact that lower time spent grooming and traveling is associated with longer sleep duration is consistent with the finding from previous literature that workers are faced with a tradeoff between these activities (Christian, 2012; Basner, Spaeth and Dinges, 2014).

Time savings from traveling and grooming are not fully reallocated to sleep. Workers also eat/drink for longer, do more housework, and spend more time in discretionary activities. Male workers also spend more time on care work.

The relationship between working from home and household labor requires further attention. The detected increase in time spent on housework and childcare activities suggests that working from home is associated with lower work to family conflict. At the same time, the large increase in time spent on secondary childcare suggests that workers on WFH days experience higher levels of family to work conflict. This confirms boundary theory’s prediction that when the home and family domains are not physically separated from each other, the two are more likely to interfere with one another. Overall, the longer average sleep duration on WFH days, together with the fact that there were no statistically significant changes in workday duration or in bedtimes at the end of the day, implies that workers do not end up working longer hours or sleeping less because of increased family to work conflict. Nonetheless, this large increase in time spent in secondary childcare while working underscores the fact that telework on its own may not reduce work-family conflict but rather just shift its direction. Consequently, an increased adoption of this arrangement should be accompanied by increased accessibility to other supportive policies, such as paid family leave (Beckel and Fisher, 2022).

Another important reason why these changes in time spent on unpaid work deserve attention is that they are gendered. In line with the findings from previous studies, this analysis has shown that male teleworkers increase the time they spend on care work more than female workers on WFH days. This means that a more frequent adoption of telework among heterosexual couples has the potential to decrease gender inequalities in childcare labor. There are, however, two major caveats to this. For starters, previous studies have found that fathers tend to spend more time in high enjoyment and low stress activities with their children, like playing, while mothers tend to do a higher share of the most onerous care work tasks (Musick, Meier and Flood, 2016). Thus, future research should explore whether telework has any effect on the qualitative dimensions of care work inequalities. Secondly, other time use research, together with literature using dyadic longitudinal designs, has shown that telework among female workers intensifies housework inequalities in heterosexual couples (Wang and Cheng, 2024). Given all this, telework is likely to have a complex and multidirectional effect on different dimensions of household labor inequalities within heterosexual couples.

Of course, these considerations may not be related to sleep strictly speaking, but they should be taken into account when considering the use of telework as a sleep policy instrument, in order to prevent unintended negative outcomes.

The timing and efficiency of sleep when working from home

Time savings associated with telework also help us understand how sleep timing changes between WFH and WAFH days. My analysis shows that teleworkers wake up significantly later on WFH days than they do on WAFH days. Later wake-up times explain the majority of the corresponding increase in sleep duration. From the perspective of the JRD framework, delayed wake-up times can be explained by the lower time pressure that teleworkers experience in the morning on WFH days. A large portion of the time savings associated with working from home concerns activities that take place, at least in part, in the first hours of the day. This reduces time pressure in the morning, allowing workers to wake up at later times than they would on WAFH days.

This delay in wake-up times constitutes evidence in support of the hypothesis that workers have a lower risk of experiencing social jetlag on WFH days than they do on WAFH days. When workers experience less time pressure in the morning, they have more discretion with respect to when to wake up and thus can time their sleep in ways that are better suited to their circadian preferences. This finding is consistent with the conclusions from previous studies on the relationship between social jetlag and telework (Salfi *et al.*, 2022; Peltoniemi, 2023).

Another interesting finding with respect to the timing of sleep is the fact that there are no significant changes in bedtimes at the end of the day between WFH days and WAFH days. Both the JRD model and role theory predict that workers will experience higher levels of role ambiguity on WFH days, mainly due to the lack of in-person communication with their colleagues (Sardeshmukh, Sharma and Golden, 2012). The fact that bedtimes are not postponed, and that workday duration is also comparable between the two groups, suggests that either workers do not experience significantly higher levels of role ambiguity, or that such an increase does not translate into longer workdays and/or delayed bedtimes.

Existing evidence suggests that teleworking has an impact on multiple predictors of sleep efficiency. Nonetheless, there seems to be no difference between WFH and WAFH workers in this regard. This may in part be explained by the fact that there are no statistically significant differences in the time spent on sport and recreational activities between the two groups, suggesting that variation in sedentary behavior is not large. Another possibility is that workers' access to job resources negatively correlated with stress, such as feedback and social support, is preserved when working from home. Nonetheless, it is important to underscore that the lack of a significant change may also be attributable to the limitations of the data used, as it is hard for respondents to self-report the exact time at which they fell asleep without the help of an external device.

The limits of telework

Beyond the effect that telework has on sleep duration at the individual level, it is also important to consider the higher-order effects of expanded adoption of telework arrangements.

My findings suggest that, in terms of race and education, those groups who are more likely to be sleep deprived are also less likely to be able to telework at their job. Black workers are significantly more likely than White workers to be short sleepers, but they are also significantly less likely to have access to telework at their job, regardless of the way in which access to telework is operationalized. The same differences can be seen between college educated students (lower risk of insufficient sleep, higher probability of having access to telework) and those with a high school diploma or less. By definition, any effort aimed at promoting the adoption of teleworking will affect only those workers who can telework at their job in the first place. This means that, holding everything else equal, increased adoption of telework will increase the existing inequalities in sleep duration across race and educational backgrounds. Those groups who are already better off today in terms of sleep outcomes, White or Asian and highly educated workers, will be more likely to have access to the sleep duration benefits of telework, while those groups who are already worse off, Black and lower education workers, will be less affected.

As we have seen in the introduction, insufficient sleep is associated with a variety of negative health outcomes, such as diabetes, hypertension, and heart disease (Consensus Conference Panel, 2015). Because sleep and health are tightly related, any policy aimed at promoting the adoption of telework will increase the pre-existing, and well-documented, disparities in health outcomes across race and SES (Lago *et al.*, 2018; Redline, Redline and James, 2019). This dynamic is a clear example of how SES acts as a fundamental social cause of health inequalities. A fundamental social cause of health inequalities can be defined as any social factor that influences multiple health outcomes through multiple risk factors and that is associated with access to resources that can be used to prevent those risks or to minimize their consequences. Its association with health is also reproduced over time (Phelan, Link and Tehranifar, 2010). In the context of sleep, workers with higher SES have access to the educational (skills), financial (funds to cover IT costs) and occupational (a teleworkable job) resources needed to be able to work from home. This, in turn, allows them to engage in telework, a workplace arrangement that reduces the risk of being sleep deprived, and through that, the risk of any associated negative health outcome. Workers with a lower SES do not have the resources to access a teleworkable job in the first place and thus cannot experience the sleep and health-related benefits associated with this arrangement (or are less likely to be able to).

Another important thing to point out is that telework can only mitigate some of the mechanisms through which work negatively impacts sleep, such as time pressure and role conflict. Nonetheless, there is a vast array of other work-related mechanisms that can still negatively impact sleep, regardless of whether an employee is working from home or somewhere else. Things like understaffing, labor law violations, or social pressures to overwork fall in this category. In this regard, fragmenting the labor force into individual households may actually make things worse. Telework complicates workers' efforts to unionize, while compliance with labor regulations becomes harder to enforce. This reduces workers' bargaining power with their employer, thus increasing the risk of abusive work practices that may negatively impact sleep.

The dynamics described in this section lead us to two important conclusions. On the one hand, any policy mobilizing telework as an instrument to reduce sleep duration should also include other sleep-related policies that target the needs of those workers who do not have a teleworkable job. Otherwise, expanded telework adoption will increase sleep and health inequalities across racial and educational groups. On the other hand, legislators should draft comprehensive solutions that both mobilize the potential of telework and also address other mechanisms that link work with short sleep, especially when those same mechanisms might be even more relevant in a work-from-home setting.

Do findings from 2017-2018 data apply to the post-pandemic era?

A final point should be made about the external validity of the findings of this paper based on ATUS data from 2017 and 2018 (research questions (A) and (B)). The share of workers teleworking regularly has increased sharply in the aftermath of the Covid-19 pandemic, likely changing the composition of the teleworker population overall. If pre- and post-pandemic teleworkers are different in ways that are correlated with sleep outcomes, then the results of this paper may only be partially applicable to those who work from home today.

Findings from more recent studies, as well as an exploratory analysis based on more recent data, support the possibility that the trends described here still apply to a post-pandemic context. Looking at other research, papers using more recent data have produced comparable results. Wray (2024), who based their analysis on data from the 2022 – 2023 Canadian time use survey, found that workers sleep 19 minutes more on WFH days than on WAFH days, while Massar *et al.*, 2023, who included in their analysis actigraphic data from 2022, found evidence of a 20 minutes sleep premium. At the same time, the demographic and SES profile of teleworkers has remained mostly unchanged throughout the years. Teleworkers are still predominantly high income, college educated, white collar workers (Salon *et al.*, 2022). Throughout my analysis, I also produced some preliminary evidence on the sleep outcomes of post-pandemic teleworkers. Using data from the CPS sample, I trained a boosting algorithm capable of assigning teleworker status based on a set of demographic and SES covariates. I then used this algorithm to classify workers in the ATUS_2123 as teleworkers and non-teleworkers, and then compared sleep outcomes within the first group between WFH days and WAFH days. Running the same regression model as in model [1], I found that workers sleep on average 14 minutes more on WFH days than they do on WAFH days ($p < 0.001$; 95CI = 6.7, 22; Table 13). The methodology presented here has important limitations, described further in Annex 2. Nonetheless, this finding offers preliminary evidence of the existence of a WFH sleep premium in the post-pandemic world.

While all this offers encouraging evidence about the applicability of my findings in a post-pandemic context, it is undeniable that studying the relationship between telework and sleep with more recent data will produce more accurate results. As the 2024 wave of the ATUS will also include the LFJ module, future research should combine the methodological insights from this paper with this more recent data source to produce a more accurate account of the effect of working from home on sleep duration.

Conclusions and limitations

This paper explored the relationship between working from home and sleep duration. Using data from the American Time Use Survey and the Current Population Survey, I tested whether teleworkers sleep longer on Work-From-Home days than they do on Work-Away-From-Home days. I then explored three mechanisms that link telework to sleep duration: the reallocation of telework-induced time savings, the realignment of social and circadian rhythms, and changes in sleep efficiency. Finally, I looked at how increasing telework adoption is likely to affect sleep inequalities across different demographic and SES groups.

The results of my analysis show that teleworkers sleep 30 minutes longer on WFH days than they do on WAFH days. They also have 78% lower odds of being short sleepers (<7 hrs sleep over 24 hrs). Teleworkers have more time to sleep on WFH days thanks to the time they save on traveling (-84 minutes) and grooming (-9.8 minutes for men, -22.8 minutes for women), but this newfound temporal budget is also allocated to other activities. On WFH days, workers eat/sleep more (+14 minutes), they do more housework (+30 minutes), and they enjoy more discretionary time (+44 minutes), mostly spent watching TV and on other leisure activities. Men spend more time on care work on WFH days (+ 20 minutes), women less (-9 minutes). Teleworkers are also more likely to work while taking care of their child on WFH days (+ 100 minutes). Most of the increase in sleep duration is explained by delayed wake-up times (+20 minutes). Being able to wake up later also means that teleworkers are less likely to experience social jetlag on WFH days. Finally, I found no evidence of a change in sleep efficiency between WFH and WAFH days. Black and lower education workers are more likely to be sleep deprived than white and college educated, but they are also less likely to have access to telework at their job. Consequently, holding everything else equal, promoting the adoption of telework will increase sleep (and health) inequalities.

This analysis presents multiple limitations. For starters, the size of my sample (334 diary days) is too small to control for telework intensity, meaning that treatment assignment is not random. As such, these findings should be interpreted as conditional correlations, and not as causal effects. The limited number of observations also reduced my ability to test for interactions, consequently, some of the correlations reported might vary in strength and direction across different groups. An important limitation of time use data in general is that bedtimes on the night before the diary day are not recorded. If teleworkers delay their bedtimes on nights before a WFH day, the total increase in sleep duration associated with telework will be lower than what can be observed using time use data. As such, the coefficient reported in the analysis (+ 30 minutes) should be considered an upper bound. Finally, the fact that this paper is based on pre-pandemic data raises concerns about the applicability of my findings to a post-pandemic context. The sharp rise in popularity of telework in the aftermath of the Covid-19 pandemic has increased the total number of teleworkers substantially. If the pre- and post-pandemic populations vary in terms of outcomes related to sleep, these results might not be applicable to post-pandemic teleworkers. Existing evidence, together with some exploratory data analysis presented in Annex 2, suggests that post-pandemic teleworkers also enjoy a sleep premium when working from home. This final limitation does not apply to the third part of my data analysis (redistributional implications of increased telework adoption), which is based on post-pandemic data.

Despite its limitations, this paper contributes to the existing literature on telework and sleep in multiple ways. The results presented provide an in-depth overview not only of the relationship between telework and sleep, but also of some of the mechanisms linking the two. Building on the strengths and weaknesses of previous studies, this paper also introduced a sampling methodology that more accurately identifies teleworkers and unpaid overtimers in the LFJ module. Finally, a domain that has received little empirical attention so far was explored: the redistributional implications in terms of sleep inequalities of increased telework adoption.

Building on the findings from this paper, future research should investigate whether a positive relationship between place of work and sleep duration is detected also when analyzing post-pandemic data. In the coming months, the 2024 ATUS wave, which will also contain the leave module, will be released, offering the opportunity to apply the sample selection framework outlined in this paper to more recent data. Next to this, future research should use time use data to identify working arrangements beneficial for sleep that are accessible to those workers who do not have a teleworkable job. Finally, future research should implement dyadic designs to better understand the effect of teleworking on household labor inequalities within heterosexual couples.

Policy recommendations

Based on the findings of this paper, I formulate the following policy recommendations.

Promote the voluntary adoption of teleworking arrangements
Teleworkers were significantly less likely to be short sleepers on WFH days than on WAFH days, suggesting that this practice can be used to reduce the number of short sleepers in the general population. Preferences over telework intensity, as well as over whether or not to telework in the first place, vary from worker to worker. Consequently, any telework-promoting policy should not force workers into a remote arrangement, nor make it costly for them to opt out from it.

Promote temporal flexibility, not just spatial flexibility
Teleworkers are able to sleep for longer mostly due to later wake up times, which also decrease their risk of experiencing social jetlag. Nonetheless, remote workers with later chronotypes might still be experiencing social jetlag on WFH days, if in a more attenuated fashion. Combining spatial flexibility with temporal flexibility by allowing workers to pick their own starting times will further decrease the risk of experiencing social jetlag when working from home, further decreasing the prevalence of short sleep among workers

Implement sleep-promoting policies for those who cannot telework
Ceteris paribus, promoting the adoption of teleworking arrangements will increase sleep inequalities. Consequently, any policy effort aimed at increasing the adoption of teleworking arrangements should be accompanied by the implementation of measures that target workers with non-teleworkable jobs. One possible path of action is the increased regulation of unpredictable scheduling and shift work, as both practices have been found to be highly disruptive to sleep.

Do not treat telework as a substitute for other supportive policies
While telework can provide workers with multiple job resources that cater to their needs, it is not an all-encompassing answer to every possible necessity. For instance, telework has a limited effect on work-family conflict, as it decreases work to family conflict, but also increases family to work conflict. Regulators should ensure that workers are granted the right to other support policies, such as sick and family leave, and that supervisors do not encourage telework as a substitute for those policies either.

Account for the second order effects of telework adoption
Increased adoption of telework will have secondary consequences on the distribution of labor within the household and the balance of power within the workplace. Regulators should monitor these second order outcomes and take action to address any potential unintended consequence of telework-promoting policies.

Bibliography

Adan, A. *et al.* (2012) ‘Circadian Typology: A Comprehensive Review’, *Chronobiology International*, 29(9), pp. 1153–1175. Available at: https://doi.org/10.3109/07420528.2012.719971.

Allen, T.D., Golden, T.D. and Shockley, K.M. (2015) ‘How Effective Is Telecommuting? Assessing the Status of Our Scientific Findings’, *Psychological Science in the Public Interest*, 16(2), pp. 40–68. Available at: https://doi.org/10.1177/1529100615593273.

Average internet connection speed in the U.S. 2007-2017 (no date) *Statista*. Available at: https://www.statista.com/statistics/616210/average-internet-connection-speed-in-the-us/ (Accessed: 22 April 2025).

Barnes, C.M. *et al.* (2011) ‘Lack of sleep and unethical conduct’, *Organizational Behavior and Human Decision Processes*, 115(2), pp. 169–180. Available at: https://doi.org/10.1016/j.obhdp.2011.01.009.

Basner, M., Spaeth, A.M. and Dinges, D.F. (2014) ‘Sociodemographic Characteristics and Waking Activities and their Role in the Timing and Duration of Sleep’, *Sleep*, 37(12), pp. 1889–1906. Available at: https://doi.org/10.5665/sleep.4238.

Beattie, L. *et al.* (2015) ‘Social interactions, emotion and sleep: A systematic review and research agenda’, *Sleep Medicine Reviews*, 24, pp. 83–100. Available at: https://doi.org/10.1016/j.smrv.2014.12.005.

Beckel, J.L.O. *et al.* (2023) ‘The Impact of Telework on Conflict between Work and Family: A Meta-Analytic Investigation’, *Occupational Health Science*, 7(4), pp. 681–706. Available at: https://doi.org/10.1007/s41542-023-00158-8.

Beckel, J.L.O. and Fisher, G.G. (2022) ‘Telework and Worker Health and Well-Being: A Review and Recommendations for Research and Practice’, *International Journal of Environmental Research and Public Health*, 19(7), p. 3879. Available at: https://doi.org/10.3390/ijerph19073879.

Breideband, T. *et al.* (2022) ‘Sleep Patterns and Sleep Alignment in Remote Teams during COVID-19’, *Proceedings of the ACM on Human-Computer Interaction*, 6(CSCW2), pp. 1–31. Available at: https://doi.org/10.1145/3555217.

Bureau of labor statistics (2024) ‘American Time Use Survey User’s Guide’.

Bureau, U.C. (2024) *Methodology*, *Census.gov*. Available at: https://www.census.gov/programs-surveys/cps/technical-documentation/methodology.html (Accessed: 29 April 2025).

Buysse, D.J. (2014) ‘Sleep Health: Can We Define It? Does It Matter?’, *Sleep*, 37(1), pp. 9–17. Available at: https://doi.org/10.5665/sleep.3298.

Christian, T.J. (2012) ‘Trade-Offs Between Commuting Time and Health-Related Activities’, *Journal of Urban Health*, 89(5), pp. 746–757. Available at: https://doi.org/10.1007/s11524-012-9678-6.

Consensus Conference Panel *et al.* (2015) 'Recommended Amount of Sleep for a Healthy Adult: A Joint Consensus Statement of the American Academy of Sleep Medicine and Sleep Research Society', *Journal of Clinical Sleep Medicine*, 11(06), pp. 591–592. Available at: https://doi.org/10.5664/jcsm.4758.

Crain, T.L. *et al.* (2019) 'Sustaining sleep: Results from the randomized controlled work, family, and health study.', *Journal of Occupational Health Psychology*, 24(1), pp. 180–197. Available at: https://doi.org/10.1037/ocp0000122.

Delanoeije, J., Verbruggen, M. and Germeys, L. (2019) 'Boundary role transitions: A day-to-day approach to explain the effects of home-based telework on work-to-home conflict and home-to-work conflict', *Human Relations*, 72(12), pp. 1843–1868. Available at: https://doi.org/10.1177/0018726718823071.

Demerouti, E. *et al.* (2001) 'The job demands-resources model of burnout.', *Journal of Applied Psychology*, 86(3), pp. 499–512. Available at: https://doi.org/10.1037/0021-9010.86.3.499.

Dingel, J.I. and Neiman, B. (2020) 'How many jobs can be done at home?', *Journal of Public Economics*, 189, p. 104235. Available at: https://doi.org/10.1016/j.jpubeco.2020.104235.

Dolezal, B.A. *et al.* (2017) 'Interrelationship between Sleep and Exercise: A Systematic Review', *Advances in Preventive Medicine*, 2017, pp. 1–14. Available at: https://doi.org/10.1155/2017/1364387.

Fischer, D. *et al.* (2017) 'Chronotypes in the US – Influence of age and sex', *PLOS ONE*. Edited by G. Tosini, 12(6), p. e0178782. Available at: https://doi.org/10.1371/journal.pone.0178782.

Flood, S. *et al.* (2024) 'IPUMS, Current Population Survey: Version 12.0'. Minneapolis, MN: IPUMS. Available at: https://doi.org/10.18128/D030.V12.0.

Flood, S.M. *et al.* (2023) 'American Time Use Survey Data Extract Builder: Version 3.2'. College Park, MD: University of Maryland and Minneapolis, MN: IPUMS. Available at: https://doi.org/10.18128/D060.V3.2.

Frazis, H. (2022) 'Is Telecommuting Family-Friendly? Evidence from the American Time Use Survey', *Journal of Time Use Research* [Preprint]. Available at: https://doi.org/10.32797/jtur-2022-2.

Fukushima, N. *et al.* (2021) 'Associations of working from home with occupational physical activity and sedentary behavior under the COVID-19 pandemic', *Journal of Occupational Health*, 63(1), p. e12212. Available at: https://doi.org/10.1002/1348-9585.12212.

Gao, C. and Scullin, M.K. (2020) 'Sleep health early in the coronavirus disease 2019 (COVID-19) outbreak in the United States: integrating longitudinal, cross-sectional, and retrospective recall data', *Sleep Medicine*, 73, pp. 1–10. Available at: https://doi.org/10.1016/j.sleep.2020.06.032.

Garbarino, S. *et al.* (2025) 'Not All Workers Experience Equal Sleep Changes: Insights from the "WorkInCovid" Project', *Clocks & Sleep*, 7(1), p. 13. Available at: https://doi.org/10.3390/clockssleep7010013.

van der Geest, S. (2015) ‘Hygiene and sanitation: medical, social and psychological concerns’, *CMAJ : Canadian Medical Association Journal*, 187(17), pp. 1313–1314. Available at: https://doi.org/10.1503/cmaj.150588.

Golsch, K. and Adams, A. (2025) ‘Sleep duration, work-to-family conflicts and telecommuting: a mediation analysis among German mothers and fathers’, *Community, Work & Family*, pp. 1–22. Available at: https://doi.org/10.1080/13668803.2025.2455660.

Government of Canada, S.C. (2024) *Research to Insights: Working from home in Canada*. Available at: https://www150.statcan.gc.ca/n1/pub/11-631-x/11-631-x2024001-eng.htm (Accessed: 29 April 2025).

Grandner, M.A. *et al.* (2015) ‘Social and Behavioral Determinants of Perceived Insufficient Sleep’, *Frontiers in Neurology*, 6. Available at: https://doi.org/10.3389/fneur.2015.00112.

Grandner, M.A. (2019) ‘Socioeconomic Status and Sleep’, in D.T. Duncan, I. Kawachi, and S. Redline (eds) *The Social Epidemiology of Sleep*. Oxford University Press, p. 0. Available at: https://doi.org/10.1093/oso/9780190930448.003.0010.

Greenhaus, J.H. and Beutell, N.J. (1985) ‘Sources of Conflict between Work and Family Roles’, *The Academy of Management Review*, 10(1), p. 76. Available at: https://doi.org/10.2307/258214.

Hagen, E.W. *et al.* (2013) ‘The Sleep-Time Cost of Parenting: Sleep Duration and Sleepiness Among Employed Parents in the Wisconsin Sleep Cohort Study’, *American Journal of Epidemiology*, 177(5), pp. 394–401. Available at: https://doi.org/10.1093/aje/kws246.

Hale, L. (2014) ‘Inadequate Sleep Duration as a Public Health and Social Justice Problem: Can We Truly Trade Off Our Daily Activities for More Sleep?’, *Sleep*, 37(12), pp. 1879–1880. Available at: https://doi.org/10.5665/sleep.4228.

Hall, D.T. and Richter, J. (1988) ‘Balancing Work Life and Home Life: What Can Organizations Do to Help?’, *Academy of Management Perspectives*, 2(3), pp. 213–223. Available at: https://doi.org/10.5465/ame.1988.4277258.

Harknett, K., Schneider, D. and Wolfe, R. (2020) ‘Losing sleep over work scheduling? The relationship between work schedules and sleep quality for service sector workers’, *SSM - Population Health*, 12, p. 100681. Available at: https://doi.org/10.1016/j.ssmph.2020.100681.

Haynes, K. (2012) ‘Body Beautiful? Gender, Identity and the Body in Professional Services Firms’, *Gender, Work & Organization*, 19(5), pp. 489–507. Available at: https://doi.org/10.1111/j.1468-0432.2011.00583.x.

He, L. *et al.* (2021) ‘The effect of COVID-19 lockdowns on sleep time perception: Comparing actigraphy and sleep diary measures’, *International Journal of Psychophysiology*, 167, pp. 86–93. Available at: https://doi.org/10.1016/j.ijpsycho.2021.07.001.

Hirshkowitz, M. *et al.* (2015) ‘National Sleep Foundation’s sleep time duration recommendations: methodology and results summary’, *Sleep Health*, 1(1), pp. 40–43. Available at: https://doi.org/10.1016/j.sleh.2014.12.010.

Hulsegge, G. *et al.* (2023) 'Adapting shift work schedules for sleep quality, sleep duration, and sleepiness in shift workers', *Cochrane Database of Systematic Reviews*. Edited by Cochrane Work Group, 2023(9). Available at: https://doi.org/10.1002/14651858.CD010639.pub2.

Johnson, D.A. *et al.* (2019) 'Are sleep patterns influenced by race/ethnicity – a marker of relative advantage or disadvantage? Evidence to date', *Nature and Science of Sleep*, Volume 11, pp. 79–95. Available at: https://doi.org/10.2147/NSS.S169312.

Jonasdottir, S.S., Minor, K. and Lehmann, S. (2021) 'Gender differences in nighttime sleep patterns and variability across the adult lifespan: a global-scale wearables study', *Sleep*, 44(2), p. zsaa169. Available at: https://doi.org/10.1093/sleep/zsaa169.

Kahn, R.L. *et al.* (1964) *Organizational stress: Studies in role conflict and ambiguity*. Oxford, England: John Wiley (Organizational stress: Studies in role conflict and ambiguity), pp. xii, 470.

Kalenkoski, C.M., Hamrick, K.S. and Andrews, M. (2011) 'Time Poverty Thresholds and Rates for the US Population', *Social Indicators Research*, 104(1), pp. 129–155. Available at: https://doi.org/10.1007/s11205-010-9732-2.

Kaplan, R.L., Kopp, B. and Phipps, P. (2020) 'Contrasting Stylized Questions of Sleep with Diary Measures from the American Time Use Survey', in P. Beatty et al. (eds) *Advances in Questionnaire Design, Development, Evaluation and Testing*. 1st edn. Wiley, pp. 671–695. Available at: https://doi.org/10.1002/9781119263685.ch27.

Karjalainen, M. (2023) 'Gender and the blurring boundaries of work in the era of telework—A longitudinal study', *Sociology Compass*, 17(1), p. e13029. Available at: https://doi.org/10.1111/soc4.13029.

Kaynas, C.B. and R. (2024) *Telework trends, Bureau of Labor Statistics*. Available at: https://www.bls.gov/opub/btn/volume-14/telework-trends.htm (Accessed: 22 April 2025).

Klerman, E.B., Rahman, S.A. and St. Hilaire, M.A. (2020) 'What time is it? A tale of three clocks, with implications for personalized medicine', *Journal of Pineal Research*, 68(4), p. e12646. Available at: https://doi.org/10.1111/jpi.12646.

Kylin, C. (2007) *Coping with boundaries-A study on the interaction between work and non-work life in home-based telework*. PhD Thesis. Psykologiska institutionen. Available at: https://www.diva-portal.org/smash/record.jsf?pid=diva2:197443 (Accessed: 22 April 2025).

Lago, S. *et al.* (2018) 'Socioeconomic status, health inequalities and non-communicable diseases: a systematic review', *Journal of Public Health*, 26(1), pp. 1–14. Available at: https://doi.org/10.1007/s10389-017-0850-z.

Lehrer, H.M. *et al.* (2022) 'Comparing polysomnography, actigraphy, and sleep diary in the home environment: The Study of Women's Health Across the Nation (SWAN) Sleep Study', *SLEEP Advances*, 3(1), p. zpac001. Available at: https://doi.org/10.1093/sleepadvances/zpac001.

Leone, M.J., Sigman, M. and Golombek, D.A. (2020) ‘Effects of lockdown on human sleep and chronotype during the COVID-19 pandemic’, *Current Biology*, 30(16), pp. R930–R931. Available at: https://doi.org/10.1016/j.cub.2020.07.015.

Lockley, S.W. and Foster, R.G. (2012) *Sleep: a very short introduction*. Oxford: Oxford Univ. Press (Very short introductions, 295).

Lyttelton, T., Zang, E. and Musick, K. (2022) ‘Telecommuting and gender inequalities in parents’ paid and unpaid work before and during the COVID -19 pandemic’, *Journal of Marriage and Family*, 84(1), pp. 230–249. Available at: https://doi.org/10.1111/jomf.12810.

Mao, Y., Raju, G. and Zabidi, M.A. (2023) ‘Association Between Occupational Stress and Sleep Quality: A Systematic Review’, *Nature and Science of Sleep*, Volume 15, pp. 931–947. Available at: https://doi.org/10.2147/NSS.S431442.

Massar, S.A.A. *et al.* (2023) ‘Working-from-home persistently influences sleep and physical activity 2 years after the Covid-19 pandemic onset: a longitudinal sleep tracker and electronic diary-based study’, *Frontiers in Psychology*, 14, p. 1145893. Available at: https://doi.org/10.3389/fpsyg.2023.1145893.

Moen, P. *et al.* (2011) ‘Changing Work, Changing Health: Can Real Work-Time Flexibility Promote Health Behaviors and Well-Being?’, *Journal of Health and Social Behavior*, 52(4), pp. 404–429. Available at: https://doi.org/10.1177/0022146511418979.

Montaruli, A. *et al.* (2021) ‘Biological Rhythm and Chronotype: New Perspectives in Health’, *Biomolecules*, 11(4), p. 487. Available at: https://doi.org/10.3390/biom11040487.

Musick, K., Meier, A. and Flood, S. (2016) ‘How Parents Fare: Mothers’ and Fathers’ Subjective Well-Being in Time with Children’, *American Sociological Review*, 81(5), pp. 1069–1095. Available at: https://doi.org/10.1177/0003122416663917.

Nätti, J. *et al.* (2011) ‘Work at home and time use in Finland: Home-based work in Finland’, *New Technology, Work and Employment*, 26(1), pp. 68–77. Available at: https://doi.org/10.1111/j.1468-005X.2010.00258.x.

Okubo, T. (2024) ‘Work from Home and Time Allocation: Evidence from Time-use Data in Japan’, *Journal of Labor Research*, 45(4), pp. 598–630. Available at: https://doi.org/10.1007/s12122-024-09367-8.

Pabilonia, S.W. and Victoria Vernon (2022) ‘Telework, Wages, and Time Use in the United States’, *Review of Economics of the Household*, 20(3), pp. 687–734. Available at: https://doi.org/10.1007/s11150-022-09601-1.

Peltoniemi, J. (2023) ‘Remote work and social jetlag: Systematic review and empirical investigation of the healthy adult working force in Finland’, *Master’s Thesis* [Preprint]. Available at: https://www.utupub.fi/bitstream/handle/10024/174356/Jouni_Peltoniemi_Master_thesis.pdf?sequence=1.

Phelan, J.C., Link, B.G. and Tehranifar, P. (2010) ‘Social Conditions as Fundamental Causes of Health Inequalities: Theory, Evidence, and Policy Implications’, *Journal of Health and*

Social Behavior, 51(1_suppl), pp. S28–S40. Available at: https://doi.org/10.1177/0022146510383498.

Piccoli, L. *et al.* (2023) 'Restricting Human Movement During the COVID-19 Pandemic: New Research Avenues in the Study of Mobility, Migration, and Citizenship', *International Migration Review*, 57(2), pp. 505–520. Available at: https://doi.org/10.1177/01979183221118907.

Powell, A. and Craig, L. (2015) 'Gender differences in working at home and time use patterns: evidence from Australia', *Work, Employment and Society*, 29(4), pp. 571–589. Available at: https://doi.org/10.1177/0950017014568140.

Quante, M. *et al.* (2019) 'Zeitgebers and their association with rest-activity patterns', *Chronobiology international*, 36(2), pp. 203–213. Available at: https://doi.org/10.1080/07420528.2018.1527347.

Rauch, C. (2022) *Le sommeil, une variable d'ajustement? Différences sociales et genrées au cours du cycle de vie*. Sociologie. Institut d'études politiques de paris - Sciences Po. Available at: https://theses.hal.science/tel-04011660.

Redline, S., Redline, B. and James, P. (2019) 'Sleep Epidemiology: An Introduction', in D.T. Duncan, I. Kawachi, and S. Redline (eds) *The Social Epidemiology of Sleep*. Oxford University Press, p. 0. Available at: https://doi.org/10.1093/oso/9780190930448.003.0002.

Reed, D.L. and Sacco, W.P. (2016) 'Measuring Sleep Efficiency: What Should the Denominator Be?', *Journal of Clinical Sleep Medicine : JCSM : Official Publication of the American Academy of Sleep Medicine*, 12(2), pp. 263–266. Available at: https://doi.org/10.5664/jcsm.5498.

Restrepo, B.J. and Zeballos, E. (2020) 'The effect of working from home on major time allocations with a focus on food-related activities', *Review of Economics of the Household*, 18(4), pp. 1165–1187. Available at: https://doi.org/10.1007/s11150-020-09497-9.

Restrepo, B.J. and Zeballos, E. (2022) 'Work from home and daily time allocations: evidence from the coronavirus pandemic', *Review of Economics of the Household*, 20(3), pp. 735–758. Available at: https://doi.org/10.1007/s11150-022-09614-w.

Robbins, R. *et al.* (2019) 'Race as a Social Determinant of Sleep Health', in D.T. Duncan, I. Kawachi, and S. Redline (eds) *The Social Epidemiology of Sleep*. Oxford University Press, p. 0. Available at: https://doi.org/10.1093/oso/9780190930448.003.0007.

Rodgers, Y.V.D.M. (2023) 'TIME POVERTY: CONCEPTUALIZATION, GENDER DIFFERENCES, AND POLICY SOLUTIONS', *Social Philosophy and Policy*, 40(1), pp. 79–102. Available at: https://doi.org/10.1017/S0265052523000389.

Roenneberg, T., Wirz-Justice, A. and Merrow, M. (2003) 'Life between Clocks: Daily Temporal Patterns of Human Chronotypes', *Journal of Biological Rhythms*, 18(1), pp. 80–90. Available at: https://doi.org/10.1177/0748730402239679.

Salfi, F. *et al.* (2022) 'The fall of vulnerability to sleep disturbances in evening chronotypes when working from home and its implications for depression', *Scientific Reports*, 12(1), p. 12249. Available at: https://doi.org/10.1038/s41598-022-16256-6.

Salon, D. *et al.* (2022) ‘The COVID-19 pandemic and the future of telecommuting in the United States’, *Transportation Research Part D: Transport and Environment*, 112, p. 103473. Available at: https://doi.org/10.1016/j.trd.2022.103473.

Sardeshmukh, S.R., Sharma, D. and Golden, T.D. (2012) ‘Impact of telework on exhaustion and job engagement: a job demands and job resources model’, *New Technology, Work and Employment*, 27(3), pp. 193–207. Available at: https://doi.org/10.1111/j.1468-005X.2012.00284.x.

Schieman, S., Glavin, P. and Milkie, M.A. (2009) ‘When Work Interferes with Life: Work-Nonwork Interference and the Influence of Work-Related Demands and Resources’, *American Sociological Review*, 74(6), pp. 966–988. Available at: https://doi.org/10.1177/000312240907400606.

Sheehan, C.M. *et al.* (2019) ‘Are U.S. adults reporting less sleep?: Findings from sleep duration trends in the National Health Interview Survey, 2004–2017’, *Sleep*, 42(2), p. zsy221. Available at: https://doi.org/10.1093/sleep/zsy221.

Shin, J. and Kim, J.K. (2018) ‘How a Good Sleep Predicts Life Satisfaction: The Role of Zero-Sum Beliefs About Happiness’, *Frontiers in Psychology*, 9, p. 1589. Available at: https://doi.org/10.3389/fpsyg.2018.01589.

Shrivastava, D. *et al.* (2014) ‘How to interpret the results of a sleep study’, *Journal of Community Hospital Internal Medicine Perspectives*, 4(5), p. 24983. Available at: https://doi.org/10.3402/jchimp.v4.24983.

Sprajcer, M. *et al.* (2023) ‘How Tired is Too Tired to Drive? A Systematic Review Assessing the Use of Prior Sleep Duration to Detect Driving Impairment’, *Nature and Science of Sleep*, Volume 15, pp. 175–206. Available at: https://doi.org/10.2147/NSS.S392441.

Staller, N. *et al.* (2023) ‘Onsite versus home-office: differences in sleep patterns according to workplace’, *Somnologie*, 27(4), pp. 272–279. Available at: https://doi.org/10.1007/s11818-023-00408-5.

Standen, P., Daniels, K. and Lamond, D. (1999) ‘The home as a workplace: work-family interaction and psychological well-being in telework’, *Journal of Occupational Health Psychology*, 4(4), pp. 368–381. Available at: https://doi.org/10.1037//1076-8998.4.4.368.

Suh, A. and Lee, J. (2017) ‘Understanding teleworkers’ technostress and its influence on job satisfaction’, *Internet Research*, 27(1), pp. 140–159. Available at: https://doi.org/10.1108/IntR-06-2015-0181.

Sullivan Bisson, A.N., Robinson, S.A. and Lachman, M.E. (2019) ‘Walk to a better night of sleep: testing the relationship between physical activity and sleep’, *Sleep Health*, 5(5), pp. 487–494. Available at: https://doi.org/10.1016/j.sleh.2019.06.003.

Thorsteinsson, E.B., Brown, R.F. and Owens, M.T. (2019) ‘Modeling the Effects of Stress, Anxiety, and Depression on Rumination, Sleep, and Fatigue in a Nonclinical Sample’, *Journal of Nervous & Mental Disease*, 207(5), pp. 355–359. Available at: https://doi.org/10.1097/NMD.0000000000000973.

Uehli, K. *et al.* (2014) ‘Sleep problems and work injuries: A systematic review and meta-analysis’, *Sleep Medicine Reviews*, 18(1), pp. 61–73. Available at: https://doi.org/10.1016/j.smrv.2013.01.004.

Vahle-Hinz, T. *et al.* (2014) ‘Effects of work stress on work-related rumination, restful sleep, and nocturnal heart rate variability experienced on workdays and weekends.’, *Journal of Occupational Health Psychology*, 19(2), pp. 217–230. Available at: https://doi.org/10.1037/a0036009.

Wahlström, V. *et al.* (2023) ‘Hybrid office work in women and men: do directly measured physical behaviors differ between days working from home and days working at the office?’, *Annals of Work Exposures and Health*, 67(9), pp. 1043–1055. Available at: https://doi.org/10.1093/annweh/wxad057.

Wang, S. and Cheng, C. (2024) ‘Opportunity or Exploitation? A Longitudinal Dyadic Analysis of Flexible Working Arrangements and Gender Household Labor Inequality’, *Social Forces*, 102(4), pp. 1446–1466. Available at: https://doi.org/10.1093/sf/soad125.

WEST, C. and ZIMMERMAN, D.H. (1987) ‘Doing Gender’, *Gender & Society*, 1(2), pp. 125–151. Available at: https://doi.org/10.1177/0891243287001002002.

Whinnery, J. *et al.* (2014) ‘Short and Long Sleep Duration Associated with Race/Ethnicity, Sociodemographics, and Socioeconomic Position’, *Sleep*, 37(3), pp. 601–611. Available at: https://doi.org/10.5665/sleep.3508.

Who are the hybrid workers? - Office for National Statistics (2024) *Office for National Statistics*. Available at: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/whoarethehybridworkers/2024-11-11 (Accessed: 22 April 2025).

Wickwire, E.M. *et al.* (2017) ‘Shift Work and Shift Work Sleep Disorder’, *Chest*, 151(5), pp. 1156–1172. Available at: https://doi.org/10.1016/j.chest.2016.12.007.

Wittmann, M. *et al.* (2006) ‘Social Jetlag: Misalignment of Biological and Social Time’, *Chronobiology International*, 23(1–2), pp. 497–509. Available at: https://doi.org/10.1080/07420520500545979.

Wray, D. (2024) ‘Telework, time use, and well-being: Evidence from the 2022 Time Use Survey’, (89-652–X). Available at: https://www150.statcan.gc.ca/n1/pub/89-652-x/89-652-x2024003-eng.htm.

Zhang, S. *et al.* (2020) ‘A work-life conflict perspective on telework’, *Transportation Research Part A: Policy and Practice*, 141, pp. 51–68. Available at: https://doi.org/10.1016/j.tra.2020.09.007.

Annexes

Annex 1 – Controlling for endogenous variation in workday duration

Before implementing all the filters listed in the methods section, WFH workers in my sample had a significantly shorter average workday than WAFH workers. Because sleep and workday duration are correlated, I added a control for variation in average workday duration. With this control, any variation in sleep duration that is explained by the fact that the worker is working an unusually short workday is controlled for, allowing us to identify the effect of working from home on sleep duration more precisely. Once I further refined my sampling strategy, workday duration stopped being endogenous, and so I removed this control from my models.

As it may be useful for other research on this topic, here is a brief overview of how I computed the deviation from average workday duration.

CHNGWRKD indicates the difference between the usual duration of the respondent's workday and the number of minutes the worker spent working on the diary day. This variable is calculated using the following formula :

$$if\ hrs\ worked\ per\ week < 60$$

$$CHNGWRKD = (minutes\ worked\ on\ diary\ day\ ) - \frac{Usual\ hours\ worked\ per\ week * 60}{5}$$

$$if\ hrs\ worked\ per\ week \geq 60$$

$$CHNGWRKD = (minutes\ worked\ on\ diary\ day) - \frac{Usual\ hours\ worked\ per\ week * 60}{6}$$

A worker with a positive value of CHNGWRKD will have worked more than usual on the day of the diary. A worker with a negative value of CHNGWRKD will have worked less than usual on a diary day.

Annex 2 – Predicting teleworker status with categorical boosting

To test the external validity of my findings, I used CPS data to train a categorical boosting prediction algorithm to assign teleworker status to ATUS respondents in the 2021 – 2023 waves. Because of important methodological limitations, I did not include this in my main analysis. Here is an overview of the methodology and findings.

The main reason why the first two portions of my data analysis are based on 2017 – 2018 data is that it is impossible to identify teleworker status accurately without the LFJ module. Since October 2022, participants in the Current Population Survey have been asked whether they worked for pay on the week before the day of the interview. This question alone does not provide as much information as the LFJ module, but it can be used to filter out at least some non-teleworkers. As ATUS respondents can be identified in the CPS, one option is to link the two datasets and use the CPS question to identify teleworker status. The issue with that is that whether a worker has teleworked one week two to five months before the ATUS interview does not tell us much about their teleworker status when the diary was collected.

As such, I trained a categorical boosting algorithm using the CPS data to predict teleworker status based on a set of covariates and then used the estimated model to assign teleworker status to respondents in the ATUS. Then, I filtered my sample only to respondents labeled as teleworkers and compared their sleep durations on WFH days and WAFH days. The estimation model used is the same as model [1]. As Table 13 shows, I found that WFH workers slept on average 14 minutes longer on WFH days than on WAFH days ($p<0.001$; 95CI = 6.7, 22). This suggests that post-pandemic teleworkers also enjoy a sleep premium.

The results from this model have not been included in the main analysis because of the numerous limitations of this approach. For starters, having teleworked last week does not mean the same as being a regular teleworker, the latter being the population of interest of the first two sections of my data analysis. At the same time, the model was quite inaccurate; only 80% of the testing sample was correctly assigned teleworker status. On top of this, the error terms of the coefficients from the model used to estimate changes in sleep duration do not account for the prediction error of the categorical boosting algorithm. As such, p-values and confidence intervals are underestimated. Given all this, the results from this model are only exploratory. The effect of working from home on sleep duration should be tested with post-pandemic data that includes information on teleworker status.

Abstract and Keywords

Although sleep is a core component of wellbeing, data shows that 18% of the U.S. working population does not get the sleep they need on the average night. This paper evaluates whether telework can encourage longer sleep durations. Using data from the Ametican Time Use Survey (ATUS) and from the Current Population Survey, I find that teleworkers sleep 30 minutes longer on Work-From-Home days than they do on Work-Away-From-Home days. They also have 78% lower odds of being sleep deprived. Teleworkers have more time to sleep on WFH days because they save time on traveling and personal care. This newfound temporal budget is only partially reallocated to sleep, with time spent in housework, discretionary activities and eating/drinking also increasing. Changes in care work and personal care time are moderated by gender. By saving time on activities that take place in the first part of the day, teleworkers experience lower time pressure in the morning on WFH days. This allows them to wake up 20 minutes later. Delayed wake up times imply that a larger range of circadian preferences can be accommodated, reducing the risk of social jetlag. While these results are promising, ceteris paribus, telework will increase sleep (and health) inequalities by race and education, as those groups of workers who are more likely to be sleep deprived are also less likely to have a teleworkable job. The external validity of these findings is limited by the sample size, date and structure of the data analyzed. Nonetheless, this paper contributes to existing research by offering an overview of the mechanisms linking the place of work to sleep duration. A more accurate methodology to identify teleworkers and unpaid overtimers in time use data is also introduced. Finally, a domain that has received little empirical attention so far is explored: the redistributional implications of increased telework adoption in terms of sleep inequalities.

Keywords : telework, sleep duration, insufficient sleep, time use research, sleep inequalities

TABLE 0 - Trends in sleep deprivation over time

Year	Share of sleep deprived
2021	20.0%
2022	20.3%
2023	18.0%

Weighted share of workers sleeping less than 7 hours on the average working day, Source : ATUS (2021-2023). Author's calculations

Table 1: **Descriptive statistics, ATUS 2017 - 2018 sample**

Variable	**N = 341**
Family income	
Between 40000$ and 100000$/year	125 (37%)
Less than 40000$/year	28 (8.2%)
More than 100000/$ year	188 (55%)
Age	45 (SD = 11)
Sex	
Female	168 (49%)
Male	173 (51%)
Race	
Asian	21 (6.2%)
Black	38 (11%)
Hispanic	28 (8.2%)
Other race	4 (1.2%)
White	250 (73%)
Education	
Bachelor's or above	247 (72%)
High school	16 (4.7%)
Less than high school	1 (0.3%)
Other educational background	1 (0.3%)
Some college, asssociate's degree, professional school	76 (22%)
Number of kids in the household	
0	161 (47%)
1	87 (26%)
2	63 (18%)
3	21 (6.2%)
4	9 (2.6%)
Location of household	
Metropolitan, central city	94 (28%)
Metropolitan, central city status not identified	40 (12%)
Metropolitan, not central city	188 (55%)
Nonmetropolitan	17 (5.0%)
Not identified	2 (0.6%)
Occupational category	
Construction and extraction occupations	2 (0.6%)
Farming, fishing and forestry occupations	0 (0%)
Installation, maintenance and repair occupations	1 (0.3%)
Management, business and financial occupations	114 (33%)
Not in universe	0 (0%)
Office and administrative support occupations	29 (8.5%)
Production occupations	3 (0.9%)
Professional and related occupations	136 (40%)
Sales and related occupations	40 (12%)
Service Occupations	15 (4.4%)
Transportation and material moving occupations	1 (0.3%)
Citizenship status	

Table 1: **Descriptive statistics, ATUS 2017 - 2018 sample** *(continued)*

Variable	**N = 341**
Naturalized citizen	2 (0.6%)
Not a citizen	5 (1.5%)
Not in universe	43 (13%)
US-born Citizen (soil or american parents)	291 (85%)
Sleep duration	465 (SD = 89)
Short sleeper	80 (23%)
Reason for telework	
Other reasons	6 (1.8%)
Blank or not a teleworker	0 (0%)
Job mandated telework	117 (34%)
Personal preference	218 (64%)
Frequency of telework	
Blank or not a teleworker	0 (0%)
Home-based teleworker	188 (55%)
Occasional teleworker	153 (45%)
Sporadic teleworker	0 (0%)
Industry	
Public administration	18 (5.3%)
Accomodation and food services	4 (1.2%)
Agriculture, forestry, fishing and hunting	2 (0.6%)
Arts, entertainment and recreation	2 (0.6%)
Construction	5 (1.5%)
Educational services	23 (6.7%)
Finance and insurance	47 (14%)
Health care and social services	30 (8.8%)
Information	24 (7.0%)
Management, admin and waste management services	11 (3.2%)
Manufacturing, durable goods	25 (7.3%)
Manufacturing, non-durable goods	15 (4.4%)
Mining	0 (0%)
NIU	0 (0%)
Other services, except private households	11 (3.2%)
Private households	0 (0%)
Professional, scientific and technical services	80 (23%)
Real estate and rental leasing	9 (2.6%)
Retail Trade	15 (4.4%)
Transportation and warehousing	9 (2.6%)
Utilities	2 (0.6%)
Wholesale Trade	9 (2.6%)
Multiple jobs	
Does not have more than one job	302 (89%)
Has more than one job	39 (11%)
Place of work	
Hybrid workday	63 (18%)
Work away from home day	104 (30%)
Work from home day	174 (51%)

[1] n (%); Mean (SD = SD)

Source : ATUS 2017 - 2018, Author's calculations

Table 2: **Descriptive statistics, ATUS 2021 - 2023 sample**

Variable	N = 8,404
Family income	
Between 40000$ and 100000$/year	3,293 (39%)
Less than 40000$/year	1,525 (18%)
More than 100000/$ year	3,586 (43%)
Age	45 (SD = 14)
Sex	
Female	3,916 (47%)
Male	4,488 (53%)
Race	
Asian	561 (6.7%)
Black	866 (10%)
Hispanic	1,284 (15%)
Other race	154 (1.8%)
White	5,539 (66%)
Education	
Bachelor's or above	4,220 (50%)
High school	1,414 (17%)
Less than high school	432 (5.1%)
Other educational background	118 (1.4%)
Some college, asssociate's degree, professional school	2,220 (26%)
Number of kids in the household	0.73 (SD = 1.06)
Location of household	
Metropolitan, central city	2,349 (28%)
Metropolitan, central city status not identified	1,089 (13%)
Metropolitan, not central city	3,828 (46%)
Nonmetropolitan	1,060 (13%)
Not identified	78 (0.9%)
Occupational category	
Construction and extraction occupations	298 (3.5%)
Farming, fishing and forestry occupations	120 (1.4%)
Installation, maintenance and repair occupations	239 (2.8%)
Management, business and financial occupations	1,958 (23%)
Not in universe	0 (0%)
Office and administrative support occupations	765 (9.1%)
Production occupations	350 (4.2%)
Professional and related occupations	2,442 (29%)
Sales and related occupations	714 (8.5%)
Service Occupations	1,032 (12%)
Transportation and material moving occupations	486 (5.8%)
Citizenship status	
Naturalized citizen	38 (0.5%)
Not a citizen	90 (1.1%)
Not in universe	1,479 (18%)
US-born Citizen (soil or american parents)	6,797 (81%)
Sleep duration	488 (SD = 108)
Short sleeper	1,623 (19%)

[1] n (%); Mean (SD = SD)

Source : ATUS 2021 - 2023, Author's calculations

Table 3: **Descriptive statistics, CPS Oct. 2022 - Jan. 2025 sample**

Variable	**N = 363,192**
Family income	
Between 40000$ and 100000$/year	140,253 (39%)
Less than 40000$/year	62,757 (17%)
More than 100000/$ year	160,182 (44%)
Age	43 (SD = 15)
Sex	
Male	188,301 (52%)
Female	174,891 (48%)
Race	
White	230,986 (64%)
Asian	22,968 (6.3%)
Black	36,087 (9.9%)
Hispanic	62,200 (17%)
Other race	10,951 (3.0%)
Education	
High school	99,301 (27%)
Bachelor's or above	135,620 (37%)
Less than high school	29,539 (8.1%)
Other educational background	43 (<0.1%)
Some college, asssociate's degree, professional school	98,689 (27%)
Number of own children in household	1 (SD = 1)
Location of household	
Metropolitan, central city	93,180 (26%)
Metropolitan, central city status not identified	58,420 (16%)
Metropolitan, not central city	146,878 (40%)
Nonmetropolitan	61,137 (17%)
Not identified	3,577 (1.0%)
Occupational category	
Service Occupations	62,192 (17%)
Construction and extraction occupations	19,952 (5.5%)
Farming, fishing and forestry occupations	2,771 (0.8%)
Installation, maintenance and repair occupations	11,068 (3.0%)
Management, business and financial occupations	66,679 (18%)
Not classified	714 (0.2%)
Office and administrative support occupations	36,221 (10.0%)
Production occupations	18,445 (5.1%)
Professional and related occupations	85,854 (24%)
Sales and related occupations	32,475 (8.9%)
Transportation and material moving occupations	26,821 (7.4%)
Citizenship status	
US-born Citizen (soil or american parents)	302,429 (83%)
Naturalized citizen	28,227 (7.8%)
Not a citizen	32,536 (9.0%)
Worked from home last week	
Yes	69,919 (100%)

[1] n (%); Mean (SD = SD)

Source : CPS (Oct. 2022 - Jan. 2025), Author's calculations

Table 4: **Changes in teleworkers' sleep duration on the diary day by place of work**

	Change in sleep duration		
Variable	**Beta**	**95% CI**	**p-value**
Place of Work			
Work from home day	30	8.3, 52	0.007
Hybrid work day	26	-3.8, 55	0.087
Abbreviation: CI = Confidence Interval			

Source : ATUS 2017 - 2018, Author's calculations

Table 5: **Changes in teleworkers' odds of being a short sleeper on the diary day by place of work**

	Percentage change in the odds of being a short sleeper		
Variable	**OR**	**95% CI**	**p-value**
Place of Work			
Work from home day	0.22	0.10, 0.51	<0.001
Hybrid work day	0.42	0.16, 1.10	0.079
Abbreviations: CI = Confidence Interval, OR = Odds Ratio			

Source : ATUS 2017 - 2018, Author's calculations

Table 6: **Changes in the allocation of time to different activities on diary day by place of work**

Variable	**Coefficient**	**95% CI**	**p-value**
Personal care (excl. sleep)			
Work from home day	-16	-25, -7.5	<0.001
Hybrid work day	-2.5	-12, 6.9	0.6
Housework			
Work from home day	30	15, 44	<0.001
Hybrid work day	35	6.4, 63	0.017
Care work (household members)			
Work from home day	4.7	-8.2, 18	0.5
Hybrid work day	0.45	-15, 16	>0.9
Care work (non-household members)			
Work from home day	-1.0	-4.0, 1.9	0.5
Hybrid work day	-0.88	-3.2, 1.5	0.5
Education			
Work from home day	-3.5	-9.6, 2.6	0.3
Hybrid work day	-2.3	-8.2, 3.7	0.5
Consumer purchases			
Work from home day	-2.9	-8.3, 2.6	0.3
Hybrid work day	-5.8	-11, -0.03	0.049
Care services			
Work from home day	0.21	-5.7, 6.1	>0.9
Hybrid work day	4.0	-6.5, 15	0.5
Household services			
Work from home day	0.45	-0.78, 1.7	0.5
Hybrid work day	-0.16	-1.4, 1.1	0.8
Government serices and civic obligations			
Work from home day	0.49	-0.45, 1.4	0.3
Hybrid work day	0.41	-0.27, 1.1	0.2
Eating and drinking			
Work from home day	14	4.7, 24	0.004
Hybrid work day	4.5	-7.9, 17	0.5
Socializing and leisure			
Work from home day	32	8.1, 56	0.009
Hybrid work day	-25	-54, 5.2	0.11
Sport and recreation			
Work from home day	2.5	-7.4, 12	0.6
Hybrid work day	-1.1	-10, 8.2	0.8
Religious activities			
Work from home day	-1.2	-4.0, 1.7	0.4
Hybrid work day	-0.60	-4.4, 3.2	0.8
Volunteering			
Work from home day	0.55	-5.0, 6.1	0.8
Hybrid work day	0.06	-3.9, 4.0	>0.9
Traveling			
Work from home day	-84	-101, -68	<0.001
Hybrid work day	-27	-47, -6.9	0.008
Secondary childcare while working			
Work from home day	100	56, 144	<0.001
Hybrid work day	97	19, 174	0.015
Secondary eldercare while working			
Work from home day	1.6	-1.6, 4.8	0.3
Hybrid work day	0.15	-1.2, 1.5	0.8
Watching TV			
Work from home day	20	-0.51, 40	0.056
Hybrid work day	-9.3	-38, 20	0.5
Socializing			
Work from home day	-7.1	-24, 9.8	0.4
Hybrid work day	-16	-33, 0.62	0.059

Table 6: **Changes in the allocation of time to different activities on diary day by place of work** *(continued)*

Variable	**Coefficient**	**95% CI**	**p-value**
Leisure (exc. watching TV)			
Work from home day	19	2.5, 36	0.024
Hybrid work day	0.77	-18, 20	>0.9
Workday duration			
Work from home day	-3.6	-35, 27	0.8
Hybrid work day	-13	-57, 31	0.6
Discretionary activities			
Work from home day	44	20, 69	<0.001
Hybrid work day	-28	-61, 4.2	0.088

Abbreviation: CI = Confidence Interval

Source : ATUS 2017 - 2018, Author's calculations

Table 7: **Changes in the allocation of time, Interaction with gender**

	Personal care (excl. sleep)			Household activities			Carework (household members)			Secondary childcare			Discretionary time		
Variable	**Beta**	**95% CI**	**p-value**	**Beta**	**95% CI**	**p-value**	**Beta**	**95% CI**	**p-value**	**Beta**	**95% CI**	**p-value**	**Beta**	**95% CI**	**p-value**
Place of work (main effect)															
Work away from home day	—	—		—	—		—	—		—	—		—	—	
Work from home day	-9.8	-20, 0.52	0.063	30	9.9, 49	0.003	20	3.9, 36	0.015	85	17, 153	0.015	45	11, 79	0.010
Hybrid workday	3.2	-8.7, 15	0.6	25	1.4, 49	0.038	-4.8	-23, 13	0.6	191	77, 306	0.001	-40	-82, 2.4	0.065
Gender (main effect)															
Male worker	—	—		—	—		—	—		—	—		—	—	
Female worker	26	12, 40	<0.001	23	1.1, 45	0.040	23	-0.41, 47	0.054	-47	-105, 10	0.10	-46	-86, -6.1	0.024
Interaction term															
Female worker on WFH day	-13	-29, 1.8	0.083	2.3	-28, 32	0.9	-29	-57, -1.3	0.041	32	-56, 120	0.5	1.4	-50, 53	>0.9
Female worker on HW day	-13	-31, 5.0	0.2	21	-27, 69	0.4	11	-21, 44	0.5	-171	-304, -38	0.013	26	-37, 89	0.4

Abbreviation: CI = Confidence Interval

Source : ATUS 2017 - 2018, Author's calculations

Table 8: **Changes in time spent sleepless on diary day by place of work**

Variable	Table 1		
	Beta	**95% CI**	**p-value**
Place of work			
Work from home day	-0.74	-2.5, 1.0	0.4
Hybrid work day	-1.9	-3.9, 0.05	0.056
Abbreviation: CI = Confidence Interval			

Source : ATUS 2017 - 2018, Author's calculations

Table 9: **Changes in teleworkers' wake-up times and bedtimes on the diary day by place of work (both on regular workdays and short workdays)**

Variable	**Coefficient**	**95% CI**	**p-value**
Wake-up time on regular workdays			
Work from home day	20	4.3, 36	0.013
Hybrid work day	-5.9	-26, 14	0.6
Wake-up time on short workdays			
Work from home day	4.2	-45, 53	0.9
Hybrid work day	1.0	-70, 72	>0.9
Bedtime on regular workdays			
Work from home day	-15	-37, 7.5	0.2
Hybrid work day	-19	-52, 14	0.2
Abbreviation: CI = Confidence Interval			

Source : ATUS 2017 - 2018, Author's calculations

Table 10: **Demographic and SES predictors of being a short sleeper on the diary day (workdays)**

Variable	Coefficient	95% CI	p-value
Family income			
Between 40000$ and 100000$/year	—	—	
Less than 40000$/year	1.02	0.90, 1.16	0.8
More than 100000/$ year	0.96	0.85, 1.08	0.5
Age	1.01	1.00, 1.03	0.082
Age squared	1.00	1.00, 1.00	0.11
Sex			
Male	—	—	
Female	0.85	0.77, 0.94	0.002
Race			
White	—	—	
Asian	0.79	0.61, 1.01	0.064
Black	1.56	1.34, 1.81	<0.001
Hispanic	0.95	0.79, 1.14	0.6
Other race	1.18	0.84, 1.66	0.3
Education			
High school	—	—	
Bachelor's or above	0.87	0.75, 1.01	0.062
Less than high school	1.30	1.06, 1.58	0.011
Other educational background	1.05	0.76, 1.46	0.8
Some college, asssociate's degree, professional school	1.17	1.02, 1.35	0.024
Number of children under 18 in household	1.09	1.03, 1.14	0.001
Location of household			
Metropolitan, central city	—	—	
Metropolitan, central city status not identified	0.86	0.73, 1.02	0.080
Metropolitan, not central city	0.97	0.86, 1.10	0.7
Nonmetropolitan	0.93	0.78, 1.09	0.4
Not identified	1.38	0.86, 2.20	0.2
Occupational category			
Service Occupations	—	—	
Construction and extraction occupations	0.97	0.69, 1.36	0.9
Farming, fishing and forestry occupations	0.96	0.56, 1.63	0.9
Installation, maintenance and repair occupations	1.36	0.95, 1.96	0.094
Management, business and financial occupations	1.12	0.90, 1.39	0.3
Not in universe	0.71	0.52, 0.97	0.033
Office and administrative support occupations	0.87	0.67, 1.12	0.3
Production occupations	1.42	1.06, 1.91	0.017
Professional and related occupations	1.06	0.86, 1.31	0.6
Sales and related occupations	1.00	0.76, 1.31	>0.9
Transportation and material moving occupations	1.21	0.91, 1.61	0.2
Citizenship status			
US-born Citizen (soil or american parents)	—	—	
Naturalized citizen	1.35	0.74, 2.48	0.3
Not a citizen	1.15	0.72, 1.84	0.6
Not in universe	0.90	0.75, 1.08	0.2
Hours worked	1.00	1.00, 1.00	0.8

Abbreviations: CI = Confidence Interval, OR = Odds Ratio

Source : ATUS 2021 - 2023, Author's calculations

Table 11: **Demographic and SES predictors of having teleworked last week**

Variable	Coefficient	95% CI	p-value
Family income			
Between 40000$ and 100000$/year	—	—	
Less than 40000$/year	0.85	0.82, 0.88	<0.001
More than 100000/$ year	1.52	1.48, 1.56	<0.001
Age	1.06	1.06, 1.07	<0.001
Age squared	1.00	1.00, 1.00	<0.001
Race			
White	—	—	
Asian	1.17	1.12, 1.22	<0.001
Black	0.80	0.77, 0.83	<0.001
Hispanic	0.75	0.72, 0.78	<0.001
Other race	1.03	0.96, 1.11	0.4
Sex			
Male	—	—	
Female	1.03	1.00, 1.05	0.016
Education			
High school	—	—	
Bachelor's or above	2.97	2.87, 3.08	<0.001
Less than high school	0.61	0.56, 0.66	<0.001
Other educational background	2.49	0.91, 6.77	0.074
Some college, asssociate's degree, professional school	1.63	1.57, 1.69	<0.001
Number of own children in household	0.96	0.95, 0.97	<0.001
Location of household			
Metropolitan, central city	—	—	
Metropolitan, central city status not identified	0.62	0.60, 0.65	<0.001
Metropolitan, not central city	0.82	0.80, 0.84	<0.001
Nonmetropolitan	0.45	0.43, 0.47	<0.001
Not identified	0.47	0.42, 0.54	<0.001
Hours usually worked per week at all jobs	1.00	1.00, 1.00	<0.001
Occupational category			
Service Occupations	—	—	
Construction and extraction occupations	0.59	0.53, 0.67	<0.001
Farming, fishing and forestry occupations	1.05	0.81, 1.36	0.7
Installation, maintenance and repair occupations	0.72	0.63, 0.82	<0.001
Management, business and financial occupations	7.48	7.12, 7.86	<0.001
Not classified	5.83	4.60, 7.40	<0.001
Office and administrative support occupations	4.96	4.70, 5.24	<0.001
Production occupations	0.92	0.84, 1.02	0.10
Professional and related occupations	4.25	4.04, 4.46	<0.001
Sales and related occupations	4.27	4.04, 4.51	<0.001
Transportation and material moving occupations	0.36	0.32, 0.40	<0.001
Citizenship status			
US-born Citizen (soil or american parents)	—	—	
Naturalized citizen	0.88	0.84, 0.92	<0.001
Not a citizen	0.99	0.95, 1.04	0.8

Abbreviations: CI = Confidence Interval, OR = Odds Ratio

Source : CPS (Oct. 2022 - Jan. 2025), Author's calculations

Table 12: **Demographic and SES predictors of having a teleworkable job**

Variable	Coefficient	95% CI	p-value
Family income			
Between 40000$ and 100000$/year	—	—	
Less than 40000$/year	0.91	0.88, 0.95	<0.001
More than 100000/$ year	1.15	1.12, 1.18	<0.001
Age	1.04	1.03, 1.04	<0.001
Age squared	1.00	1.00, 1.00	<0.001
Race			
White	—	—	
Asian	1.06	1.01, 1.11	0.009
Black	0.83	0.80, 0.86	<0.001
Hispanic	0.91	0.88, 0.94	<0.001
Other race	0.91	0.86, 0.97	0.006
Sex			
Male	—	—	
Female	0.94	0.92, 0.96	<0.001
Education			
High school	—	—	
Bachelor's or above	1.86	1.80, 1.92	<0.001
Less than high school	0.64	0.60, 0.68	<0.001
Some college, asssociate's degree, professional school	1.22	1.18, 1.26	<0.001
Number of own children in household	1.01	1.00, 1.02	0.037
Location of household			
Metropolitan, central city	—	—	
Metropolitan, central city status not identified	0.84	0.81, 0.86	<0.001
Metropolitan, not central city	0.96	0.93, 0.98	<0.001
Nonmetropolitan	0.74	0.71, 0.76	<0.001
Not identified	0.88	0.79, 0.98	0.019
Hours usually worked per week at all jobs	1.00	1.00, 1.00	<0.001
Occupational category			
Service Occupations	—	—	
Construction and extraction occupations	0.00	0.00, 0.00	<0.001
Farming, fishing and forestry occupations	0.00	0.00, 0.00	<0.001
Installation, maintenance and repair occupations	0.12	0.09, 0.16	<0.001
Management, business and financial occupations	41.9	39.9, 43.9	<0.001
Office and administrative support occupations	21.9	20.9, 23.0	<0.001
Production occupations	0.04	0.03, 0.06	<0.001
Professional and related occupations	15.4	14.7, 16.1	<0.001
Sales and related occupations	5.92	5.63, 6.23	<0.001
Transportation and material moving occupations	0.00	0.00, 0.00	<0.001
Citizenship status			
US-born Citizen (soil or american parents)	—	—	
Naturalized citizen	0.83	0.79, 0.86	<0.001
Not a citizen	1.11	1.06, 1.16	<0.001

Abbreviations: CI = Confidence Interval, OR = Odds Ratio

Source : CPS (Oct. 2022 - Jan. 2025), Author's calculations

Table 13: **Changes in teleworkers' sleep duration on the diary day by place of work (post-pandemic)**

	Change in sleep duration		
Variable	**Beta**	**95% CI**	**p-value**
Place of Work			
Work from home day	14	6.7, 22	<0.001
Hybrid work day	-19	-29, -9.1	<0.001
Abbreviation: CI = Confidence Interval			

Source : ATUS 2021 - 2023, Author's calculations