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Gender and Time for Sleep among U.S. Adults

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Abstract

Do women really sleep more than men? Biomedical and social scientific studies show longer sleep durations for women, a surprising finding given sociological research showing women have more unpaid work and less high-quality leisure time compared to men. We assess explanations for gender differences in time for sleep, including compositional differences in levels of engagement in paid and unpaid labor, gendered responses to work and family responsibilities, and differences in napping, bedtimes, and interrupted sleep for caregiving. We examine the overall gender gap in time for sleep as well as gaps within family life-course stages based on age, partnership, and parenthood statuses. We analyze minutes of sleep from a diary day collected from nationally representative samples of working-age adults in the American Time Use Surveys of 2003 to 2007. Overall and at most life course stages, women slept more than men. Much of the gap is explained by work and family responsibilities and gendered time tradeoffs; as such, gender differences vary across life course stages. The gender gap in sleep time favoring women is relatively small for most comparisons and should be considered in light of the gender gap in leisure time favoring men at all life course stages.

Keywords

gender; sleep; stratification; time use

Do women really sleep more than men? Positive evidence comes from self-reports of sleep duration from biomedical studies (Burazeri, Gofine, and Kark 2003; Gale and Martyn 1998); social scientific studies of large, population-based samples (Krueger and Friedman 2009); time diary data (Basner et al. 2007; Chatzitheochari and Arber 2009; Hale 2005; Robinson and Godbey 1997); and actigraphy (Lauderdale et al. 2006).[1] Women's longer sleep duration is surprising, however, given gender differences in time use during waking hours. Women, especially married women with children, spend more time than men doing unpaid work, even if they are employed (Bianchi et al. 2000), and have less leisure time (Sayer 2005). Moreover, evidence is accumulating that women get less high-quality, uninterrupted

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[1]Actigraphy measures are taken with wristwatch-like instruments with highly sensitive accelerometers to digitally record an integrated measure of gross motor activity, which is analyzed to identify sleep periods.

sleep (e.g., Burgard 2011; Hislop and Arber 2003a; Maume, Sebastian, and Bardo 2009) because they prioritize family needs, even during sleeping hours (Venn et al. 2008).

Although studies about women's time use and sleep quality suggest they may have less time for sleep than men, particularly among employed parents of small children, existing sleep studies show that women sleep longer than men. Sleep studies, however, generally make comparisons across all men and women, or focus on specific groups or parts of the life course, such as dual-income parents with young children (Maume, Sebastian, and Bardo 2010) or midlife women (Hislop and Arber 2003a). Additionally, prior studies have not accounted for gender differences in the amount of time spent fulfilling paid and unpaid work obligations over adulthood, or strategies used to achieve more sleep, such as earlier bedtimes. Therefore, to our knowledge, this study is the first to examine time for sleep in a representative sample of working-age U.S. adults, considering gender differences among individuals who have similar work-family responsibilities and incorporating information about attempts to increase sleep.

Sleep is essential for survival, health, and productivity and takes up more time than any other single activity, so understanding inequality in time for sleep is important. The social patterning of sleep time is an understudied aspect of gender differences in time use, and a better understanding could inform a largely biomedical literature that treats sleep as an individual health behavior or risk factor. In this study, we assess the nature and determinants of gender differences in time for sleep among U.S. adults overall and at different life course stages. We draw data from the annual American Time Use Surveys (ATUS) of 2003 to 2007, a large nationally representative sample of adults. We contextualize the magnitude of gender differences in time for sleep by comparing them to differences in leisure, another discretionary use of time. This study adds to our understanding of gender differences in sleep and offers new evidence for the power of social factors in structuring time use.

BACKGROUND

Compositional Explanations for Gender Differences in Time for Sleep

Gender differences in time for sleep could be a function of compositional differences in time spent in paid and unpaid work by gender and age. Time use data show that paid work has a stronger negative association with sleep time than any other activity (Basner et al. 2007; Biddle and Hamermesh 1990; Chatzitheochari and Arber 2009) and may be less compatible than other activities with finding time to sleep. We might therefore expect men to sleep less because, on average, they do more paid work than women, although gender differences in sleep time could vary across adulthood as time spent in paid work rises and falls. In addition, time spent doing unpaid work that accompanies family formation and childrearing could interfere with time for sleep. Compared to men, women do almost twice the amount of housework (Bianchi et al. 2000; Sayer 2005) and childcare (Aldous, Mulligan, and Bjarnason 1998; Robinson and Godbey 1997; Sayer 2005). As individuals form families and raise children, women may face decreasing time for sleep, relative to men.

Gendered tradeoffs that typically occur with family formation are another component of this compositional explanation. Women are more likely to reduce their paid work when unpaid

work and caregiving responsibilities are highest, and men often increase their paid work when they become fathers (Kaufman and Uhlenberg 2000). Although women are increasingly working for pay, even mothers of young children, they are still less attached to the labor force than are men. For example, a study using the National Longitudinal Study of Youth 1979 cohort found that only about one-third of mothers worked for pay continuously from the year before their first and second births through the first two years of each child's life (Hynes and Clarkberg 2005). Because of mothers' reductions in paid work when unpaid family responsibilities are greatest, we might expect that among parents of young children, women will have more time for sleep than men.

Of course, not all women reduce their paid work time even when unpaid obligations are substantial. Major social, demographic, and macroeconomic changes in the United States over the past several decades have resulted in large increases in women's paid labor force participation, at the same time that increases in divorce and shifts in marriage and cohabitation patterns have raised the prevalence of single parenting, which is concentrated among women (Bianchi, Robinson, and Milkie 2007). This means more women are allocating considerable time to paid work and still fulfilling unpaid household and family responsibilities, such that women with the same paid work commitments as men may have less time for sleep.

Gendered Responses to Work and Family Roles

Beyond changes and tradeoffs in paid and unpaid roles, transitions from youth and singlehood to partnership and parenting mean increased opportunity or pressure to express gendered role behaviors. Even if they hold the same roles as their male counterparts, women may spend more time on female-typed tasks such as housework and childcare (Bianchi et al. 2000; Hochschild and Machung 2003). Some evidence suggests that when family responsibilities increase and the volume of unpaid work rises, women's leisure time declines more than men's (Bittman and Wajcman 2000; Miller and Brown 2005). Gendered expectations may also reduce time for sleep. Venn and colleagues (2008) argue that women expect and are expected to take on the "fourth shift" of managing the emotional and practical needs of family members during the night. Their study of 26 working-age U.K. couples with children showed that women were more likely to rise from sleep to do emotional and other care work. A study of 25 U.S. dual-earner, working-class couples under 50 years old also found that women reported more sleep interruptions to provide care for others, even if they worked the night shift (Maume et al. 2010). A study using a nationally representative sample of working-age U.S. parents also showed substantially more sleep interruptions for caregiving among women, net their employment and parental responsibilities (Burgard 2011).

Alternatively, men's time use may be more strongly affected than women's in the transition to partnership and parenthood. One study found that work and family roles, especially marriage, restricted exercise time more for men (Nomaguchi and Bianchi 2004) because they allocated more time to earning income. A study of employed 20- to 60-year-olds from the 2000 UK Time Use Survey showed that work hours and other aspects of work influenced men's sleep time more than women's, and that unpaid work time was also more

strongly associated with short sleep among men (Chatzitheochari and Arber 2009). Given men's increased paid work when they form relationships and become parents, these findings suggest that men may have less time for sleep, particularly when partnered or parenting.

Gendered Approaches to Preserving Time for Sleep

In addition to allocating time to paid and unpaid work differently in response to evolving family demands and gendered expectations across adulthood, women and men may also differ in their attempts to preserve sleep. There is little research on this topic, but studies suggest that women may be more likely to nap or pursue earlier bedtimes. An actigraphy-based study of 72 couples found that U.S. mothers were more likely to have their sleep interrupted in the first month postpartum, but they still got more sleep than their male partners because they were more likely to sleep during the day (Gay, Lee, and Lee 2004). Women may have less access to uninterrupted sleep, increasing their fatigue, but women who spend less time in paid work may have more flexible schedules that allow them to sleep more during the day. Additionally, some research suggests that men and women value sleep differently. A qualitative study of 40 working-age British couples found that men have different views of the meaning and value of sleep (Meadows et al. 2008); men understand sleep as an unfortunate necessity because it takes away time that could otherwise be used to fulfill responsibilities. Women's views could differ for multiple reasons (Meadows et al. 2008). Enacting feminine behaviors does not involve as much health risk-taking as enacting masculine behaviors (Courtenay 2000). Getting adequate sleep may require an early bedtime, an action seen as childish, cautious, weak, or incompatible with masculine uses of discretionary time. Women are also more likely than men to attend to health knowledge in general (Cameron and Bernardes 1998), and this could extend to public health messages about sleep. Pursuing naps and earlier bedtimes may allow women to achieve more time for sleep than their male counterparts, even net of their paid and unpaid work responsibilities.

The Present Study

Changes in paid and unpaid work responsibilities as individuals age, form relationships, have children, and eventually see their children exit the household and become independent make up life course stages that mark different configurations of time use and responsibilities (Anxo et al. 2011; Glick 1947). We use a stylized typology of stages that describe single young adults entering the labor force, partnered young adults, partnered new parents, partnered parents of older children, and single parents, as well as older partnered and older single people. Expectations accompanying life course stages are gendered (Moen 1996) and could generate differences in men's and women's time for sleep. For example, having a spouse or partner instead of being single could make it easier to accomplish a household's needs, leaving more time for other activities such as sleep. On the other hand, it could also increase pressure to allocate more time to paid or unpaid work to accommodate gendered expectations about roles as breadwinner or parent. Similarly, a life course stage marked by parenthood implies more unpaid work that could limit time for sleep, perhaps more for women than for men, but it may also signal the acceptability of reduced paid work time for women, increasing their ability to preserve sleep.

We examine the overall gender difference in time for sleep as well as differences within distinct life course stages and assess the following hypotheses: (1) the overall gender gap in time for sleep will favor women; (2) the overall gender gap in time for sleep will be explained by gender differences in paid and unpaid work time, napping, bedtimes, and sleep interruptions for caregiving; (3) paid and unpaid work time, napping, bedtimes, and sleep interruptions for caregiving will influence men's and women's sleep time differently; and (4) the gender gap in time for sleep will favor women most at life course stages involving partnership and parenting, and there will be a smaller gender gap at other life course stages.

To contextualize the direction and magnitude of gender differences in time for sleep, we assess time for leisure using the same approach. The literature suggests women may sleep more but have poorer quality sleep; men, however, have both more and higher quality leisure (Bittman and Wajcman 2000; Mattingly and Bianchi 2003; Sayer 2005). Although sleep takes up more hours per day than leisure, offering a greater possible range for gender differences, the biological need for sleep and its strong physiological patterning mean it may be less responsive than leisure time to social roles and gendered expectations.

DATA AND METHODS

Data

We use the American Time Use Survey (ATUS), a representative sample of the non-institutionalized population age 15 years and older conducted annually by the Census Bureau since 2003 (Abraham et al. 2008). Respondents are interviewed for ATUS two to five months after rotating out of the Current Population Survey. After receiving mail notification of the survey and the nature of the questions they will be asked, respondents are interviewed by phone about their time use. Respondents report on their diary days, which run from 4 a.m. on the designated day to 3:59 a.m. the following day. Pooling the annual ATUS interviews conducted from 2003 to 2007 produces a sample of 72,922 respondents. Response rates range from 55.1 to 57.8 percent. Analysis of these response rates, which are relatively typical of time use studies (Chatzitheochari and Arber 2009), shows that busy people appear no less likely to respond to the ATUS; people who are weakly integrated into their communities, however, are less likely to respond, mostly because they are less likely to be contacted (Abraham, Maitland, and Bianchi 2006).

We dropped respondents younger than 18 years or older than 64 years (N = 16,079) and those for whom ATUS staff identified data quality issues (N = 694), leaving a final analytic sample of 56,149 respondents. We top-coded all time use variables at the 95th percentile of the overall distribution to reduce the influence of outliers, a strategy used by other studies (e.g., Mattingly and Bianchi 2003).

Measures

Sleep measures—Our dependent variable is *minutes of time for sleep*, including sleeping, sleeplessness while in bed, and sleeping activity not elsewhere classified, for the main sleeping period and any naps. The vast majority of total sleep time is spent sleeping; only about 3 percent of respondents reported any sleeplessness. Sleep time ranges from 0 to 741

minutes (after top-coding at the 95th percentile as discussed earlier) with an average of 502 minutes, or about 8 hours and 22 minutes. Most biomedical studies suggest that sleeping 6.5 to 8 hours per night is optimal (Kripke et al. 2002; Patel et al. 2004). Sleep time calculated from diary data is often longer than that reported by survey respondents when asked how much sleep they usually get, but there is no reason to believe estimates of group differences in time for sleep based on diary data are more biased than those based on self-reports. Time diary respondents likely report the time they went to bed, rather than the time they fell asleep, helping to explain why these durations appear long relative to other self-report measurements.

A dichotomous indicator of *interrupted sleep* measures caregiving responsibilities that require respondents to get up from sleeping. We examined detailed diary records and coded respondents as having interrupted sleep if they reported physical or medical care for a household member (usually a child) after they had gone to sleep for their main sleep period (usually in the evening) or in the hours before rising for their main activities (usually in the early morning), an activity reported by 1.7 percent of the sample. We created an indicator of whether a respondent *napped* by searching diary day records for relatively short periods of sleep interrupting what appeared to be that respondent's main waking time. Most naps occurred in mid-morning after respondents were awake for several hours, or in mid-afternoon before several hours of waking activities that preceded the main sleep spell. A measure of *bedtime after midnight* denotes late bedtimes. We identified the start time of the longest sleep spell and classified respondents who went to sleep between midnight and 4 a.m. as having a bedtime after midnight.[2]

Other time use measures—We categorized minutes of paid work time because of its skewed distribution and correlation with minutes of sleep (−.43 for men and −.36 for women). To create our *employment category* measure, we combined reported minutes worked (including travel time related to paid work) with an indicator of employment status (whether a respondent was in the paid labor force at the time of the ATUS interview). Many employed respondents interviewed on a weekend did not report any paid work minutes but still probably differ from unemployed respondents. The categories distinguish (1) respondents not in the labor force from those who (2) were employed but did no paid work on the diary day, (3) worked for less than eight hours on the diary day, or (4) worked for eight hours or more on the diary day.[3] *Unpaid work* includes time spent in housework; food and drink preparation and clean up; interior and exterior maintenance; repair and decoration; caring for lawn, garden and houseplants, animals and pets, vehicles, appliances, toys, and tools; household management; other household activities; caring for and helping household children and adults; activities related to household children's education and health; and related care activities. We generated quartiles based on the full sample of ATUS respondents

[2]Most ATUS respondents reported their main sleep spell during nighttime hours, but some respondents had no clear bedtime and may have been shift workers who only napped during the diary day. In a sensitivity analysis, we combined these respondents with those who reported no sleep minutes (the two groups make up 1.7 percent of the total sample) and denoted them with an indicator variable; the main findings are substantively unchanged from those presented here.

[3]In multivariate analyses, we included an interaction term between paid work categories and gender to examine potential differences in influence of paid work time on sleep, but these also captured sex differences in the minutes worked within categories. In the less than eight hours category, men averaged 280 minutes compared to women's 299 minutes; in the eight or more hours category, men averaged 591 minutes compared to women's 569 minutes.

to reduce the influence of the skewed distribution of unpaid work time. Respondents in the lowest quartile reported 0 to 19 minutes of unpaid work; respondents in the second and third quartiles reported 20 to 104 or 105 to 239 minutes, respectively; and respondents in the top quartile reported 240 to 656 minutes of unpaid work.

Leisure time includes socializing and communicating; attending or hosting social events; relaxing and engaging in leisure, arts, or entertainment (other than sports); participating in sports, exercise, or recreation at light intensity; attending sports or recreational events; waiting or engaging in security procedures associated with socializing or with sports, exercise, or recreation; and related leisure activities not classified elsewhere. Reported leisure time in this sample ranges from 0 to 725 minutes, with an average of 265 minutes. We included minutes spent in *exercise* of moderate to high intensity (> 3 METs) because exercise may influence the need for or quality of sleep or could compete with time available for sleep.[4] We used the standard compendium of physical activities to classify them as moderate or high intensity (Tudor-Locke et al. 2009); representative activities include playing baseball (5 METs) or using cardiovascular equipment (8 METs). Respondents exercised for 0 to 105 minutes, reporting an average of 9.9 minutes.

Other independent variables—We created *life course stage* groups similar to those used by Anxo and colleagues (2011) using information about parental status, partnership status, and age. *Parental status* divides respondents with no biological children under age 18 living with them at the time of the ATUS interview from those who had coresident children either age 6 to 17 years (and no younger children) or younger than 6 years. *Partnership status* indicates whether a respondent was living with a spouse or unmarried partner at the time of interview. We created categories of *life course stage* for individuals who were (1) young (less than 40 years), single, and childless; (2) young, partnered, and childless; (3) partnered (of any age) with any younger children (under 6 years old); (4) partnered (of any age) with older children (ages 6 to 17 years) and no younger children; (5) single parents of any age; (6) older (40 years or older), partnered, and childless; or (7) older, single, and childless. Although it might seem preferable to subdivide these life course stages further, we needed groups that included comparable men and women and contained enough men and women to make comparisons across groups statistically meaningful. We adjusted for *employment status of spouse or partner* to acknowledge the availability of others in the household to do paid and unpaid work, distinguishing respondents (1) with no partner from (2) those with an employed partner or (3) unemployed partner.

We used respondent's *age* (centered on 18 years) and *age squared* (generated from centered age) in continuous form in multivariate analyses to capture the curvilinear decline in sleep time with age established in prior studies. *Race/ethnicity* distinguishes (1) white, (2) African American, and (3) Asian/Pacific Islander or other/multiple race individuals from (4) Hispanic respondents, who can be of any race. *Educational attainment* distinguishes respondents (1) who did not finish high school from (2) those with a high school diploma, (3) some college, or (4) who completed four years of college or more. *Disability status* is

[4]An MET is defined as the activity metabolic rate divided by the resting metabolic rate. Lying or sitting quietly is classified as 1 MET, light cleaning is a 2.5 MET activity, and running is a 7.5 MET activity.

coded 1 for respondents with a disability affecting their ability to work at the CPS interview (two to five months prior to the ATUS interview), and we used this as a proxy indicator of a serious health problem that could affect social roles and sleep. We also controlled for survey year (2003 to 2007) and whether the diary day was on the weekend or a holiday. Following earlier time use studies, we included an indicator of the total number of activities reported, capturing differences in activity level and reporting styles.

Analytic Strategy

We conducted bivariate analyses to examine gender gaps in sleep time overall and by employment category and life course stage. We then estimated a series of multivariate OLS regression models to explore predictors of sleep time. Using our final model, which includes gender interactions with all key predictor variables, we generated predicted values for gender-specific sleep and leisure times for the overall sample and life course stages. We obtained these predicted values while leaving values for all independent variables at those reported by respondents.[5] We took the difference of the predicted values for women and men to obtain adjusted estimates of the gender gap in sleep and leisure time. All analyses were conducted using Stata/SE 11.0 (StataCorp 2009), with ATUS-provided survey weights that account for oversampling of certain subgroups and weekend days and for different response rates.[6]

RESULTS

Table 1 presents the weighted distributions of respondents' characteristics for the overall sample and by gender. We tested for statistical significance of gender differences using weighted OLS regressions (for continuous variables) or logistic or multinomial logistic regressions (for categorical variables), with gender as the sole predictor. Because most comparisons are statistically significant, we note only those differences that are not.

Table 1 shows that ATUS respondents slept about 502 minutes on their diary day, with men reporting less sleep than women (496 versus 508 minutes), a statistically significant difference of about 11 minutes. Although considerably less time was spent in leisure than in sleep (265 minutes on average), the gender gap in leisure was three times larger (35 minutes) and favored men. Men were much more likely than women to have worked eight or more hours on their diary day and were also much less likely to not be in the labor force. Women were substantially more likely than men (31 versus 14 percent) to be in the highest quartile of unpaid work time. Men were more likely than women to be young, single, and childless and less likely to be single parents. Women were more likely than men to be living with an employed spouse or partner and less likely to be living with a partner who was not employed. Although it was uncommon for men or women to experience interrupted sleep for caregiving, women were significantly more likely to report interrupted sleep (3 versus 1 percent). Men were less likely than women to nap (9 versus 11 percent) and more likely to report bedtimes between midnight and 4 a.m. (22 versus 20 percent). Women were only

[5]Specifying particular values for independent variables when generating predicted values does not change conclusions about the relative magnitude or direction of gender gaps in time for sleep.
[6]Coding syntax used to conduct all analyses is available from the first author.

slightly older than men, and gender differences on most other demographic and survey characteristics were minor or as expected.

Time Use and Sleep by Life Course Stage

Table 2 presents means and standard deviations or weighted percentages of sleep minutes, napping, bedtime, and interrupted sleep for caregiving among men and women who reported the same employment category or were in the same life course stage. We tested for statistical significance of differences for two comparisons: (1) to assess the gender gap, separate weighted regression models predict the outcome in question for each employment category or life course stage with gender as the sole independent variable; (2) to assess differences across employment categories or life course stages among men only or women only, separate weighted regression models predict the sleep outcome in question with employment category or life course stage as the sole independent variable. Because most comparisons are statistically significant, we note only the between- and within-gender differences that are not.

The top panel of Table 2 shows that gaps in sleep time are much larger by employment category than by gender. These findings illustrate the importance of examining time spent working, rather than simply separating the employed from those not in the labor force. Men who were employed but did not work on the diary day slept about 116 minutes more than those who worked eight or more hours (559 versus 443 minutes), and the magnitude of this gap is similar for women, even though all of these individuals were employed. Differences in sleep time between respondents not in the labor force and all other employment categories are statistically significant for men and women. By contrast, gender differences in sleep time within each employment category are much smaller. Women actually reported less sleep time than men in all employment categories except among respondents who worked eight or more hours on the diary day. Men and women were distributed very differently, however, across employment categories, with about 44 percent of men in the eight or more hours category, compared to 27 percent of women, and a quarter of women not in the labor force, compared to only 12 percent of men (see Table 1). Different paid work involvement appears to be a major factor underlying the average gender difference in sleep time.

The top panel of Table 2 also shows that women were significantly more likely than men to report interrupted sleep for caregiving across all employment categories, but interruptions were most common among women not in the labor force and least common among women who worked eight or more hours on the diary day. Napping was more common among respondents not in the labor force and least likely among those who worked eight or more hours; we found no significant gender differences in napping for respondents who worked at all on the diary day. Men were more likely than women to go to bed between midnight and 4 a.m. in all employment categories except among respondents who worked eight or more hours on their diary day. Men and women working eight or more hours were significantly less likely to report a late bedtime than those who were not in the labor force.

The bottom panel of Table 2 shows that time for sleep also varies significantly by life course stage, with young, single, childless respondents reporting the most sleep (521 minutes for men, 527 for women) and partnered respondents with children 6 to 17 years old reporting

the least (482 and 495 minutes, respectively). With the exception of older, single, childless respondents, women reported more time for sleep than men, with a gap ranging from about 6 to 28 minutes. As we hypothesized, gender differences in time for sleep are not significant among young or older single, childless respondents, the groups who appear to have the fewest family responsibilities, and are larger and significantly favor women in life course stages that involve the most family obligations to a partner or children.

Within-gender comparisons show that among men, young, single, childless respondents reported significantly more sleep than all other groups. Among women, those reporting the most sleep were young and childless, regardless of partnership status. Across all life course stages, women were more likely to interrupt sleep for caregiving, with partnered women with young children most likely to do so. Napping varied across life course stages more for men than for women. Many life course stages saw no significant gender difference, although among young, partnered individuals with or without children and among single parents, women napped more. Bedtimes between midnight and 4 a.m. were substantially more common among young, single, childless respondents than at other life course stages. Men were significantly more likely than women to report late bedtimes only among partnered respondents with young children and older, single, childless respondents.

Potential Explanations for Gender Differences in Time for Sleep

Next we turn to multivariate examination of the gender difference in time for sleep. Table 3 shows coefficients and standard errors (in parentheses) for focal predictors from regression models of minutes of sleep. All regression models adjust for age and age squared, race/ethnicity, educational attainment, disability status, study year, weekend day, holiday, total number of activities, and exercise minutes (coefficients not shown but available in Table S1 in the online supplement [http://asr.sagepub.com/supplemental]). Likelihood ratio tests demonstrated that the addition of covariates across models improved fit in sequential comparisons. The female coefficient in Model 1 represents the gender gap at age 18 years adjusted for these covariates, and Model 1 adds life course stage, omitting the young, single, childless group. Model 1 further adjusts for time spent in unpaid work, employment category, and partner's employment status. Model 1 adds indicators of napping, bedtime, and interrupted sleep for caregiving. Model 1 simultaneously adds interactions between gender and age and age squared, life course stage, employment category, unpaid work time, employment status of spouse or partner, napping, bedtime, and interrupted sleep for caregiving. We present coefficients for the interaction terms in a column to the right of the coefficients for the main effects of each predictor in Model 1.

Results for Model 1 show that women reported about 23 more minutes of sleep than men, after adjusting for sociodemographic characteristics and conditions of the diary day. Results for Model 1 show that partnered respondents with young children and single parents reported statistically significant more time for sleep (four to eight minutes more) than young, single, childless respondents. These relatively small adjusted differences across life course groups in Table 3 demonstrate the importance of sociodemographic differences underlying the larger, unadjusted differences in sleep time across life course groups shown in Table 2.

Additional adjustment for time spent in unpaid and paid work in Model 1 substantially reduces the gender difference in sleep time to about 13 minutes. Respondents with the most unpaid work slept 30 minutes less than those doing the least, but paid work had an even stronger association with time for sleep. Compared to respondents not in the labor force, respondents who worked eight or more hours reported 102 minutes less sleep time. Model 1 adjusts for other sleep behaviors, reducing the gender difference to about 10 minutes in favor of women. Respondents who napped on the diary day reported about 77 minutes more sleep, and those who went to bed between midnight and 4 a.m. slept 86 minutes less. Adjusting for sleep behaviors does not greatly alter the association between sleep time and paid and unpaid work or other characteristics, but it does shift associations between time for sleep and life course stage, as these aspects of sleep are highly age-graded and depend on family responsibilities. After adjusting for differences in sleep behaviors, respondents in most other life course stages slept significantly less than young, single, childless individuals, as they did in the unadjusted associations shown in Table 2. Thus, the multivariate findings continue to emphasize the importance of compositional differences in work and family roles, time spent fulfilling those roles, and napping and bedtime behaviors for understanding the overall gender difference in time for sleep.

We hypothesized that the extent to which work and family responsibilities influence time for sleep might vary for men and women, so we examine gender interactions in Model 1. Strikingly, the results show that for the reference group of young, single, childless respondents, the gender gap decreases substantially to only about two minutes and is no longer statistically significant. There are significant gender differences in the associations between many of the focal predictors and time for sleep. These interactions reveal that in life course stages with more responsibilities to partners or children, sleep time is reduced more for men than for women. For example, partnered men with young children sleep about 13 minutes less than men who are young, single, and childless, but the interaction term for this life course stage indicates that this same comparison yields a difference of less than five minutes for women and actually favors women with young children ($-12.97 + 17.46 = 4.49$). Men's sleep is also significantly more restricted than women's by time spent in unpaid work and by full-time work, although men gain slightly more time for sleep if they nap and lose slightly less if they have a late bedtime.

Predicted Gender Gaps: Comparison of Time for Sleep and Leisure

To incorporate all the interaction terms in Model 1 and illustrate the extent to which predictors explain the gender gap in time for sleep, we present unadjusted and predicted (adjusted) gender differences in Figure 1. We compare the magnitude and direction of gender differences in time for sleep and leisure overall and by life course stage. We obtained predicted values for leisure minutes from an otherwise identical model with leisure time as the outcome (available from the authors). Significance levels of gender differences were obtained for unadjusted values from weighted OLS regressions for each life course stage using gender as the sole predictor and for predicted values from chi-square tests of the predictive margins.

Positive values in Figure 1 represent gender differences that favor women, and negative values favor men. Women reported significantly more time for sleep in most life course stages, except among younger and older single, childless respondents in unadjusted comparisons, and among younger, single, childless respondents in adjusted comparisons. In most life course stages, the sleep time gap favoring women is reduced, although not eliminated, after adjusting for all predictors and gender interactions. For example, single, partnered, childless women and partnered women with young children reported about 27 to 28 more minutes of sleep than their male counterparts. These gaps shrink to about 12 to 15 minutes after adjusting for compositional differences in men's and women's characteristics and taking account of gender differences in how age, life course stage, paid and unpaid work, partner's employment status, and sleep behaviors influence time for sleep. For other life course stages, unadjusted and adjusted differences are similar or smaller than these. Time for leisure shows a very different pattern: it always favors men by a wide margin; gaps range from about 20 to almost 70 minutes when considering unadjusted and adjusted values. We also examined the sensitivity of all results to alternative specifications, but none substantially alter our main conclusions.[7]

DISCUSSION

Adding to an emerging literature on the sociology of sleep, we extended prior research by assessing gender differences in time for sleep among individuals who had similar work-family responsibilities. We also more carefully accounted for time spent in paid and unpaid work and took account of individuals' attempts to preserve time for sleep. Consistent with prior biomedical and social science research and our first hypothesis, we found that women slept more overall, but our findings add to the literature by showing that women generally slept longer than men even when considering adults at the same life course stage. These differences were not very large, ranging from about 5 minutes favoring men to about 28 minutes favoring women before adjusting for any other characteristics. Providing some support for our second hypothesis, gender gaps were smaller once adjusted for differential engagement in paid and unpaid work and variation in napping, bedtimes, and sleep interruptions for caregiving. We also found that work and family roles and time spent fulfilling responsibilities were differentially influential for women's and men's sleep time, as we hypothesized. Men's sleep time was influenced more by life course stage and by time spent in paid and unpaid work. Moreover, the gap in sleep time favoring women was largest for respondents who were partnered or had children in the home and was small or even insignificant among single adults without children. These results support other findings about time for sleep and exercise that suggest partnership and parenthood may more strongly alter time use for men than for women (Chatzitheochari and Arber 2009; Nomaguchi and Bianchi 2004), at least for some activities.

[7]In sensitivity analyses not shown, we restricted the sample to respondents who reported on non-holiday weekdays; the pattern of gender gaps was consistent although, unsurprisingly, sleep and leisure durations were shorter. We examined models including household income as a predictor, a measure excluded from the main analyses due to missing data, but the pattern of predicted gender differences was unchanged. Predicted gender differences were substantively unchanged when we adjusted for time spent experiencing sleeplessness, omitted respondents reporting any sleeplessness, or omitted non-white respondents. The pattern of results was consistent when we used a categorical indicator (less than 6.5 hours, 6.5 to 8.5 hours, more than 8.5 hours) rather than sleep minutes.

Note that some of the largest gender gaps in sleep time favoring women were found for life course stages when interrupted sleep for caregiving was most common. Getting up to take care of others, a task disproportionately performed by women, is highly disruptive to sleep and may reduce overall sleep quality. Therefore, another way to think about gender differences in time for sleep is to ask whether they are *large* enough; even an extra 30 minutes of sleep for mothers might not compensate for their greater likelihood of waking to provide care. At the same time, interruptions like these are rare, except among individuals with young children, and it is critical to account for the different tradeoffs between paid and unpaid work made by mothers and fathers. Fewer women than men in our sample worked a full eight hours or more on their diary day and 25 percent were not in the labor force, compared to only about 12 percent of men. These differences, possibly in combination with gendered attitudes about sleep, may give women more flexibility to nap or go to bed earlier during childbearing years. Our results thus add some nuance to the emerging sociological literature that focuses on women's poorer sleep quality by confirming that women also sleep slightly longer than men. We add to the accumulating evidence that multiple aspects of sleep are shaped by work-family responsibilities and gendered social expectations for their fulfillment.

Although a majority of working-age men sleep less than their female counterparts, the difference is negligible overall and in many life course stages, especially considering how factors like later bedtimes among younger men contribute to the gap. Additionally, our results suggest gender gaps in leisure time favor men and are similar to or greater in magnitude than the gender gap in sleep time. Discussions of equity in discretionary time need to consider its total quantity, made up of both sleep and leisure time, the quality of the available time, such as its continuity and restfulness, the way it is shaped by multiple responsibilities and roles, and how gender gaps may vary over the life course.[8]

These findings make significant contributions, but this study has limitations. Gendered attitudes toward sleep lead men to report artificially short sleep times, resulting in estimates of gender differences favoring women that may be too large. Time diary data, however, are collected by asking for the start and end times of each activity, which probably leads to less reporting bias than in studies that ask for a total number of hours or minutes spent in a given activity. Additionally, only one 24-hour day is observed, limiting our ability to account for day-to-day variation in sleep cycles. Future studies should consider individuals age 65 years and older, who are not included here because we focused on those likely to face the greatest work and family responsibilities. Gender differences in sleep time among older adults could vary substantially from those shown here, because of lower levels of paid employment and changes in the physiology of sleep in later life.

ATUS data provide a large and representative sample of contemporary Americans, but they are cross-sectional and thus do not allow assessment of causal directionality in the associations we discuss. Engaging in excessive sleep, for instance, could influence the

[8]Men may be more likely than women to choose leisure activities over sleep, so we explored models of sleep time that included leisure time as a predictor to examine the influence of such a tradeoff (not shown). The pattern of gender differences was very similar, but the magnitude of the difference favoring women was smaller than that shown here, and among young, single, childless women there was a significant gender gap in sleep time favoring men.

likelihood of taking on paid employment or getting married. Moreover, ATUS does not include detailed information on respondents' physical or mental health conditions that could underlie either excessive sleep or selection out of paid employment or parenthood. Evidence suggests that causal links between poor sleep quality and affective disorders operate in both directions (Espie 2002). Chronic physical health problems and sleep also likely have reciprocal and feedback relationships (Kutner, Bliwise, and Zhang 2004), so it is difficult even with longitudinal data to tease out their causal directionality. We did include an indicator of disability in our models and conducted a sensitivity analysis using two ATUS waves that had measures of overall self-rated health and body mass index. Although results differed slightly when using the restricted sample, conclusions about gender gaps in sleep time were not altered by inclusion of these health indicators. ATUS does not include measures of health behaviors like alcohol use, smoking, or use of sleep aids or medications, which vary by gender and likely influence sleep time, so our findings should be interpreted with appropriate caution.[9] Additionally, sensitivity to the biological aspects of sex differences in sleep disorders could be greatly improved with more comprehensive and objectively collected data on sleep quantity and quality, hormonal levels and health problems, and biologically important characteristics such as pregnancy and menopausal status.

ATUS respondents may underreport napping and sleep interruptions, particularly interruptions that did not involve getting out of bed. Prior research describes a fourth shift of nighttime care work that spans physical care and emotion work, including activities such as lying in bed worrying about a family member (Hislop and Arber 2003a; Venn et al. 2008), but we cannot capture such activity here. Finally, time diary data and self-reported bedtimes produce a measure of sleep duration that captures time allocated for sleep, not actual time spent sleeping (Lauderdale et al. 2006), so future studies should consider alternative data collection methods.

Despite these limitations, our findings suggest that theoretical and empirical investigation into the nature and consequences of gender stratification should consider sleep. Moreover, gender differences in sleep may be amenable to policy changes. In particular, time for sleep is vulnerable to workplace policies that have not caught up to changes in women's likelihood of working for pay, men's and women's work schedules, the increase in dual-income families, and how these changes affect the conflict between paid and unpaid work for men and women across midlife (Williams 2010). Deeper sociological investigation of sleep and new data collections to enable it are warranted, given the huge time investments we all make in sleep over our lifetimes and its strong links to safety, health, productivity, equity, and quality of life.

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[9]Maume and colleagues (2009) found that medication use and other health behaviors are not significantly associated with sleep disruptions.

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Biography

Sarah A. Burgard is associate professor of sociology and epidemiology and research associate professor at the Population Studies Center at the University of Michigan. Her research focuses on the ways that stratification by race-ethnicity, gender, and socioeconomic position influence people's opportunities in life and how this influences their health. Burgard uses large-scale social surveys and other data to examine a variety of health outcomes that chart the boundaries of the healthy life course. She is currently engaged in several data collection projects aimed at understanding links between the Great Recession and population health.

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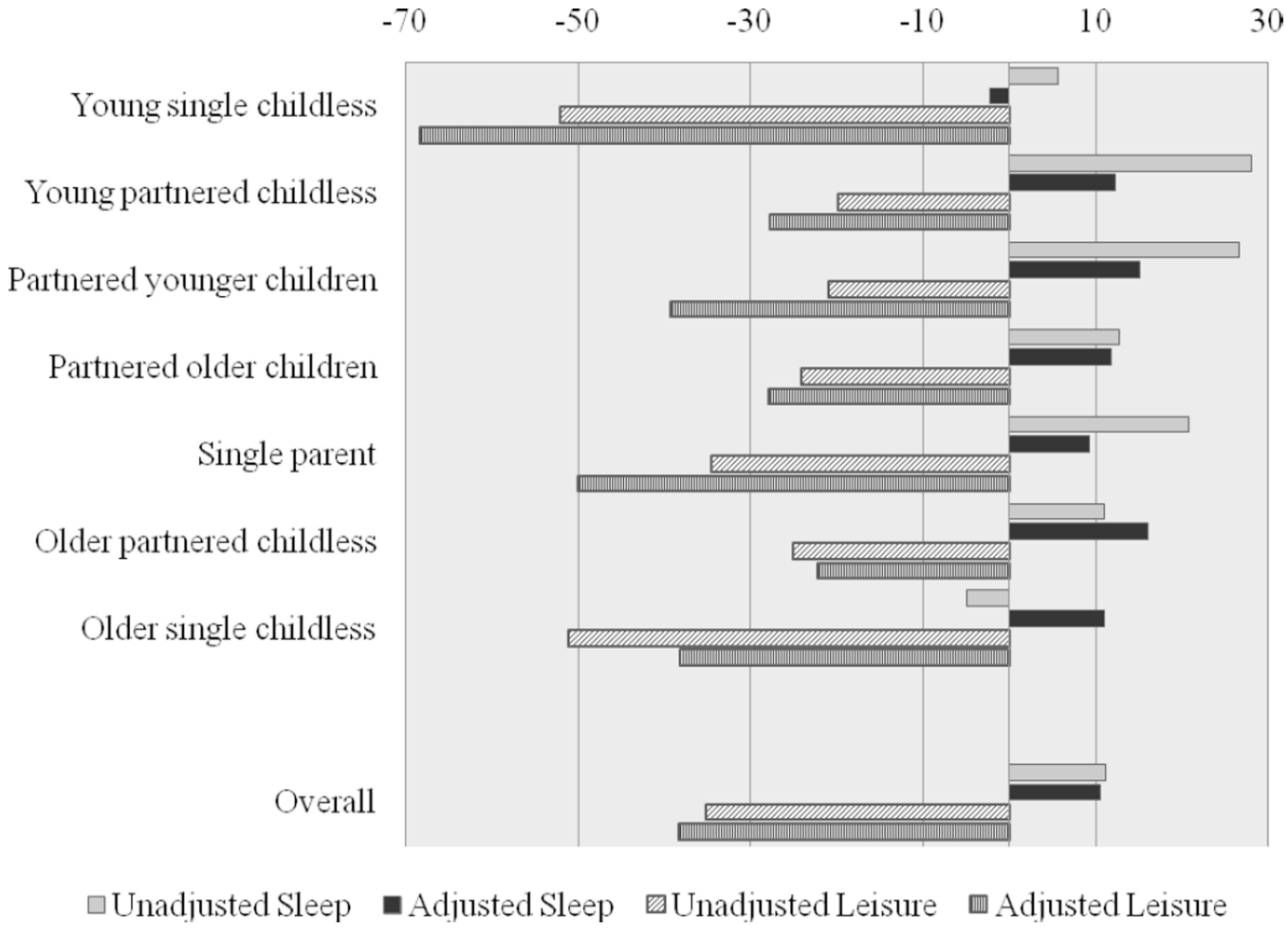

Figure 1.
Predicted Female–Male Differences in Minutes of Sleep (on right) and Leisure (on left) by Life Course Stage, Unadjusted and Predicted (predicted values based on estimates from Model 1, Table 3)

Table 1

Descriptive Statistics for Respondents' Sociodemographic and Diary Day Characteristics, Overall and by Gender; 18- to 64-Year-Old ATUS 2003 to 2007 Respondents

	Overall	Men	Women
Minutes of Sleep	502.1	496.4	507.6
	(119.2)	(122.6)	(115.6)
Minutes of Leisure on Diary Day	264.9	282.8	247.5
	(187.8)	(197.7)	(175.9)
Employment Category (percent)			
Not in Labor Force, No paid work	18.3	11.8	24.6
In Labor Force, No Paid Work	26.5	26.0	27.0
In Labor Force, < 8 Hours Paid Work	20.0	18.6	21.3
In Labor Force, 8+ Hours Paid Work	35.3	43.7	27.2
Unpaid Work on Diary Day (percent)			
Lowest Quartile	27.1	37.6	16.9
Second Quartile	26.8	28.4	25.3
Third Quartile	23.4	20.3	26.5
Highest Quartile	22.7	13.8	31.3
Life Course Stage (percent)			
Young Single Childless	18.7	23.2	14.3
Young Partnered Childless	7.0	7.2	6.9
Partnered Younger Children	15.9	16.1	15.7
Partnered Older Children	16.7	16.6	16.7
Single Parent	5.9	2.2	9.5
Older Partnered Childless	23.9	23.6	24.3
Older Single Childless	11.9	11.1	12.6
Spouse or Cohabiting Partner and Partner's Employment Status (percent)			
No Partner	36.5	36.5	36.5
Partner Is Employed	48.5	43.0	53.8
Partner Is Not Employed	15.0	20.5	9.8
Percent Interrupted Sleep for Caregiving	1.7	0.6	2.8
Percent Napped on Diary Day	10.2	9.4	11.0
Percent Went to Bed Midnight to 4 a.m.	21.0	22.3	19.8
Age in Years	40.2	40.0	40.3
	(12.9)	(12.8)	(12.9)
Race/Ethnicity (percent)			
White	69.4	69.8	69.1
African American	11.3	10.3	12.3
Asian/Pacific Islander/Other[a]	5.2	5.3	5.1
Hispanic (any race)	14.1	14.7	13.5
Educational Attainment (percent)			
< High School	12.7	13.6	11.9

	Overall	Men	Women
High School/GED	31.2	32.0	30.3
Some College	27.9	26.4	29.4
BA+	28.2	28.0	28.4
Percent Has Disability[a]	4.6	4.5	4.7
Minutes of Moderate to Intense Exercise on Diary Day	9.9	11.7	8.0
	(26.8)	(29.8)	(23.4)
Total Number of Activities	20.1	18.1	21.9
	(8.3)	(6.9)	(9.0)
Year (percent)			
2003	19.5	19.5	19.5
2004[a]	19.9	19.8	20.0
2005[a]	20.1	20.0	20.1
2006[a]	20.1	20.1	20.1
2007[a]	20.4	20.5	20.4
Percent Weekend Day[a]	28.6	28.5	28.6
Percent Holiday[a]	1.7	1.8	1.7
N	56,149	24,677	31,472

Note: Figures are weighted means with standard deviations in parentheses or weighted percentages.

[a]Gender difference is not statistically significant, based on weighted linear regression models with the variable in question as the dependent variable and female as the sole independent variable (for continuous variables) or weighted logistic or multinomial logistic regression models with female as the sole predictor (for categorical variables).

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Table 2

Sleep Characteristics by Gender and Employment Category or Life Course Stage; 18- to 64-Year-Old ATUS 2003 to 2007 Respondents

	Sleep Minutes		Percent Interrupted Sleep for Caregiving		Percent Napped		Percent Bedtime past Midnight	
	Men	Women	Men	Women	Men	Women	Men	Women
Employment Category								
Did Not Work, Is Not in Labor Force	548.0	531.2	.4	4.3	17.0	14.2	26.7	20.1
	(128.2)	(119.1)						
Did Not Work, Is Employed	558.6	552.9	.7[b]	3.3	12.7	14.9[b]	24.1[b]	21.5[b]
	(119.0)	(114.1)						
Worked < 8 Hours	502.6	496.0	.8	2.4	11.2	10.5[a]	25.1[b]	19.7[b]
	(117.1)	(105.8)						
Worked 8+ Hours	442.9	450.4	.5[b]	1.2	4.5	4.6[a]	18.8	17.8[a]
	(99.0)	(93.7)						
Life Course Stage								
Young Single Childless	521.3	526.9[a]	.1	.2[a]	10.2	12.2[a]	37.1	34.6[a]
	(136.9)	(125.4)						
Young Partnered Childless	494.2	522.2[b]	.0[b]	.5[b]	6.2	10.3[b]	23.4	20.6[a]
	(119.0)	(113.0)						
Partnered Younger Children	486.8	513.4	2.9	12.2	6.9	10.9[b]	18.2	16.1
	(118.7)	(108.0)						
Partnered Older Children	482.2	495.1	.3[b]	1.4	8.1	8.6[a]	15.7	14.5[a]
	(112.2)	(106.3)						
Single Parent	500.3	521.0	.5	3.7	8.9[b]	14.0[b]	21.7	20.3[a]
	(125.0)	(131.3)						
Older Partnered Childless	484.7	495.7	.2[b]	.8	10.0[b]	10.1[a]	14.7	16.5[a]
	(111.1)	(104.7)						
Older Single Childless	505.0	500.2[a]	.1[b]	.3[b]	13.8	12.6[a,b]	22.4	20.1
	(127.8)	(128.0)						

[a]Gender difference is not statistically significant, based on linear or logistic regression models for each employment or life course stage category with female as sole predictor.

[b] Within-gender difference between omitted employment (did not work, is not in the labor force) or life course stage (young, single, childless) and focal category is not statistically significant, based on linear or logistic regression models with categories of employment or life cycle stage as sole predictors.

Table 3

Selected Coefficients and Standard Errors from OLS Regression Models of Sleep Minutes; 18- to 64-Year-Old ATUS 2003 to 2007 Respondents

	Model 1	Model 2	Model 3	Model 4	Model 5	
	Main Effect	Main Effect	Main Effect	Main Effect	Main Effect	Interaction Term
Female	22.794***	22.373***	12.762***	10.182***	2.430	N/A
	(.967)	(.986)	(.964)	(.888)	(3.430)	
Life Course Stage						
Young Single Childless						
Young Partnered Childless		− 2.364	1.836	−6.524**	−12.066***	14.529***
		(2.160)	(2.309)	(2.125)	(2.833)	(4.347)
Partnered Younger Children		3.653*	6.181**	−5.958**	−12.970***	17.461***
		(1.857)	(2.036)	(1.888)	(2.404)	(3.977)
Partnered Older Children		2.207	4.164	−6.999**	−12.646***	14.145**
		(2.242)	(2.384)	(2.196)	(2.905)	(4.512)
Single Parent		8.201**	14.385***	3.495	−1.740	11.625*
		(2.497)	(2.370)	(2.183)	(4.273)	(5.084)
Older Partnered Childless		−1.920	−1.846	−11.949***	−20.057***	18.367***
		(2.572)	(2.632)	(2.423)	(3.268)	(4.899)
Older Single Childless		1.078	2.566	−4.833*	−10.904***	13.299**
		(2.672)	(2.506)	(2.307)	(3.124)	(4.594)
Partner Employed			2.314	1.792	−.337	2.068
			(1.346)	(1.238)	(1.578)	(2.604)
Unpaid Work on Diary Day						
Lowest Quartile						
Second Quartile			.110	−1.077	−2.411	4.463
			(1.238)	(1.138)	(1.463)	(2.324)
Third Quartile			−5.372***	−6.302***	−10.208***	9.123***
			(1.358)	(1.249)	(1.679)	(2.522)
Highest Quartile			−30.299***	−27.597***	−33.686***	11.922***

	Model 1	Model 2	Model 3	Model 4	Model 5	
	Main Effect	Main Effect	Main Effect	Main Effect	Main Effect	Interaction Term
			(1.531)	(1.411)	(2.005)	(2.850)
Employment Category						
Not in Labor Force						
In Labor Force, No Paid Work			11.481***	9.296***	9.557***	1.075
			(1.510)	(1.388)	(2.254)	(2.672)
In Labor Force, < 8 Hours Paid Work			−32.365***	−31.832***	−30.645***	−.596
			(1.583)	(1.457)	(2.346)	(2.829)
In Labor Force, 8+ Hours Paid Work			−101.961***	−98.024***	−101.635***	10.229***
			(1.578)	(1.456)	(2.227)	(2.719)
Interrupted Sleep for Caregiving				−4.484	−3.431	−3.731
				(3.207)	(7.410)	(8.218)
Napped on Diary Day				76.510***	79.997***	−6.436*
				(1.357)	(2.004)	(2.709)
Went to Bed Midnight to 4 a.m.				−85.961***	−84.005***	−3.957*
				(1.015)	(1.420)	(2.019)
Constant	507.168***	507.372***	553.628***	579.821***	581.122***	N/A
	(1.962)	(2.015)	(2.271)	(2.146)	(2.815)	
R^2	.136	.137	.244	.361	.362	

Note: All models adjust for age and age-squared, race/ethnicity, educational attainment, disability status, study year, weekend day or holiday, total activities, and minutes of exercise.

* $p \leq .05$;

** $p \leq .01$;

*** $p \leq .001$ (two-tailed tests).