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Unemployment and sleep: evidence from the United States and Europe

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ABSTRACT

Using data for over 2.5 million individuals in the United States over the period 2006–2019 from the Behavioral Risk Factor Surveillance System (BRFSS) survey series we show the unemployed suffer sleep disruption. The unemployed suffer more short and long sleep than the employed and are more likely to suffer from disturbed sleep. These are especially problematic for the long-term unemployed and for the jobless who say they are unable to work. Similar findings on unemployment and poor sleep quality are found in European data. Increases in the unemployment rate raise the incidence of short sleep and lower sleep durations.

1. Introduction

Unemployment hurts. It increases susceptibility to malnutrition, illness, mental stress, and loss of self-esteem, leading to depression (Blanchflower, 2021), and it reduces the life expectancy of workers, often through its impact on poor physical health such as heart attacks later in life, or the adoption of unhealthy habits such as smoking. Increases in the unemployment rate are associated with increases in the suicide rate. How harmful unemployment is depends, in part, on when it strikes and how long it lasts. It is well known that unemployment can have harmful effects if durations are long and especially so if they happen when young (Ellwood, 1984). Young people who are unable to make the transition from school to work find it more difficult to strike out on their own and often end up living with their parents. Morale sinks as the duration of unemployment rises. Long spells of unemployment are especially harmful as the losses from unemployment worsen as the duration of spell lengthens (Machin and Manning, 1999). For instance, the long-term unemployed are at a disadvantage in obtaining jobs and tend to earn less once they find new jobs (Nichols et al., 2013).

Unemployment, particularly long-term unemployment (LTU), continued to have adverse consequences after the Great Recession when it rose sharply (Chart 1). In prior recessions the US did not experience long-term unemployment to the same degree as other OECD countries, such as the UK, France and Germany. The LTU have a 20–40 per cent lower probability of being employed 1–2 years ahead, compared to the short-term unemployed (Krueger et al., 2014). Abraham et al. (2019) confirmed that unemployment duration has a strong negative impact on the likelihood of subsequent employment and of lower subsequent earnings. They rule out the possibility that these LTU individuals are “bad apples” and show they fare worse than the short-term unemployed (STU) more likely due to the state dependence explanation of the negative relationship between unemployment duration and subsequent success in the labor market. And yet, using data from 1987 to 2000 years of the Behavioral Risk Factor Surveillance System (BRFSS), Ruhm (2005) found that health often *improves* during an unemployment spell as unemployed workers get more exercise, smoke and drink less and lose weight.

A major issue in the United States has been the difficulties faced by the ’left-behinds’ who have dropped out of the labor market. Blanchflower (2021) shows the decline in the availability of good jobs for this group who have experienced wage stagnation since the mid-1970s. Case and Deaton (2020) have documented that less educated prime age whites – men and women - have increasingly experienced deaths of despair, by suicide and alcohol and drug poisonings. J.D. Vance (2016) documented what he called a ’crisis of culture’ among whites in Appalachia. Kristof and WuDunn (2020) and Arnade (2020) further documented the decline in hope and dignity while Quinones (2015) says this explains the emergence of the opiate crisis among less educated whites.

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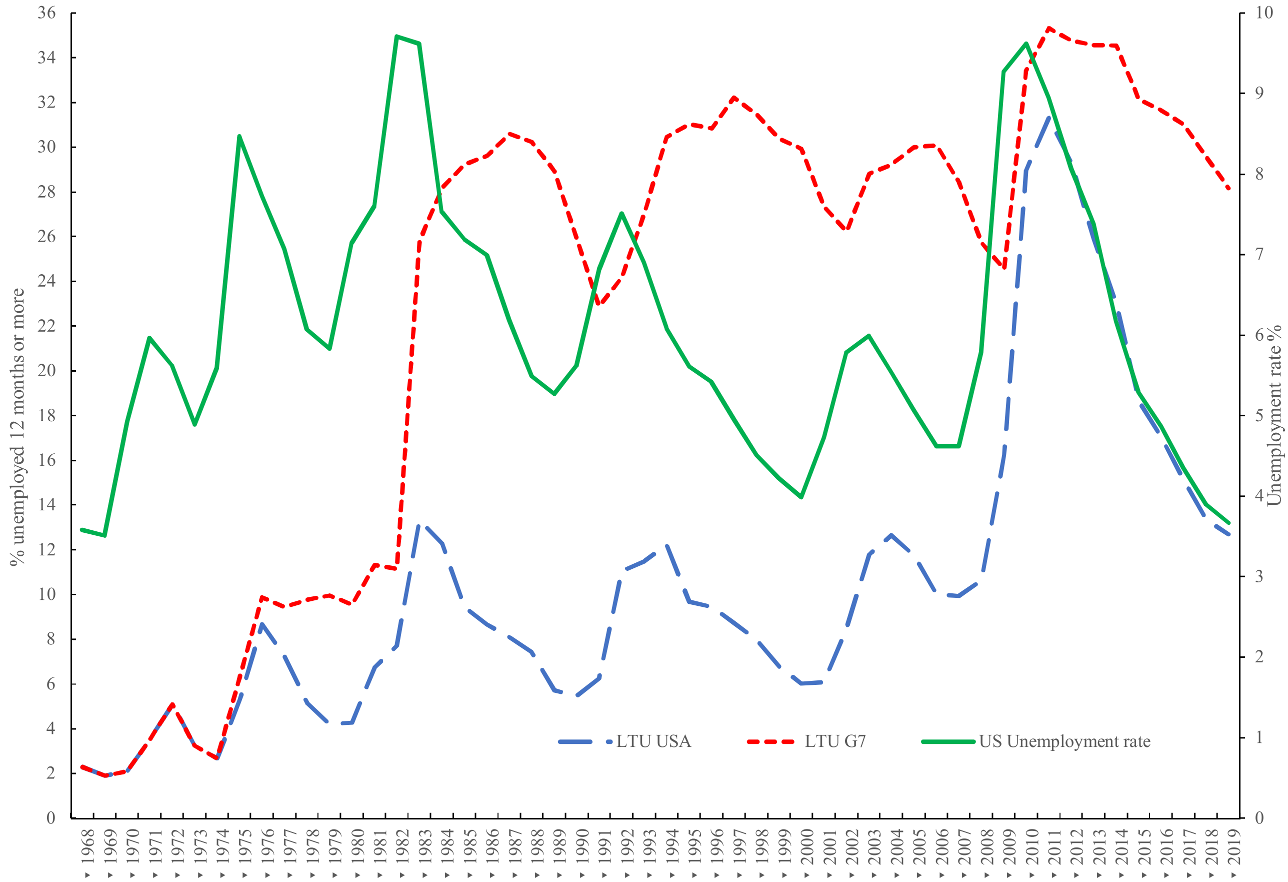


Chart 1. Long-term unemployment rates, US and G7.

There is evidence that rising despair is even higher among Native peoples than Whites and especially so for the less educated (Blanchflower and Feir, 2021). In the data used below we focus not only on the unemployed – who would usually be available for and actively seeking work – but those who classify themselves as 'Unable to Work' (UTW). This group is likely to include the left-behinds but may not be confined to them. As we show below, they tend to suffer from poorer health than other groups, something we return to in the analysis.

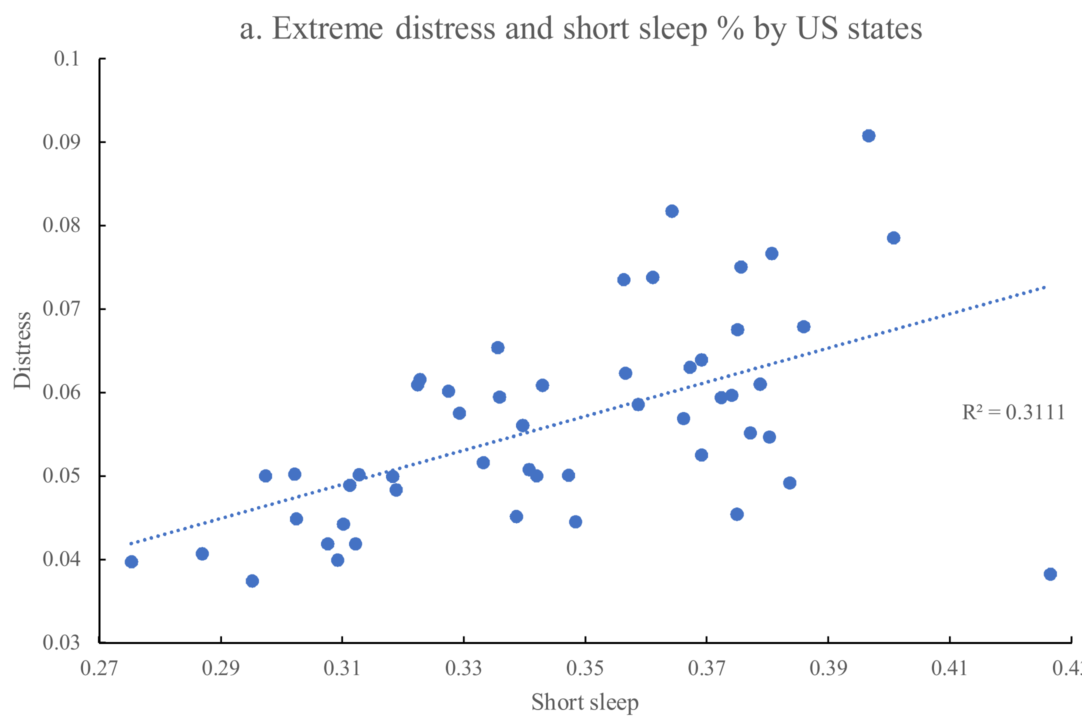
The US President's Council of Economic Advisors (2016) examined the long run decline in the prime age male labor force participation rate and found that the largest difference in how prime age men in and out of the labor force spend their time is on leisure activities—socializing, relaxing and leisure. Nonparticipating men spent almost twice as much time on these activities than prime-age men overall, and more than twice as much time watching television.

The literature on the relationship between sleep and joblessness – including both the unemployed and those unable to work – is small. The evidence that does exist is contradictory and focuses on the impact of macroeconomic labor market conditions on sleep duration. Using the American Time Use Survey (ATUS) data from 2003 to 2012 Antillón et al. (2015) found that increases in the unemployment rate increased sleep duration: a 1 percentage point increase in unemployment is correlated with an extra 0.83 min of sleep. In contrast, Ásgeirsdóttir and Ólafsson (2015), also using ATUS, found no consistent relationship between unemployment and sleep duration but did find an inverse relationship between sleep duration and wages. The two papers used different dependent variables: the latter focuses on the overall amount of rest on the diary day, whereas the former used the length of the longest continuous sleep episode. This might account for differences in the results. Neither explicitly examined the sleep duration of the unemployed themselves. Furthermore, neither account for the geographical location of survey respondents, something which we show below proves to be very important due to the strong correlation between location and local labor market conditions, and location and the quality of sleep. The latter has been identified as important in previous research (Grandner et al., 2015; Perales and Plage, 2017). Moreover Niekamp (2018) and Colman and Dave (2013) (discussed below) incorporate location fixed effects in their estimates.

Three other papers use ATUS to look at sleep and the labor market. Niekamp (2018) finds economic expansions, where the unemployment rate falls, decreased weekday sleep but increased weekend sleep. Gibson and Shrader (2018) focus on earnings: they find increasing short-run weekly average sleep by 1 h increased worker earnings by roughly 1%. In an early paper, Basner et al. (2007) found that increased working time reduced time spent sleeping.

Beyond the United States there are a handful of studies examining unemployment and sleep. Maeda et al. (2019) found that in Japan unemployed men and women both had a higher likelihood of insomnia than the employed. Knabe et al. (2010) using German data find that the unemployed sleep almost one hour longer than the employed. For Sweden, Asplund et al. (2005) found that poor sleep was associated with an increased propensity for sick leave, while unemployment itself was associated with increased occurrence of poor sleep. However, they found that unemployment was *not* independently associated with sleep impairment after adjustment for age, health, marital status and place of residence.

It is unfortunate that there is little research on the relationship between unemployment and sleep because poor sleep may be one of the mechanisms by which unemployment affects health and labor market prospects. However, Virtanen et al. (2013) caution that there is a potential for reverse causality from poor health and poor sleep to unemployment. They show that poor self-rated health and mood were good



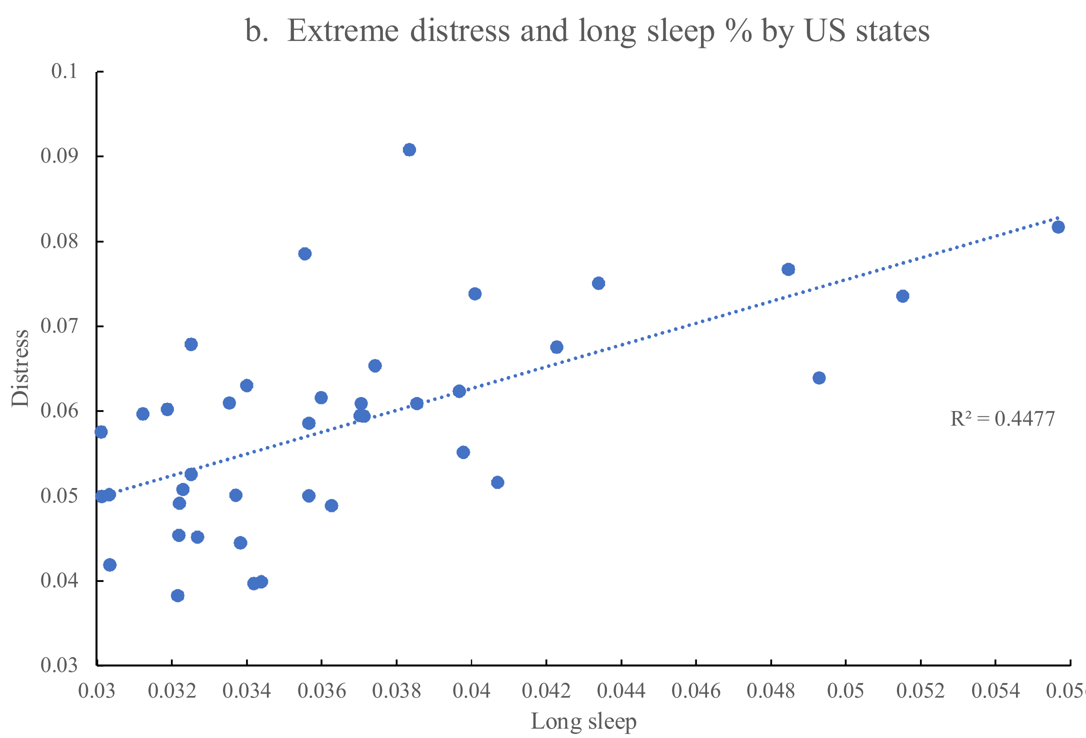


Chart 2. a Extreme distress and short sleep % by US states. b Extreme distress and long sleep % by US states.

predictors of unemployment and prolonged unemployment. But they also found that the LTU were more likely to have musculoskeletal pain and poor sleep quality.

The lockdown in the spring of 2020 has generated a shock to the labor market and unemployment has risen sharply as activity slowed. The US Department of Labor has shown that over 59 million workers filed initial unemployment claims between the week ending March 20th and the week ending 20th August 29th, 2020.[1] The US Census Bureau has been conducting weekly Household Pulse Surveys tracking anxiety post Covid.[2] In the period April 23 to May 5th 36 % of respondents said

[1] https://www.dol.gov/sites/dolgov/files/OPA/newsreleases/ui-claims/20201671.pdf

[2] https://www.census.gov/programs-surveys/household-pulse-survey/data.html

they had had anxiety “not at all” in the last 7 days. By July 6th to July 17th, 2020 that had fallen to 11 %. The dominant relationship in 2020 was thus from unemployment to anxiety rather than the reverse.

We contribute to the literature by examining the association between labor market status and various aspects of sleep duration and quality, distinguishing between overall sleep duration in a 24 -h period, short sleep, long sleep and disturbed sleep as indicated by problems falling or staying asleep or staying asleep too much. We separate out the effects on both the STU and LTU as well of those in an increasingly important group who say they are ‘unable to work’ (UTW) (Blanchflower and Oswald, 2020). We also have data on how many days per month respondents say they have insufficient sleep. In isolating the partial correlation between individuals’ labor market status and their sleep we condition on local unemployment rates and test the sensitivity of results to state fixed effects. We find the STU suffer more short and long sleep than the employed and are more likely to suffer from disturbed sleep. These problems are greater for the LTU and for the jobless who say they are unable to work.

2. Why should labor economists like us care about sleep?

Inadequate sleep is mostly measured within a twenty-four-hour period (Chattu et al. (2018); Altevogt and Colten (2006); Exelmans and Van den Bulck (2016); Lockley et al. (2004); Roehrs et al. (1983)). But as we show below it can also be based on days in a month. Inadequate, or short sleep is associated with multiple poor life outcomes that impact daily functioning. It is known for example, that short sleep duration (<7 h per night) is associated with greater likelihoods of obesity (Wheaton et al., 2011a, 2011b), diabetes (Shan et al., 2015), coronary heart disease (Magee and Hale, 2012; Wang et al., 2016, and Wu et al., 2014), depression, (Zhai et al., 2015), hypertension (Wang et al., 2015), and death (Gallicchio and Kalesan, 2009). Insufficient sleep is also bad for social welfare: it can result in lost GDP and lower productivity (Hafner et al., 2017).

Perhaps less well-known is the evidence linking long sleep to poor health outcomes.[3] The traditional focus on short sleep is unsurprising since many more people suffer short sleep than they do long sleep (Knutson and Turek, 2006). However, a growing body of research establishes the health problems related to long sleep as well as short sleep. Jike et al. (2018) conducted a meta-analysis covering over 5 million respondents and found that long sleep was significantly associated with higher rates of mortality, diabetes, cardiovascular disease, stroke, coronary heart disease and obesity. Long sleep may also mean it is hard for the unemployed to engage in the sort of regular routine required by systematic job search, which is often a requirement of welfare receipt.

Some studies investigate the effects of both short and long sleep. There are higher risks of mortality associated with both long and short sleep (Patel et al., 2004; Yin et al., 2017; Kronholm et al., 2011). In some studies, the association is even stronger in long than short sleep (Tamakoshi and Ohno, 2004; Kwok et al., 2018). Bin et al. (2013) note that short and long sleep are both risk factors for morbidity and mortality. They find that short sleep predicts higher mortality, cardiovascular events, metabolic dysfunction, obesity, and poor mental health, while habitual long sleep predicts premature mortality, cardiovascular disease, and cognitive impairment. Buxton and Marcelli (2010) reported that both short and long sleep are positively associated with obesity, diabetes, hypertension, and cardiovascular disease among adults in the United States. Magee et al. (2009) in a study of Australian adults found that short sleep was associated with long working hours and obesity while long sleep was associated with recent treatment for cancer, heart attack and angina. Short and long sleep are also associated with a higher risk of type-2 diabetes (Ferrie et al., 2015). Recent work suggests short sleep duration in midlife is associated with an increased risk of late-onset dementia (Sabia et al., 2021).

The data used in this paper confirm strong links between short and long sleep and mental health. Chart 2 a and b plot by US state the percent of short (<7 h) and long sleepers (> = 10 h) against the percent reporting extreme distress. The data are the sample averages over the period 2009–2019. Following Blanchflower and Oswald (2020) extreme distress is defined as having bad mental health days in all of the previous 30 days.[4] The charts show a strong positive association across states between the extent of extreme mental distress and both short and long sleep.

Changes in sleep duration are also found to affect health. Sleep deterioration had a negative effect on pain-related health outcomes (Afolalu et al., 2018). An increase in sleep results in better outcomes such as sleep quality and a reduction in sleep medication (Tang et al., 2017). Sleep duration also affects subjective wellbeing: Piper (2016) shows a link between sleep duration and life satisfaction. Using data from the German Socio-Economic panel of 2008−2012 he finds Germans sleep for seven hours a night - one hour less than the level he estimates to be optimal for life satisfaction.

The literature also indicates that economic shocks affect sleep duration. Colman and Dave (2013) and Niekamp (2018) find that sleep duration is counter-cyclical. In contrast we find it is procyclical. Nearly one-third of foregone work hours during the Great Recession were devoted to more sleep and TV watching (Aguiar et al., 2013). An economic shock associated with job loss and subsequent unemployment is liable to impact an individual’s sleep adversely, both indirectly through increased anxiety, depression and other health-related problems attendant on unemployment, but also directly having conditioned on health-related problems if, for example, the experience of unemployment impacts an individual’s motivation and energy levels or reduces the opportunity costs of sleep. We find, though, that an economic shock makes both those in jobs and the jobless sleep less. Short sleep rises in a slump.

In the years before the Great Recession, the US experienced relatively little long-term unemployment – measured as the percentage of the unemployed with a duration of at least 12 moths - compared with other countries. The concern is that long spell so unemployment especially when young have harmful long-run effects (Blanchflower, 2021). This changed in recent years as long-term unemployment (LTU) became much more prevalent and much more similar to that of other G7 countries. Chart 1 illustrates by plotting the LTU rate in the United States and the G7 since 1968 along with the US unemployment rate on the right-hand axis using OECD data. Of note is that in 1982 and 1983 with annual US unemployment rates just under 10 % the LTU rate peaked at 13.3 % in 1983 versus 27 % in the G7. In 2010 with an annual unemployment rate of 9.6 %, LTU in the United States peaked at 31.3 % in 2011 versus 35.3 % that year in the G7.[5]

3. The data from the behavioral risk factor surveillance system (BRFSS) and its previous use in the literature

We analyze data from 2.5 million Americans from the Behavioral Risk Factor Surveillance System (BRFSS) survey series from

[3] Patel et al. (2006) found that multiple sclerosis, anti-depressant use, benzodiapine use and lupus were factors most strongly associated with long sleep.

[4] The exact question used is “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” Sample size is 2,003,664.

[5] LTU rates by country were as follows- Canada 12.0 (13.6); France 39.4 (41.2); Germany 41.6 (47.9); Japan 12.9 (39.4) and UK 45.6 (33.5), where numbers in parentheses are 2011 LTU percentages. Source: OECD.

2006–2019.[6] The BRFSS is a telephone survey conducted by the Center for Disease Control (CDC) regarding health-related risk behaviors, chronic health conditions, and use of preventive services. Established in 1984 with 15 states, BRFSS now collects data in all 50 states as well as the District of Columbia and three territories of the United States. In recent years around 400,000 adult interviews are conducted each year in the BRFSS. Questions vary over time. In some years only subsets of states field the relevant questions.

These data have a number of advantages over other data used in the sleep literature, the chief one being the very large sample sizes which make it easier for the analyst to establish robust relationships between sleep patterns and other factors in people's lives.

A series of studies have studied sleep patterns using BRFSS surveys, with a number focusing on the association with age.[7] Liu et al. (2013b) used the 2010 BRFSS to examine short and long sleep using the following question:

Q1.'*On average how many hours of sleep do you get in a 24 -h period?' (sleeptime)*

They examined data on 54,269 adults ages 45 and above and found that 31 % of respondents age 45 and older reported being short sleepers (≤ 6 h), 65 % were optimal sleepers (7−9 hours), and 4% were long sleepers (≥10 h) in a 24 -h period. In a subsequent study using the 2016 BRFSS Liu et al. (2020) found a significantly higher prevalence of short sleep duration (<7 h per 24 -h period) among caregivers (39.5 %) than among non-caregivers (34.2 %). The propensity for short sleep increased with the hours of care given, and with prolonged caregiving (≥5 years).

Using BRFSS 2014's Q1 question, Liu et al. (2016) found that the percent of adults ages 18–60 with ≥7 h usual sleep followed a U-shape in age, minimizing between age 35 and 44. Analogously, the proportion with short sleep defined as <7 h followed an inverted U-shape with a maximum in the same age group of 35−44. Their results on the proportions with short sleep are reported below.

Ages 18−24	32.2 %
Ages 25−34	37.9%
Ages 35−44	38.3%
Ages 45−64	37.3 %
Ages ≥65	26.3%
All	35.1 %
N	444,346

Grandner et al. (2012) used the 2006 BRFSS survey and examined responses on 155,877 participants on sleep disturbance over a fortnight. They found that sleep disturbances were especially high among the unemployed and those unable to work. The LTU had higher levels of complaints than the STU. We confirm this finding on later sweeps of the BRFSS. Shockey and Wheaton (2017) used the 2013 and 2014 BRFSS data to examine 93 detailed occupation groups in 29 states. They found that the prevalence of short sleep, defined as <7 h of sleep per day, ranged from 21.4 % among air transportation workers to 58.2 % among communications equipment workers.

The literature does suggest a note of caution when examining self-reported sleep duration data as exists in the BRFSS. Self-reported data seems to produce longer durations than do more objective measures. Cespedes et al. (2016), for example, examined sleep duration among 2086 participants in the Hispanic Community Health Study/Study of Latinos who completed more than 5 nights of wrist actigraphy. Mean amount of time spent asleep was 7.85 h by self-report and 6.74 h by actigraphy. Jackson et al. (2018) in a sample of 1910 adults found an upward bias of 66 min of self-reports versus actigraphy. Kurina et al (2013) note that, in addition to actigraphy, some estimate sleep duration based on polysomnography. Polysomnography estimates sleep based on electrical brain activity and is considered by many to be the "gold standard" for defining sleep. However, they note that polysomnography is not well suited to estimating usual sleep duration in a population-based study; the unfamiliarity of the procedure and its invasiveness apparently often alter sleep (p. 362).

Girschik et al. (2012) suggested that sleep questions typically used in epidemiologic studies do not closely correspond with objective measures of sleep as assessed using actigraphy. Lauderdale et al. (2008) took sleep measurements using wrist actigraphy, a sleep log, and questions about usual sleep duration. Average measured sleep they found was 6 h versus 6.8 h from subjective reports. In all of the characteristics they examined actigraphy gave shorter sleep durations and in every case they were less than an hour. Of note is that differences were higher for men versus women (.82 vs .73 h) for Whites vs blacks (.87 vs .65) for those under 43 vs those older (.88 vs .74) the obese vs non-obese (.89 vs .61) and higher for those in good health vs poor health (.79 vs .54) and for those with a college degree versus those without (.81 vs .73).

There could be various reasons for self-reports giving shorter durations than objective measurement. For example, it may be that the days when the subject wore an actigraph were atypical. It is unclear if there is any bias when respondents are asked about days in the month when they have had poor sleep (which is one of the measures we use below). It is unclear whether any difference between objective and subjective measures is constant across the distribution of hours of sleeps. In terms of sleep quality Katarina et al. (2018) found there was a low correlation between actigraphy sleep parameters and subjective sleep quality but conclude "*that the two methods of measurement capture different dimensions of sleep*." Aili et al. (2017) conclude similarly.

The literature on how best to measure sleep durations is still in its infancy. In a recent review of the literature in relation to diary, actigraphy and standard survey metrics Kaplan et al. (2019) observe that sleep durations tend to be longer when estimated using standard survey questions (what they term 'stylized questions') when compared to diary estimates, by anything up to three hours (p. 671). 'Objective' methods for capturing sleep duration such as sensor data produce estimates which "*fall somewhere in between diary and stylized self-reports*" (p. 692). However, even these more objective data are "*not without [their] own set of measurement and user error*" (p. 692). They go on to conclude that one should be cautious when determining sleep duration based on any single method and they call for "*future research [to] explore additional reasons for the gap between diary and stylized measures beyond just the response process*" (op. cit.). They recommend a "*multimethod approach.... as each method can capture unique sources of measurement error and can build off the preceding results and insights*" (op. cit.).

In the current paper we utilize the stylized self-reports which may impart an upward bias to sleep duration estimates. However, our focus is principally on short sleep (under seven hours a night) and long sleep (ten hours or more). To our knowledge, there is no evidence suggesting that misclassifications have a large effect on whether someone is classified as a short sleeper or a long sleeper. That is to say, the recall error would have to move an individual across these thresholds to have an impact on the results presented below. In the presumably relatively rare event of this occurring it is unlikely to have any substantive impact on our results regarding links between labor market status and sleep. If someone actually sleeps for eight and a half hours and actigraphy measured sleep as seven and a half hours that will impact sleep duration measures but will likely have no effect on our estimates of short or long sleep. Actigraph measures suggest that sleep duration on self-reports overstates measured sleep by less than an hour. To tackle any potential issue, we experiment with various cutoffs for both long and short sleep and show our results are insensitive to changes in definition.[8]

Furthermore, we do not simply rely on reported sleep durations to

[6] Excluding 2007. There is an overlap of data across years, so the 2018 file has some data for 2019. The data are downloadable at https://www.cdc.gov/brfss/annual_data/annual_data.htm

[7] https://www.cdc.gov/sleep/publications/publications-by-data-source.html

[8] These robustness tests are available from the authors on request.

Table 1
Hours of sleep in a 24-h period (weighted), 2009-2019. %.

	All	Workers	Unemployed ≥1 year	Unemployed <1 year	Unable to work	N
1	0.1	0.1	0.2	0.2	0.4	2329
2	0.3	0.2	0.6	0.4	1.2	5207
3	0.8	0.5	1.7	1.2	3.5	14,385
4	3.1	2.5	6	4.4	10.2	56,885
5	7.6	7.6	10.1	8.7	13.3	136,747
6	23.3	25.7	23.7	23	22.2	440,612
7	29.3	33.1	19.5	22.9	12.8	608,732
8	27.6	25.2	26.9	28.7	22.8	596,468
9	4.4	3.2	5.1	5.6	4.5	98,693
10	2.3	1.3	3.7	3.1	4.8	49,551
11	0.2	0.1	0.3	0.3	0.4	3339
12	0.7	0.3	1.3	1.1	2.6	14,766
>12	0.4	0.2	0.7	0.6	1.5	7144
Mean	6.98	6.87	6.91	6.99	6.72	
% short sleep	35.2	37.3	42.3	37.8	50.7	
% long sleep	3.5	1.9	6.1	5	9.2	
N	2,034,858	1,014,258	46,912	44,150	145,661	2,034,858

capture poor sleep or sleeping problems. We examine the BRFSS on sleep duration in twenty-four hours and then move on to the other measures of sleep or lack of it by the number of days in a month and a fortnight. It remains unclear if there is a bias in such data. Again, results are consistent with those relating to short and long-sleep: those who are unemployed, particularly the long-term unemployed, and those unable to work, suffer poorer sleep than otherwise equivalent people.

Earlier studies using BRFSS indicate that these additional sleep metrics are important. Liu et al. (2013a) examined self-reported sleep and chronic disease in 375,563 adults from the 2009 BRFSS based on days and focused on the number of days of insufficient sleep. They found a significant association between insufficient sleep, measured as at least half the days in a month with insufficient sleep - and six chronic diseases of diabetes, high blood pressure, coronary heart disease, stroke, asthma and arthritis. Wheaton et al. (2011a, 2011b) examined the 2008 BRFSS on 384,541 adults on sleep days in a month and found that days of insufficient rest or sleep strongly correlated with BMI. Perceived insufficient sleep was assessed by question Q2 in both studies.

Q2. "During the past 30 days, for about how many days have you felt you did not get enough rest or sleep?" ***(qlrest2)***

Defining insufficient sleep as at least 14 days the authors showed that this variable had an *inverted U-shape in age* 18−24 = 29 %; 25−34 = 36.0 %; 35−44 = 33 %; 45−64 = 26 % and 65 and over = 14 %. They demonstrated a highly significant relationship between insufficient sleep and frequent mental distress (not good mental health days ≥14), an indicator of psychological distress. McKnight-Eily et al. (2009) used 2006 data from the BRFSS to examine insufficient sleep and found 11.1 % reported insufficient sleep every day during the preceding thirty. Females (12.4 %) were more likely than males (9.9 %) and non-Hispanic blacks (13.3 %) were more likely than other racial/ethnic groups to report insufficient rest or sleep. Insufficient sleep also varied by state: North Dakota had the lowest rate at 7.4 % and West Virginia the highest at 19.3 %. These differences are large and could only be observed, and their implications considered, in large scale data such as BRFSS. Studies relying on smaller samples, which are common in the literature, tend to omit variables such as those capturing geographical location, from their estimates, leaving them vulnerable to omitted variables biases.

Despite all this work on sleep we know very little about the relationship between unemployment and sleep and especially between long and short sleep and unemployment. It is often assumed that, since the unemployed have more time available to them than the employed, and they are less constrained in how they spend that time – other than with regards to costly leisure pursuits - the opportunity costs of sleeping are lower and they will likely sleep more.

We contribute to this literature using observations on 2.5 million respondents in the 2006–2019 BRFSS to establish associations between labor market status and poor sleep including short sleep, long sleep and disturbed sleep.

4. Results

4.1. Sleep duration in hours in a day, 2009–2019

We begin with nationally representative data for the United States from eight sweeps of the BRFSS survey from 2009 to 2014, 2016, and 2018 using the hours of sleep in a day Q1 question described above. Several of the surveys also have a few observations from the prior year so there are some observations in 2014 from the 2013 survey and in 2015 from the 2014 survey, and so on.

The data for 2019 come from the 2018 survey and the small sample for 2015 of under five thousand comes from the 2014 survey, and so on. The responses in the years prior to 2013 are drawn from the sub-sample of states asked the questions in those years, namely:

2009=Georgia; Hawaii; Illinois; Louisiana; Minnesota and Wyoming

2010= Arkansas; Connecticut; Delaware; DC; Hawaii; Illinois; Louisiana; Minnesota; Missouri; Nevada and Oregon.

2011= Alaska; Hawaii; Minnesota and Tennessee

2012=Alaska; Kansas; Nevada; Oregon; and Puerto Rico

In our BRFSS sample of over two million respondents, as can be seen below, hours of sleep average very close to seven hours per night in every year. The data are essentially flat over time in the years following the Great Recession.[9]

Average hours of sleep		N
2009	7.03 (35.1) [3.7]	36,829
2010	7.04 (33.7) [3.9]	46,244
2011	7.01 (35.0) [3.8]	22,230
2012	7.06 (34.8) [4.6]	24,854
2013	6.98 (35.6) [3.6]	478,898
2014	6.98 (34.8) [3.6]	458,992
2015	6.99 (34.5) [3.3]	4770
2016	6.98 (34.7) [3.4]	466,777
2017	7.00 (34.1) [3.3]	62,529
2018	6.95 (35.7) [3.5]	413,998
2019	6.95 (35.8) [3.1]	18,737
Total	6.98 (35.2) [3.5]	2,034,858

Sample weights are used in calculating these mean estimates (using the variable, *llcpwt*). The numbers in round parentheses are the

[9] Over this period the US annual OECD unemployment rate steadily declined; 2009=9.3%; 2010=9.6%; 2011=9.0%; 2012=8.1%; 2013=7.4%; 2014=6.2%; 2015=5.3%; 2016=4.9%; 2017=4.4%; 2018=3.9%; 2019=3.7%.

Table 2
Hours of self-reported sleep duration in a 24 -h period, 2009-2019.

	1	2 No college	3 College	4 No college	5	6 College
Log unemployment rate	−.1407 (7.06)	−.1756 (6.81)	−.1182 (6.44)	−.0219 (1.48)	−.0517 (2.30)	−.0033 (0.22)
Self-employed	.1406 (36.52)	.1553 (21.37)	.1337 (30.86)	.1353 (34.76)	.1480 (20.20)	.1297 (29.39)
Unemployed ≥1 yr	.0644 (5.74)	.0603 (3.52)	.0633 (5.02)	.0664 (5.92)	.0646 (3.75)	.0647 (5.14)
Unemployed <1 yr	.1231 (12.58)	.1176 (7.89)	.1245 (11.23)	.1232 (12.68)	.1173 (7.90)	.1254 (11.43)
Homemaker	.1857 (28.72)	.1976 (18.90)	.1785 (24.02)	.1823 (28.93)	.1942 (19.24)	.1758 (23.84)
Student	.1549 (20.88)	.2545 (16.07)	.1254 (14.83)	.1550 (20.91)	.2535 (16.06)	.1251 (14.91)
Retired	.2384 (47.02)	.2225 (27.63)	.2486 (46.64)	.2367 (48.72)	.2240 (28.28)	.2462 (48.03)
Unable to work	−.0772 (7.61)	−.0987 (7.78)	−.0523 (4.08)	−.0774 (7.80)	−.0981 (7.80)	−.0533 (4.24)
Refused	.1555 (8.58)	.1746 (6.31)	0.128	.1561 (7.80)	.1779 (6.50)	.1279 (5.72)
State fixed effects	No	No	No	Yes	Yes	Yes
Constant	8.0275	7.9786	7.8674	7.7361	7.6708	7.8674
Adjusted R^2	0.0326	0.0287	0.0403	0.0347	0.0312	0.0538
N	1,862,890	657,183	1,202,307	1,862,890	657,183	1,202,307

All equations include year and month dummies and personal controls which include a cell phone dummy, gender, age and its square, BMI, marital status, race and education. Excluded category employees. Estimated by OLS. Standard errors are clustered at level of state and year. T-statistics in parentheses.

proportion of respondents that report less than seven hours of sleep per day. The proportion with short sleep ranges from 33.7%–35.8%, and averages 35.2 % and has changed little over the decade or so examined. The numbers in square parentheses are the proportion of 'long sleepers' sleeping > = 10 h. There is an average of around 3.5 % long sleepers per annum. Hence the number of short sleepers in the USA is ten times more prevalent than long sleep.[10]

Table 1 shows the overall distribution of (weighted) average hours of sleep by labor market status for the years 2009–2019. 61.3 % of the sample report sleeping between seven and nine hours; 35.2 % are short sleepers defined as six hours or less. On average 3.5 % are long sleepers, defined as 10 h per night or more. In the remaining columns of Table 1 we show sleep duration patterns by labor market status. Definitions of labor market status differ somewhat from those used by the Bureau of Labor Statistics. The BLS define someone as unemployed if they don't have a job, have actively looked for work in the previous four weeks, and are currently available for work. It does not require them to be receiving benefits.

The BRFSS uses a simpler classification. It asks 'Are you currently employed for wages (41.3 %); self-employed (9.0 %); out of work for 1 year or more (1.9 %); unemployed for less than 1 year (2.0 %); a homemaker (4.9 %); a student (2.7 %); retired (30.0 %) or unable to work (7.5 %) and refused (0.9 %)?' The 2018 unweighted proportions are in parentheses.

There is not a lot of difference by labor market status in sleep durations, but there is in the incidence of long and short sleep, which is the main focus of our paper. The unemployed sleep marginally more hours per day than workers do (6.91 h per day for the LTU and 6.99 for the STU versus 6.87 for workers) while those who are unable to work (UTW) sleep a little less (6.72). However, both the STU and LTU are more likely than workers to experience both short sleep and long sleep. Overall, 37.3 % of workers experience short sleep (less than 7 h), compared with 37.8 % of the STU and 42.3 % of the LTU. Only 1.9 % of workers experience long sleep (10+ hours) compared with 5.0 % of the STU and 6.1 % of the LTU. Half of the UTW, which in 2018 and 2019 constituted 7.3 % of the population, said they were short sleepers, while a further 9% were long sleepers. The link to being unable to work is consistent with other studies on the adverse effects of unemployment, such as Blanchflower and Oswald (2020) which showed those who were unable to work were especially likely to report being in despair.

To examine the independent association between labor market status and sleeping patterns further we turn to multivariate analyses. In what follows we examine how these various dimensions of sleep vary with the business cycle by including the annual unemployment rate by state. We examine the sensitivity of results to the inclusion of state fixed effects to examine the sensitivity of the unemployment rate correlations having accounted for permanent but unchanging area effects, something which has not been done in earlier studies.

In what follows we find that the sleep patterns of the UTW are a particular problem. But this result seems to be driven by their poor health. In the 2009–2019 BRFSS respondents were asked to report on a five-point scale – excellent; very good; good; fair and poor – on their general level of health. For those under the age of seventy 1.3 % of workers said they were in 'poor' health versus 3.8 % of homemakers; 0.8 % of students; 5.5 % of the retired, 3.9 % of the STU, 7.5 % of the LTU and 30.1 % of the UTW. Given the difficulties inherent in cross-sectional data in tackling the problem of reverse causality when considering ill-health and lack of sleep we direct our focus on the unemployed.

Table 2 presents OLS estimates of sleep duration in a 24 -h period: all columns include year and month dummies, labor force status, gender, age and its square, race, marital status, BMI and education plus a cell-phone dummy variable.[11] Separate results are presented overall and for those with no college education and then for those with some college. In the first three columns state dummies are excluded and in the last three they are added. In all six columns both unemployment variables are significant and positive. Throughout the STU coefficient is roughly twice that of the LTU coefficient. In the first three columns the log unemployment rate is significant and negative. However, adding state fixed effects substantially reduces the size of the unemployment rate coefficient rendering it statistically non-significant for all (column 4) and for the college educated (column 6). However, it remains statistically significant for the non-college educated (column 5) who tend to be most impacted by changes in the unemployment rate (Blanchflower, 2021).

The finding that sleep duration is negatively correlated with the unemployment rate is somewhat at odds with Niekamp (2018) who found that the *employment rate* entered negatively in a sleep duration equation for those without a bachelor's degree, implying better

[10] Bin, Marshal and Glozier (2012) examine self-reported sleep duration data for adults across fifteen countries from the 1960s to the 2000s. They find sleep duration increased in 7 countries: Bulgaria, Poland, Canada, France, Britain, Korea and the Netherlands and had decreased in 6 countries: Japan, Russia, Finland, Germany, Belgium and Austria with no change for the United States and Sweden.

[11] The BRFSS data files each year from 2011 were constructed by using information on landline and cell phones identified with the variable QSTVER. Values less than 20 indicate that the interview was conducted by landline phone, and 20 and higher indicate a cell phone interview. Most of the sample are cell phone users by 2018, as older persons are adopting cell phones in higher numbers. Cell phone use accounted for 19% of the weighted sample in 2011 compared with 76% in 2018. In the regressions to follow we included a cell phone dummy which is set to zero in 2009 and 2010 and one in later years.

Table 3
OLS estimates of short sleep probabilities (<7 h) vs normal in a 24 -h period, 2009-2019.

	(1)	(2) No college	(3) College	(4) No college	(5)	(6) College
Log unemployment rate	.0531 (7.49)	.1641 (7.39)	.0488 (6.86)	.0072 (1.31)	.0154 (1.98)	.0018 (0.31)
Self-employed	−.0398 (25.65)	−.0483 (18.91)	−.0361 (19.61)	−.0385 (24.80)	−.0464 (18.02)	−.0353 (19.05)
Unemployed ≥1 yr	.0459 (15.15)	.0437 (10.22)	.0479 (11.60)	.0452 (15.01)	.0424 (9.90)	.0474 (11.52)
Unemployed <1 yr	.0024 (0.76)	−.0018 (0.43)	.0053 (1.50)	.0026 (0.84)	−.0014 (0.33)	.0054 (1.52)
Homemaker	−.0308 (13.48)	−.0284 (8.31)	−.0328 (11.98)	−.0304 (13.73)	−.0281 (8.50)	−.0325 (12.04)
Student	−.0594 (23.78)	−.1034 (20.62)	−.0447 (15.46)	−.0591 (23.91)	−.1022 (20.58)	−.0444 (15.50)
Retired	−.0446 (24.65)	−.0357 (13.25)	−.0499 (25.90)	−.0449 (26.04)	−.0367 (13.87)	−.0501 (27.19)
Unable to work	.1451 (57.76)	.1303 (44.41)	.1681 (51.89)	.1437 (60.54)	.1287 (45.06)	.1672 (53.75)
Refused	−.0158 (2.84)	−.0201(2.49)	−.0102 (1.44)	−.0459 (3.02)	−.0214 (2.69)	−.0102 (1.46)
State fixed effects	No	No	No	Yes	Yes	Yes
Constant	0.0461	0.0952	0.0605	0.1589	0.2026	0.178
R^2	0.0501	0.0418	0.0519	0.0524	0.0446	0.054
N	1,795,098	622,019	1,169,848	1,795,098	622,019	1,169,848

All equations include year and month dummies and personal controls which include a cell phone dummy, gender, age and its square, BMI, marital status, race and education. Excluded category employees. Estimated by OLS. Standard errors are clustered at level of state and year. Long sleepers>9 h are excluded in all columns.

Table 4
OLS estimates of long sleep (> = 10 h) probabilities vs normal in a 24 -h period, 2009-2019.

	(1)	(2) No college	(3) College	(4) No college	(5)	(6) College
Log unemployment rate	.0021 (1.79)	.0012 (0.54)	.0029 (2.90)	−.0011 (0.58)	−.0011 (0.27)	−.0010 (0.56)
Self-employed	.0080 (12.89)	.0082 (6.29)	.0077 (12.41)	.0078 (12.69)	.0079 (6.13)	.0076 (12.25)
Unemployed ≥1 yr	.0627 (28.21)	.0690 (19.46)	.0571 (23.02)	.0627 (28.40)	.0690 (19.48)	.0571 (23.21)
Unemployed <1 yr	.0355 (20.98)	.0390 (13.26)	.0326 (16.13)	.0356 (21.11)	.0389 (13.26)	.0328 (16.23)
Homemaker	.0267 (22.90)	.0376 (19.30)	.0209 (18.15)	.0263 (22.84)	.0370 (19.21)	.0210 (18.14)
Student	−.0002 (0.15)	−.0041 (1.26)	.0027 (2.02)	−.0002 (0.12)	−.0038 (1.21)	.0026 (2.02)
Retired	.0307 (41.80)	.0405 (29.51)	.0262 (33.83)	.0303 (42.83)	.0401 (29.73)	.0262 (33.79)
Unable to work	.1451 (73.83)	.1287 (54.89)	.1711 (63.90)	.1443 (73.14)	.1275 (54.02)	.1711 (63.92)
Refused	.0347 (10.45)	.0450 (7.69)	.0269 (7.50)	.0345 (10.33)	.0447 (7.60)	.0269 (7.45)
State fixed effects	No	No	No	Yes	Yes	Yes
Constant	0.0949	0.1022		0.1074	0.1126	0.0709
R^2	0.0445	0.0343	0.0405	0.0448	0.0347	0.0408
N	1,264,768	422,544	839,924	1,264,768	422,544	839,924

Notes: All equations include year and month dummies and personal controls which include a cell phone dummy, gender, age and its square, BMI, marital status, race and education. Excluded category employees. Estimated by OLS. Standard errors are clustered at level of state and year. Short sleepers <7 h are excluded.

economic times reduce sleep duration – overall sleep being countercyclical. Our result shows the opposite: sleep duration is procyclical - as the unemployment rate rises, sleep duration among the less educated falls. This is consistent with the findings of Perales and Plage (2017) for Australia who reported that

> *"individuals who live in areas with high unemployment rates or experience individual-level economic vulnerability sleep less than comparable individuals in areas with low unemployment rates, or who do not experience financial hardships. The negative association between local economic conditions and sleep duration is substantially stronger* among *economically vulnerable individuals."*

(2017, p.189)

Sleep duration does not portray the whole story: we need to separate out normal sleep from disrupted sleep including whether it is long or short, as well as whether people have trouble falling or staying asleep. Table 3 presents OLS estimates of short sleep probabilities in a 24 -h period omitting long sleepers, so short sleep - defined as under seven hours a night - is compared to normal sleep of 7–9 hours.[12] So, in this table long sleepers are dropped. We follow the same format as in Table 2, presenting results for all individuals and then for the non-college and college-educated separately. The first three columns are estimated without state fixed effects, followed by estimates in columns 4–6 where they are included.[13]

In all columns in Table 3 the self-employed, homemakers, students and the retired are all less likely than the employed to experience short sleep. The LTU and the UTW both have significantly more short sleep than employees in all six specifications. In contrast the STU are not significantly different from employees. The log unemployment rate is positively associated with short sleep for both college and non-college educated people but the association is only robust to the inclusion of state fixed effects in the case of the less-educated (column 5).

Table 4 reports similar OLS estimates, but this time for long sleep (10

[12] Estimates were also obtained using probit and they are essentially the same.

[13] A hump shape in age is apparent in all specifications based on the age and age squared variables as found in Blanchflower (2021b). The function maximizes at age 39 in column 2 with controls. Wheaton et al. (2011a) from the CDC found similar evidence using the 2005–2008 National Health and Nutrition Survey (NHANES): in their study 37% of U.S. adults reported regularly sleeping <7 hours per night. Short sleep duration was more common among adults aged 20–39 years (37%) or 40–59 years (40%) than among adults aged ≥60 years (32%).

or more hours) versus normal sleep (7–9 hours), having dropped those with short sleep. We add controls as in Tables 2 and 3.[14] Employees are less likely to be long sleepers than other groups. The LTU and the STU have markedly higher probabilities of being long sleepers, the effect being nearly twice as large for the LTU. For example, in column 1 the LTU coefficient is .0627 versus .0267 for the STU. The unemployment rate is not significantly associated with long sleep in any of the models.

The main finding then is that the LTU are more likely than employees to be both long and short sleepers. The short-term unemployed are more likely to be long sleepers compared with employees. These results remain somewhat hidden if one simply focuses on overall sleep duration, which is standard in the literature, because important correlations between labor market status and poor sleep can be obscured by countervailing effects on short and long sleep which cancel each other out. Our results on the correlation between unemployment rates and sleep challenge the existing literature since they show the unemployment rate lowers durations for the non-college educated and increases their probability of short sleep. Thus, higher unemployment rates appear to reduce sleep among the less educated.

4.2. Insufficient sleep, in days in a month, 2008–2012

We now turn to an alternative measure of poor sleep, namely the perception of having suffered from insufficient sleep. We examine BRFSS data on this variable *qlrest2* defined as Q2 above, using the 2008 file used by Wheaton et al. (2011a); the 2009 file used by Liu et al. (2013a) plus the 2010–2012 files. Unweighted sample sizes are as follows 2008 (n = 405,931); 2009 (n = 425,022); 2010 (n = 435,781), 2011 (n = 25,891) and 2012 (n = 24,880). The data from 2011 and 2012 are taken from a sub-set of states as they are the only ones that fielded the relevant question.[15] The sample size overall for the years 2008–2013 is 1,310,155. The variable is distributed as follows, with weights imposed with a mean of 8.5 days and a median of 4; a quarter reported 14 days or more.

# days	%	#days	%
0	36.6	6–9	4.7
1	2.9	10	6.4
2	7.6	11–19	7.7
3	5.3	20	4.5
4	3.6	21–29	3.1
5	7.2	30	10.4
Mean	8.47	>=14 days	25.0

It remains unclear the extent to which respondents over or underestimate the number of days in a month they had insufficient sleep. Actigraphy has tended to focus on inaccuracies in correctly recalling hours of sleep in a day rather than days in a month. This variable will pick up short sleepers, but long-sleepers may or may not report that they want even more sleep.

Overall, 37 % of the sample said there were zero days in which they felt they did not get enough rest or sleep in the last 30 days, while 10 % say every day.

Part 1) of Table 5 reports mean number of 'insufficient days of sleep' (column 1) and the percent reporting that they experienced that in at least half of the prior month (column 2), by labor market status for the period 2008–2012. The LTU had higher mean days (9.77) compared with employees (8.98) while the STU had fewer days (8.78). Patterns are similar in the right-hand column. Part 2) of the table reports the number of days of *restless sleep* in a fortnight and in the second column the proportion saying every day, using data from the 2006 BRFSS. In both cases the LTU and the STU have higher rates than employees. The UTW have especially high rates of both insufficient and restless sleep.

Table 5
Weighted mean by employment status by three sleep measures.

1) Days of insufficient sleep in a month, 2008–2012 (n = 1,317,505)		
	#days	% ≥14 days
Employee	8.98	29
Self-employed	7.9	24.8
Unemployed ≥1 year	9.77	33.1
Unemployed<1 year	8.78	29.1
Homemaker	8.53	27.7
Student	8.89	28.4
Retired	4.85	14.8
Unable to work	13.9	50
2) Days of restless sleep in a fortnight, 2006, (n = 186,107)		
	#days	% 14/14 days
Employee	2.42	7.6
Self-employed	2.53	8.4
Unemployed ≥1 year	4.9	22.9
Unemployed<1 year	4.69	20.6
Homemaker	2.99	10.9
Student	3.09	9.7
Retired	2.5	9.7
Unable to work	6.81	34.7

Table 6
OLS regression estimates of insufficient sleep days, 2008-2012.

	(1) # days	(2) ≥14 days.
Log unemployment rate	−.2259 (1.21)	−.0033 (0.45)
Self-employed	−.5193 (14.23)	−.0204 (12.53)
Unemployed ≥1 yr	1.2890 (15.80)	.0606 (17.62)
Unemployed <1 yr	−.1684 (2.32)	.0051 (1.65)
Homemaker	−.2635 (5.58)	−.0057 (2.79)
Student	−.7894 (9.22)	−.0257 (6.76)
Retired	−.8888 (24.46)	−.0244 (16.47)
Unable to work	5.5377 (75.07)	.2311 (75.94)
Refused	−.4420 (2.50)	−.0116 (1.66)
Male	−1.1085 (46.17)	−.0406 (40.92)
Cell	−.0416 (0.34)	.0101 (0.51)
Constant	11.998	0.4004
Adjusted R^2	0.0866	0.065
N	1,228,283	1,228,283

Notes: controls in every equation include year, month and state dummies, age and its square, BMI, education, gender, marital status and race.

In Table 6 we turn to insufficient sleep, as reported by respondents. The first column of Table 6 presents OLS regression estimates for the average number of days while the second column estimates the proportion saying they had insufficient sleep in a half or more days in the month. We include the annual state-level unemployment rate but this is never statistically significantly different from zero. The LTU have more days of insufficient sleep when compared to employees (the reference category) (column 1) and they are more likely to report insufficient sleep in at least half the days in the last month (column 2). On the other hand, the STU have fewer days of insufficient sleep and are no different from employees in terms of reporting at least half their days as having insufficient sleep. The UTW face particular problems since they report more insufficient sleep days than anyone else and a greater likelihood of spending most of their time with insufficient sleep.

4.3. Disturbed Sleep: Trouble falling asleep, staying asleep or sleeping too much over a fortnight, 2006

The previous section used a question on insufficient sleep that was unlikely to pick up long sleepers unless they had long sleep and wanted

[14] Long sleep is U-shaped in age in every case, minimizing around the age of 50 years in all six columns.

[15] The 16 states with data on insufficient sleep for 2011 and 2012 were Alaska; California; Colorado; Hawaii; Illinois; Kansas; Louisiana; Minnesota; Nevada; New Mexico; North Carolina; Oklahoma; Oregon; Tennessee; Utah; Wisconsin plus Puerto Rico.

Table 7
OLS regression estimates of disturbed sleep days in the last fortnight, BRFSS 2006.

	(1)	(2)
	# restless days	All restless days
Self-employed	.2056 (5.40)	.0142 (5.47)
Unemployed ≥1 yr	2.1368 (25.75)	.1225 (21.62)
Unemployed <1 yr	1.7257 (23.02)	.0955 (18.65)
Homemaker	.4326 (10.03)	.0289 (9.81)
Student	.3116 (3.90)	.0130 (2.38)
Retired	.5837 (15.71)	.0407 (16.01)
Unable to work	4.0579 (86.32)	.2539 (79.07)
Refused	.3879 (1.57)	.0275 (1.64)
Male	−.7139 (31.28)	−.0257 (16.51)
Constant	1.582	0.0463
Adjusted/Pseudo R^2	0.077	0.0633
N	177,493	177,493

Notes: controls in every equation include month and state, education, age and its square, race, BMI and marital status.

more. It really focused on those who were unable to get enough sleep. However, the BRFSS 2006 contains a question (Q3) relating to disturbed sleep, whether it be because of too little sleep, difficulty falling asleep or too much sleep.

Q3. *"Over the last 2 weeks, how many days have you had trouble falling asleep or staying asleep or sleeping too much?"*

Girschik et al. (2012) used this question and found that 54.3 % say zero days and 10.5 % say all 14 with a mean of 2.87 days. The distribution is as follows, with around a half the distribution reporting zero days, around three quarters saying three days or less and 10.5 % saying every day.

#days	%	#days	%	#days	%	#days	%
0	54.3	4	3.3	8	0.8	12	0.7
1	6.0	5	3.5	9	0.2	13	0.2
2	8.7	6	1.1	10	2.3	14	10.5
3	5.4	7	3.0	11	0.1		

(continued on next column)

Column 1 of Table 7 reports the results of estimating an OLS equation with the dependent variable the number of days in a fortnight (fourteen days) of disturbed sleep. Both unemployed groups and UTW have significant positive coefficients relative to employees. Column 2 repeats the exercise but now the dependent variable is a 1,0 dummy if the respondent says all the last 14 days had disturbed sleep and the results are broadly similar. In column 2, compared to employees the LTU, the STU and the UTW have large and significantly positive coefficients, with the latter having the largest impact.

4.4. *Restless sleep in Europe*

Data is available for 31 European countries on the incidence of restless sleep, in sweeps 3 (2006), 6 (2012) and 7 (2014) from the European Social Survey (Blanchflower, 2020). The question asked was

Q4. *'Sleep was restless, how often the past week - none or almost none of the time* (44 %)*; some of the time* (39 %)*; most of the time* (13 %) *or all or almost all of the time* (5.2 %)*?*

We code this variable from 1−4. The pattern across countries appears to be negatively correlated with happiness data in the ESS as shown in Chart 3 (see Piper, 2016). The happiness data is scored in the range 0–10 and has a mean of 7.18. The countries with the highest score is Albania (2.20), Hungary (2.13), Ukraine (2.05) and Romania (2.04) have the highest scores while Norway (1.61) and Sweden (1.62), that are well known to be among the happiest countries in the world, score the lowest. These patterns are similar to those reported across US states in Chart 2 a and b showing that extreme mental distress is positively

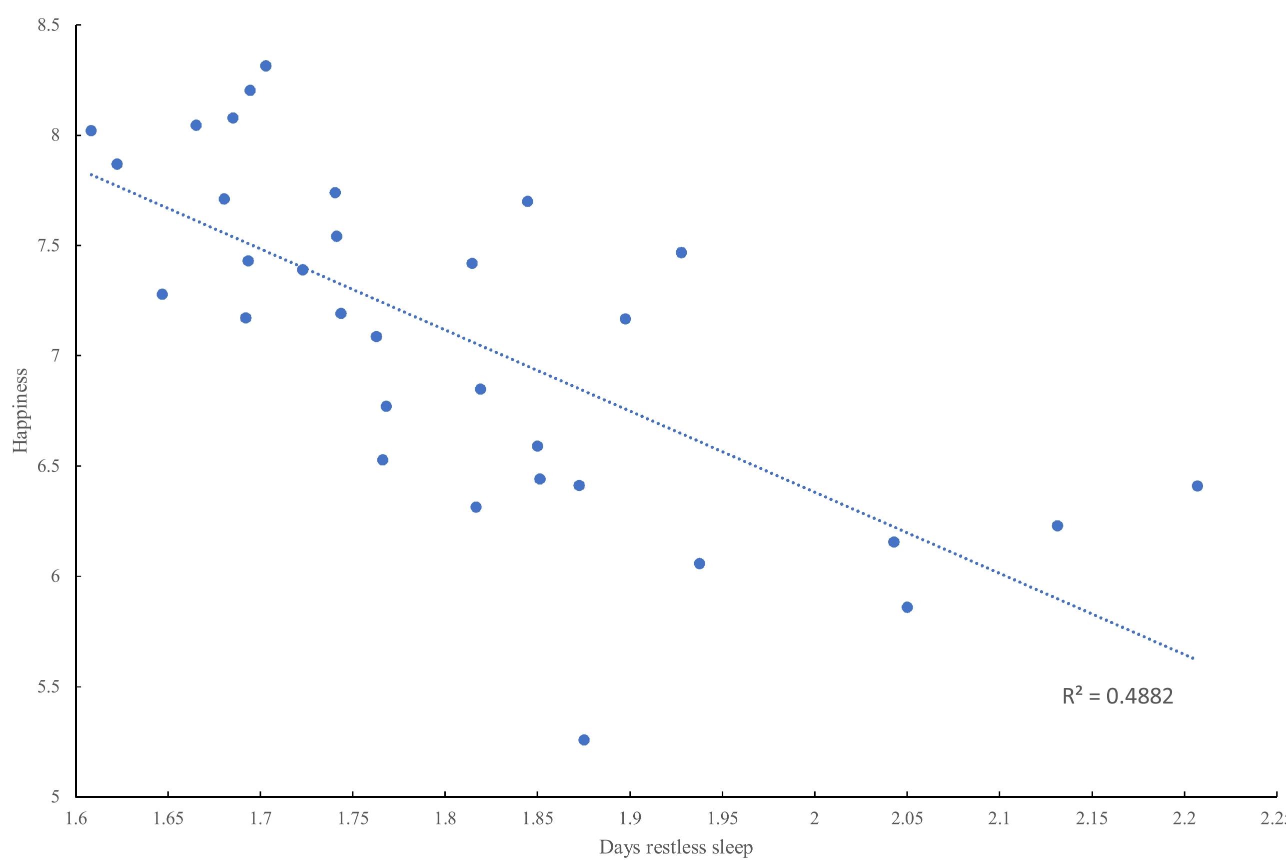


Chart 3. Happiness and days of restless sleep, Europe, 2004-2014.

Table 8
OLS days restless sleep, European Social Surveys, 2004-2014 ordered logits.

		≤12 yrs education	>12 yrs education
Ever LTU	.1094 (15.30)	.1185 (12.21)	.0978 (9.21)
Unemployed looking	.1145 (9.50)	.1246 (7.63)	.0947 (5.29)
Unemployed not looking	.1135 (6.51)	.1200 (5.38)	.0854 (3.00)
Education	−.0103 (0.99)	−.0314 (2.02)	.0300 (2.13)
Sick or disabled	.5869 (39.92)	.5598 (30.34)	.6338 (25.15)
Retired	.1173 (13.77)	.1102 (9.75)	.1084 (8.00)
Military service	.2281 (3.81)	.2107 (2.94)	.2673 (2.32)
Housework	.1151 (13.03)	.0951 (7.85)	.1240 (9.44)
Other	.0946 (4.39)	.0865 (2.96)	.1049 (3.28)
Years education	−.0114 (18.42)	.0222 (15.22)	−.0025 (2.13)
Male	−.1638 (35.45)	−.1852 (28.12)	−.1348 (20.82)
Austria	−.4738 (17.03)	.5174 (15.29)	−.3090 (5.84)
Belgium	−.3526 (13.15)	.4075 (12.30)	−.1944 (3.82)
Bulgaria	−.3886 (13.96)	−.4202 (12.75)	−.2705 (4.93)
Cyprus	−.5052 (16.69)	.5263 (14.34)	−.4141 (7.27)
Czech Republic	−.4055 (14.55)	.4145 (11.95)	−.2699 (5.17)
Denmark	−.4668 (17.01)	.5693 (16.12)	−.2911 (5.70)
Estonia	−.3931 (14.76)	.4100 (12.57)	−.2608 (5.13)
Finland	−.5273 (19.86)	.6358 (19.44)	−.3248 (6.41)
France	−.3230 (12.12)	.3910 (11.97)	−.1526 (3.00)
Germany	−.3675 (14.17)	.4064 (12.57)	−.2147 (4.31)
Great Britain	−.2938 (11.13)	.3213 (9.91)	−.1583 (3.13)
Hungary	−.0963 (3.58)	.1103 (3.41)	.0023 (0.04)
Iceland	−.4413 (11.17)	.5069 (8.26)	−.2990 (4.90)
Ireland	−.5618 (21.26)	.6108 (18.22)	−.4111 (8.19)
Israel	−.4901 (18.12)	.4909 (14.72)	−.3779 (7.37)
Italy	−.4216 (11.27)	.5167 (9.64)	−.2617 (4.34)
Kosovo	−.3782 (11.35)	.4043 (10.40)	−.2963 (4.32)
Latvia	−.3281 (10.38)	.3851 (9.99)	−.1437 (2.44)
Lithuania	−.3979 (14.51)	.4337 (12.73)	−.2435 (4.72)
Netherlands	−.4790 (17.87)	.5389 (16.10)	−.3224 (6.36)
Norway	−.5496 (20.22)	.6410 (18.57)	−.3696 (7.26)
Poland	−.4987 (18.55)	.4858 (14.96)	−.4413 (8.54)
Portugal	−.5169 (19.33)	.6064 (19.28)	−.3541 (6.39)
Romania	−.1940 (6.30)	.2366 (6.49)	−.0693 (1.14)
Russia	−.2648 (9.76)	−.2896 (8.58)	−.1286 (2.51)
Slovakia	−.3508 (12.48)	.3600 (10.25)	−.2245 (4.29)
Slovenia	−.4678 (16.86)	.4610 (13.85)	−.4192 (7.84)
Spain	−.4660 (17.42)	.5606 (17.17)	−.2992 (5.85)
Sweden	−.5618 (20.95)	.6302 (19.08)	−.3787 (7.43)
Switzerland	−.5022 (18.50)	.5541 (16.90)	−.3341 (6.41)
Ukraine	−.1934 (7.01)	.2052 (6.03)	−.0801 (1.54)
Constant	1.989	2.0784	1.8591
Adjusted R^2	0.0725	0.0871	0.0461
N	137,233	73,980	63,253

Notes: equations also include 4 marital status dummies, age and its square and 2 sweep dummies. Excluded employed.

correlated with both short and long sleep rates.

Table 8 estimates a series of OLS equations using this Q4 variable as the dependent variable. It includes country dummies, which are highly significant, showing once again there are area effects in sleep patterns. Controls are also included for gender, years of education and labor force status. Once again, we see that the unemployed (who are looking for work) have high amounts of restless sleep. Of note is that we also have available a variable identifying if the respondent had *ever* been unemployed for more than 12 months. Over and above the current unemployed variable this enters significantly positive in column 1. When the sample is split in column 2 for those with 12 years of education or less and in column 3 with more than 12 years, the coefficient on the LTU variable is greater for the less educated. The coefficient on the unemployed variable is also higher for the unemployed in the less educated equation than for the more educated (.288 and .217 respectively). Sweden has the smallest coefficient in columns 1 and 2 (-1.347 and -1.47) and Albania the biggest (zero in both).

5. Discussion and conclusion

This paper examines the relationship between labor market status and sleep. In contrast to previous studies, we distinguish between five measures of sleep, namely sleep duration in a 24 -h period, short and long sleep in a 24 -h period, insufficient sleep over a one-month, and disturbed sleep over a fortnight, as indicated by problems falling or staying asleep or staying asleep too much. We find the long-term unemployed suffer more short and long sleep than the employed and are more likely to suffer from disturbed sleep. These problems are greater for the long-term unemployed and for the jobless who say they are unable to work.

Sleep disruption seems to be a major factor for the LTU and to a lesser extent for the STU. This is of particular concern given the rising incidence of long-term unemployment in the United States since the onset of the Great Recession; this used to be a problem for the rest of the world and especially Europe but has now come to the United States.

As Blanchflower and Oswald (2020) note the UTW, especially those of prime age with low levels education, are likely to report that all thirty of the past thirty days were bad mental health days. The question is to what extent lack of sleep may have moved these folks from unemployment to UTW? It is unclear what the ‘unable to work’ are actually doing. This is a pressing matter from a policy perspective since the labor force participation rate (LFPR) of prime age, especially men, has not returned to pre-recession levels.[16]

The findings have potentially serious implications for the jobless since both short and long sleep are linked to higher morbidity and mortality. In the 2019 BRFSS released in early September 2020 and covering the period from January 2019 through April 2020 we see the poor health of the unemployed and especially the unable to work on a number of dimensions below (weighted estimates).

	Workers	STU	LTU	Unable to work
#bad mental health days last 30	3.7	7.1	7.8	10.7
#bad physical health days last 30	2.5	4.7	6.7	15.1
Despair (30/30)	4.6	11.1	15.2	21.8
Depressive disorder diagnosed ever	15.4	28.4	31.5	49.1
N (on bad mental health days)	202,639	7600	7983	28,670

Disparities in the mental and physical health of the jobless versus

[16] According to the BLS the seasonally adjusted LFPR for men ages 35−44 was 92.1% in January 2008 at the start of the Great Recession versus 90.9 in February 2020. In contrast the rates for women 35−44 had returned - from 76.1% to 76.5% respectively.

workers are huge. The period of worklessness appears to matter, too, with health problems becoming more pronounced as individuals leave STU for LTU and, in the extreme case, declare themselves "unable to work". Joblessness potentially leads to poor health and poor sleep.

Recent research shows the lockdown response to COVID-19 in Italy increased sleep difficulties, particularly among those reporting higher levels of depression and anxiety (Cellini et al., 2020) and those reporting work-related troubles (Gualano et al., 2020). Similar increases in sleep difficulties linked to increased depression and anxiety have been linked to the COVID outbreak elsewhere too (eg. Falkingham et al., 2020 for the UK and Huang and Zhao, 2020 for China). Blume et al. (2020) conducted a study of sleep after lockdown in March 2020 in Austria, Germany, Switzerland. They found that sleep durations increased but sleep quality decreased, and they suggested that led to a decrease in physical and mental wellbeing as a result.

Prescriptions for sleep medications jumped 15 % between mid-February and mid-March 2020 according to Express Scripts.[17] According to a survey conducted in May 2020, 53 % of Americans said they spent less time asleep and 68 % said they feel stress and find it hard to sleep even after the lockdown.[18]

We suggest that the problem of disturbed sleep is an important issue for the unemployed and especially for the LTU and those unable to work. We conjecture that that this may be causally linked to unemployment and joblessness. It is a problem because long sleep, like short sleep, is highly detrimental to an individuals' health, wellbeing and life prospects. Those who say they are unable to work experience even more sleep disruption than the LTU, which may play a role in their inability to find, or even search, for a job.

Declaration of Competing Interest

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