



Sleep behavior and unemployment conditions



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ABSTRACT

Recent research has reported that habitually short sleep duration is a risk factor for declining health, including increased risk of obesity, diabetes and coronary heart disease. In this study we investigate whether macroeconomic conditions are associated with variation in mean sleep time in the United States, and if so, whether the effect is procyclical or countercyclical. We merge state unemployment rates from 2003 through 2012 with the American Time Use Survey, a nationally representative sample of adults with 24 h time diaries. We find that higher aggregate unemployment is associated with longer mean sleep duration, with each additional point of state unemployment associated with an additional average 0.83 min of sleep ($p < 0.001$), after adjusting for a secular trend of increasing sleep over the time period. Despite a national poll in 2009 that found one-third of Americans reporting losing sleep over the economy, we do not find that higher state unemployment is associated with more sleeplessness. Instead, we find that higher state unemployment is associated with less frequent time use described as “sleeplessness” (marginal effect = 0.05 at 4% unemployment and 0.034 at 14% unemployment, $p < 0.001$), after controlling for a secular trend.

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1. Introduction

For several decades, the go-to list of behavioral risk factors for chronic disease epidemiology has included smoking, alcohol consumption, physical activity, diet, and body habitus. In recent years, some researchers have added sleep duration to this list (Spiegel and Van Cauter, 1999; Ferrie et al., 2007; Gangwisch et al., 2007; Patel and Hu, 2008; King et al., 2008). A key reason to consider sleep duration as a putative risk factor is evidence of a plausible biological mechanism linking shorter sleep to higher risk of obesity and diabetes (Gangwisch et al., 2007; Cappuccio et al., 2010; Patel and Hu, 2008; Lucassen et al., 2012). An influential sleep lab experiment in 1999 (Van Cauter and Spiegel, 1999) reported that young men were hungrier and had worse glucose metabolism during a week of sleep

restricted to four hours per night, compared to the week before or after the sleep restriction, suggesting that chronic partial sleep deprivation might be biologically causally related to obesity and diabetes. Many epidemiologic studies have subsequently observed associations—most often cross-sectional—between shorter sleep and higher rates of obesity, diabetes, and coronary heart disease (King et al., 2008; Magee and Hale, 2012; Patel and Hu 2008; Van Cauter and Knutson, 2008; Cappuccio et al., 2010). These associations are particularly alarming when coupled with the common assertion that Americans are sleeping less than they used to, suggesting that a long-term societal trend in sleep duration could be a significant contributor to the serious public health problems of increasing obesity and diabetes (Stamatakis et al., 2007; Knutson et al., 2010). Despite a lack of good empirical evidence about trends in sleep hours (cf. Bin et al., 2012, 2013; Matricciani et al., 2011; Aguiar and Hurst, 2007), the idea of declining sleep hours seems to have face validity, as it is often asserted without references.

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Whether or not there is a long-term secular trend in sleep duration, there are reasons to expect that sleep behaviors may track cycles in the broader macroeconomy. Articles in the sleep research literature sometimes cite as evidence of a secular trend a comparison of mean sleep times from surveys in two different years (Aguiar and Hurst, 2007; Magee et al., 2009; Rafalson et al., 2010; Ásgeirsdóttir et al., 2012) but a contrast between two time points is not specific evidence of a secular trend and could also have arisen from variation in macroeconomic conditions. While not always labeled as such, both procyclical and countercyclical effects on sleep duration have been suggested, i.e. that a weak economy leads to worse sleep (procyclical) or better sleep (countercyclical). The main procyclical argument would be that a decline in economic activity may contribute to a higher prevalence of insomnia or sleeplessness because of worry and stress. Mental health problems are often associated with sleep problems (Foster and Wulff, 2005), and, stress has also been found to be associated with insomnia (Morin et al., 2003; LeBlanc et al., 2007). A National Sleep Foundation's annual poll in 2009 found that one-third of Americans reported losing sleep over the economy (National Sleep and Foundation, 2009). A different procyclical argument would be that more individuals take on shift work during a recession, particularly those of lower income and educational attainment (Amuedo-Dorantes and Kimmel, 2009). Shift work is correlated with less sleep time, presumably due to both physiological effects (i.e. circadian rhythms, levels of melatonin during the day) (Foster and Wulff, 2005) as well as social pressures to spend time with family and friends during the day (Hamermesh, 2002).

There are also reasons to expect that sleep might be countercyclical, assuming more sleep is considered to be beneficial. Mortality appears to be countercyclical, and one of the hypothesized explanations is that a worsening economy could be associated with salubrious changes in behaviors, some related to more time available for non-work activities and some related to fewer resources available for harmful expenditures (Gerdtham and Ruhm, 2006). Health behaviors that take time, such as exercise and sleep, might be responsive to differences in opportunity costs associated with alternative uses of time (Becker, 1965; Biddle and Hamermesh, 1990; González, 1997; Virtanen et al., 2008; Ásgeirsdóttir and Zoega, 2011). It has been found that compared to individuals who work 35 h a week or more, lack of a job increases the likelihood of long sleep duration; on the other hand, working 50 h or more a week increases the likelihood of short sleep duration (Hamermesh, 2002; Hale, 2005; Hale and Do, 2007; Bezruchka, 2009). Ásgeirsdóttir et al. (2014) found that more people reported obtaining the recommended hours of sleep in Iceland after the economic crisis compared to before. Predicting how time allocation might respond to changes in macroeconomic conditions requires considerations of both substitution and income effects as well as an understanding of particular features of the changing macroeconomic circumstances (e.g. unemployment rate increases, work hour shifts, wage reductions).

Using data from the American Time Use Survey (ATUS), the present analysis focuses specifically on how changes in state unemployment rates affect sleep time and

sleeplessness over the ten-year period from 2003 through 2012, a period of macroeconomic expansion and decline. To the extent that relative time costs are affected by such macroeconomic circumstances, we would expect individuals to respond by reallocating their time budgets across all the categories of time use, not just between labor and non-labor time. A few prior studies have examined employment on the individual level and sleep time derived from time use studies (Biddle and Hamermesh, 1990; Hamermesh, 2002; Hale, 2005; Basner et al., 2007; Knutson et al., 2010) but they have not examined the contextual effects of unemployment and temporal variation. All have found an inverse association between individual employment time and sleep time. For example, using three years of the ATUS aggregated (2003–2005), Basner and others (2007) found that activities like work time, travel time, and time socializing produce significant pressures on time spent in bed, but work time produced the most pronounced pressure on sleep time, exhibiting an inverse relationship, and increasing income levels were associated with increased work time and decreased sleep time, suggesting that there are substitution and income effects at play.

Even individuals who remain employed during economic downturns may experience reduced or shifted work hours, or may reallocate their monetary budgets in anticipation of fewer work hours, reduced income, or unemployment. But whether this would affect sleep time and whether unemployment also increases sleeplessness while increasing time allocated for sleep are not known. One study examined sleep hours in the context of several health-related behaviors at two time points in Iceland, before and following the economic crisis of 2008 (Ásgeirsdóttir et al., 2014). Some health behaviors were countercyclical and some were procyclical. Sleeping what the authors identified as the “recommended” amount, 7–9 h per night, in response to a single survey question, was higher in 2009, during the economic crisis, compared to 2007. For our study, we have merged the data from the 2003 through 2012 ATUS with state-level unemployment statistics from the Bureau of Labor Statistics. We examine the relationship between state unemployment levels and sleep measures and whether their association persists while controlling for secular trends. We also examine whether general macroeconomic conditions affect behavior for individuals who are not directly affected by unemployment by adding individual employment status and household income to the models.

The economic framework within which we pursue our empirical analysis is suggested by the work of Biddle and Hamermesh (1990) which itself is an extension of Becker's classic (1965) treatment of time allocation and household production. Moreover, while the research program undertaken by Ruhm (most recently Ruhm (2013)) on the business cycle patterns of health and mortality does not primarily focus on time-use patterns, many of the questions explored by Ruhm ultimately have at their core questions of how the allocation of time – work, exercise, motor vehicle use, sleep, etc. – varies in response to business cycle phenomena.

In their analysis, Biddle and Hamermesh (1990) employ a neoclassical time allocation framework to examine the

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