



# Sleep as a victim of the “time crunch” – A multinational analysis

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## Abstract

As reflected in many popular and academic writings, there is general concern that contemporary life is becoming ruled by a societal “time crunch”, in which work and family pressures make daily life more hectic. One implication of this condition is that sleep time has been reduced in order to accommodate these pressures. While this view seems supported by recent national surveys in which Americans now claim to get less than 7 hours of sleep a night, it is not supported by sleep times reported in 2003-07 ATUS time diaries. If anything, time-diary sleep hours are higher than in previous decades, approaching 60 hours a week in both the US and Canada. Similar levels of sleep hours are found in 18 European countries, with most of those having trend data also showing no decrease in sleep over recent decades, with the exceptions of Germany and Japan. The major predictors of sleep time in US and Canada are work hours and, increasingly, education. The US-Canada finding that women sleep slightly more than men is mainly a reflection of these two predictors. Higher sleep for women is also found in more Northern and Western European countries, but not in more Eastern and Southern Europe; moreover, men in Japan, the country with by far the least sleep report more diary hours of sleep than women.

**JEL-Codes:** Z13, J22

**Keywords:** Sleep time, time-diary sleep hours, men, women

# 1 Introduction

There seems a growing consensus that people in modern societies are “running out of time” because of increasing work and family pressures and demands. This condition of serious “time crunch” is reflected in the titles of several popular books with titles like *Busy Bodies* (Burns, 1993), *Faster* (Gleick, 2003), *In Praise of Slow* (Honore, 2004) and *Take Back Your Time* (de Graff, 2006), as well as academic texts like *Amusing Ourselves to Death* (Postman, 1985), *The Time Bind* (Hochschild, 1998), *Fighting for Time* (Epstein and Kalleberg, 2007) and *Busier than Ever* (Darrah, Freeman and English-Lueck, 2007). It also seems supported by studies of qualitative experience using the “time crunch” scale developed by Robinson and Godbey (1999). Studies of overworked employees (e.g. Schor, 1991) have further resonated with both underpaid workers and those who sympathize with their plight.

In contrast, scholars who rely more heavily on results from time-diary studies have challenged this thesis, citing not only the lack of evidence of significantly higher workloads, but in terms of increased free time in the working-age population (Aguiar and Hurst, 2009; Bittman, 1998; Gershuny, 2000; Robinson and Godbey, 1999), the lack of empirical evidence for a new “24/7” economy (Glorieux and Minnen, 2009; Hamermesh and Lee, 2007) and the lack of recent increases in subjective feelings of stress or being rushed (Robinson and Godbey, 1999), and the lack of direct diary evidence of sleep decline (van Tienoven, Glorieux and Minnen, 2010)

Besides hours of work, housework and free time, another potential diary indicator of a time-crunched life-style is provided by hours of sleep in time use accounts. If today’s workers and parents are more becoming time crunched by paid or unpaid work obligations, a likely trade-off is in decreased time spent sleeping.

Indeed, recently US media have described sleep as “the new sex”, since Americans are so deprived of it. Americans’ sleep problems have prompted a steady stream of media articles and talk show segments about overcoming or treating sleep deprivation in the population. While low sleeping time has received considerable press and medical attention, it is largely based on anecdotal evidence. Main exceptions come from the press releases from the National Sleep Foundation (NSF). In March 2007, for example, NSF headlined how “Stressed-Out American Women Have No Time for Sleep.”, as reflected in the 57% of their surveyed women who said they only got a good night’s sleep at best a few times a week, and the 67% (of both working mothers and stay-at-home mothers) who had experienced symptoms of insomnia at least a few nights each week (with 8% of working women reporting missing work at least once a month because of sleep problems).

Buttressing these conclusions were data from the NSF’s 2002 poll, in which their respondents estimated that they slept just 7.07 hours a night. Their 2009 report showed a further decline, down to 6.79 hours a night.

However, asking survey respondents direct estimate questions (as in the NSF question, “How many hours do you typically sleep per night?”) may mean different things over different time periods to different respondents - and it may be subject to respondent perceptions of what they think is the most “socially desirable” response in a society in which keeping busy may be taken as a badge of honor.

This article thus:

- (1) Contrasts the diary and NSF estimate approaches to measuring time spent sleeping,
- (2) Shows their divergent historical trends in both the US and Canada,
- (3) Shows that the current small gender differences in sleep time in both countries can be seen as essentially a function of employment and education differences by gender,
- (4) Describes parallel sleep figures for men and women in 21 other (mainly European) countries,
- (5) Shows steady or increasing sleep trends in these other countries by gender.

The article concludes by summarizing these trends across decades and by gender, examines some possible quality-of-life implications of these results and notes another example of how diary sleep data differ from media coverage of sleep.

It needs to be noted at the outset that most of these trend and multinational data are on isolated or unavailable raw data files, so that it was not possible to calculate variance estimates to determine tests of statistical significance for these data, with the exception of the most recent American and Canadian data for gender differences. At the same time, the major aim of the present analysis is to show that reports of *decreased* sleep based on estimate data are not supported by findings of *flat* or increased *sleep* time in time diaries, so that significance tests are not required.

## **2 Time diary evidence**

An alternative, more comprehensive, and arguably more accurate, way to measure how much time people spend sleeping is the time diary. It is more direct and straightforward, in that it asks respondents simply to recall what they did “yesterday” – and in chronological order of that day from early morning on one day to early morning 24 hours later on the next day. The most prominent and current US 24-hour daily time diary is the American Time-Use Survey (ATUS) conducted by the US Census Bureau for the Bureau of Labor Statistics (BLS) This open-ended approach means that no single activity or set of activities is highlighted to give respondents any idea about what is expected in their responses.

Social science analysts of the ATUS data can point to the following advantages of its diary approach – and to its predecessor diary studies done at the University of Maryland and the University of Michigan since 1965:

- (1) There is complete coverage of all 24 hours of a specific day, providing a fuller context into which sleep fits with precision.
- (2) There is coverage of all days of the week and all weeks of the year.
- (3) There is coverage of sleep back to 1965 rather than 2002 in NSF.
- (4) The diaries usually take more than 10 minutes to complete rather than direct estimate questions that are usually answered within 10 seconds
- (5) No hint of any particular activity/topic being investigated is mentioned to the respondent.
- (6) There are sample sizes of more than 12,000 per year (rather than 1000 in NSF surveys).

The ATUS has much higher response rates of those selected into the sample (58% in ATUS vs. 28% in NSF), and from a sampling frame that is more comprehensive and inclusive (say in terms of including residents of households without telephones).

More methodological and background and details on the diary method are described in Ger-shuny (2000), Michelson (2005), Robinson and Godbey (1999) and Ziegler and Michelson (1981).

Not that these diaries are themselves free of limitations. Diaries are collected for only one of the seven days of the week per respondent (although diary interviews are spread out over all 7 days in order to generate the weekly averages shown below). It is also the case that when diary respondents say they “went to bed” (in their own words), that is coded as sleep time even if it took some time to actually fall asleep. The ATUS figures reported below also include time on naps during the day.

In its way, then, the time diary capitalizes on the powerful “zero-sum” property of time, in that everybody has exactly 24 hours per day to spend, so that if time on one activity (say TV) increases, it must be offset by time on some other activity (like decreased sleep or house-work). As noted above, time-diary studies across all days of the week have been collected in the United States since 1965 (and across all seasons of the year since 1975), at roughly 10-year intervals (until the now annualized ATUS diary collections).

Canada’s parallel census agency, Statistics Canada, has also collected time-use data on large national samples since 1986, as part of its series of General Social Survey (GSS). Data for its most recent surveys in 1992, 1998, and 2005 were collected throughout the year on increasingly larger samples – 19,597 respondents over age 15 in 2005. (Data in its initial 1986 survey were only collected in the month of November and the first half of December, although these do not seem to be atypical months in terms of sleep).

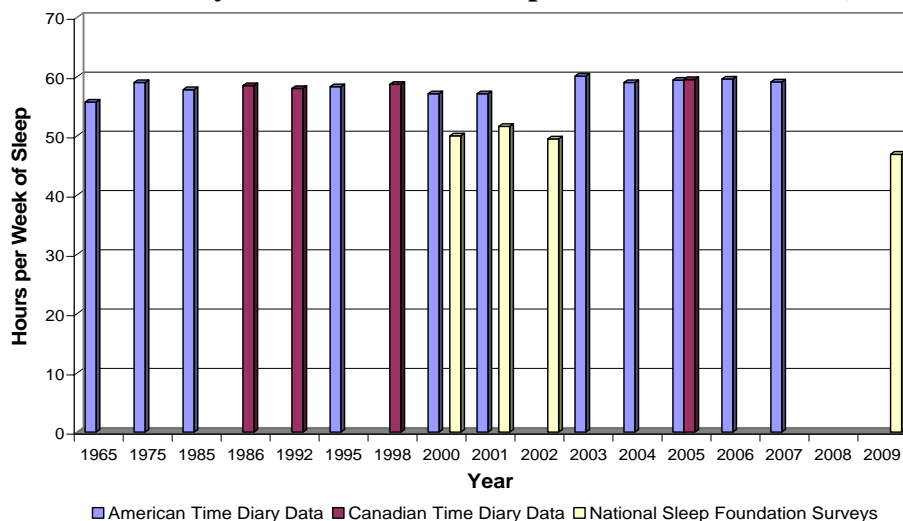
Sleep differences have not attracted much attention from time-diary analysts in either country (nor in the 25+ other countries that have collected time-diary data over the last 40+ years). As will be shown in Table 2 below, the main reason for their inattention has been the lack of evi-

dence of decreased in sleep times (in comparison to far more dramatic changes in housework, childcare and TV since the first 1965 time-diary surveys). Robinson, Converse and Szalai (1972) found that, for an aggregate, sleep is relatively inelastic, though individuals can compress it on working days and extend it on days off (ibid, 128-129). Gershuny (2000) noted almost thirty years later that, “time devoted to sleep, washing, and dressing remains remarkably constant over time...” (ibid, 116).

### 3 US-Canadian trend results

Figure 1 shows the weekly sleep hours from American time diary data (ATUS from 2003 to 2007 and the earlier university-based diary studies dating back to 1965), from Canadian time diary data (Statistics Canada General Social Surveys 2, 7, 12, and 19 from 1986, 1992, 1998, and 2005), respectively, and from the National Sleep Foundation estimate question asked since 2000. It can be seen that the diary numbers have consistently remained close to the proverbial figure of 8 hours per day (or 56 hours per week) since 1965 – with some increase in 2003 and 2005. This is in contrast to the NSF *per day* estimates, which not only translate to 7-12 hours lower per week, but have shown a *decrease* of 3 hours over the last decade.

**Figure 1**  
**Trends in weekly sleep hours – American and Canadian time diary data vs. National Sleep Foundation Survey estimates (in hours per week, ages 18-64 for time diary data and 18+ for Sleep Foundation estimates)**



Source: Own calculations based on data from ATUS, Statistics Canada and NSF.

Moreover, the recent US diary figures are very close (about 60 hours per week) to the Canadian diary data, even though they employ somewhat different diary procedures, data collection agencies and sampling/field procedures. The virtually flat diary columns in Figure 1 attest to this near constancy, with the slightly higher diary figure reported since 2000.

Indeed, the figures from the most recent 2003-2007 ATUS diary studies, with a sample size over 55,000 respondents aged 18-64, show an increase to just over 59 hours per week (8.2 hours on weekdays, 8.9 hours on Saturdays and 9.5 hours on Sundays). The equivalent Statistics Canada study in 2005 with more than 15,000 respondents aged 18-64 also indicated an increase, to 59.5 hours of sleep per week (reflecting 8.3 hours on weekdays, 8.7 on Saturdays and 9.4 on Sundays). Diary weekly sleep hours in both countries, then, average more than 12 weekly hours greater than the *estimated* sleep time (“How many hours do you typically sleep per night?”) in the NSF sleep surveys. That 12-hour a week gap is rather large (close to two hours per day), and it is growing larger. (It would grow even larger, by about another hour a week, if the ATUS columns were to include those aged 65 and above, as in the NSF surveys).

This constancy of sleep is not adjusted for demographic changes in the population over the 40 year period, although sleep figures do not vary widely by demographic factors other than employment or education. The increase in women’s employment and education should work to decrease their sleep, while their decreased likelihood for being married and having children should work increase their sleep. Whatever these overall changes, there is clearly no indication of decreased diary reports of sleep for those aged 18-64 in Figure 1.

We next turn to gender differences in these data in contrast to the two main demographic predictors of diary sleep in the two countries, which also show remarkably similar results.

## **4 Gender and other demographic predictors of sleep**

One also finds a gender constancy in diary sleep hours, with women consistently sleeping more than men – by about an hour a week in both the US and Canada.. However, there are two simple demographic factors that seem to explain even these small gender differences. One is that men have slightly higher years of education. However, the more important factor is that men, particularly those aged 18-64, are more likely to be employed and to work longer hours on their job. There is the need, then, to examine these gender differences in the context of these other demographic predictors.

(Economists might explain the education-sleep correlation with the fact that higher education increases the expected wage and thus increase the “opportunity cost” of sleep (as in Biddle and Hamermesh 1990. Those with higher incomes do spent less time sleeping in the ATUS data, but these differences are only half as large as those by education).

A statistical program that can adjust for these differences by background factors is the multiple regression program called Multiple Classification Analysis (MCA), originally developed by Andrews et al. (1973). MCA adjusts survey percentages and averages so that “other factors are equal” in calculating the effects of these other factors. In the present analysis, once work hours and education differences are taken into account, the original 1.9-hour gender differ-

ence is reduced to less than half an hour (58.4 hours men and 58.7 hours women) in the US, which is statistically significant ( $t=15.1$ ,  $p<.0001$ ) given the large sample size ( $n> 65,000$ ), but with a correlation coefficient of only .007; for Canada and its smaller sample size, their MCA-adjusted 0.2 hour difference is also significant ( $t= 5.5$ ,  $p<.01$ ), but with a correlation coefficient of only .005. Thus, it still seems best to consider to these as demographic differences than as gender differences; moreover, much the same results obtain if working men and women are analyzed separately.

## **5 Multinational differences**

Table 1 shows that the sleep hour results in the US and Canada are generally consistent with totals and differences in sleep in 21 other (mainly European) countries. It can be seen first that weekly sleep hours in these countries also tend to cluster just under the 60-hour a week level as in the Figure 1 American data. There are exceptions, like the Bulgarian and French being 1-2 hours higher than the 60-hour level, and with Japan and Korea being 6-7 hours lower than that level. Except for the latter two Asian countries, therefore, sleep hours are in excess of the “8 hours of sleep” standard.

In the middle two columns of Table 1, it can be seen that these nearly 60-hour levels are found for women as well as men in their peak working years of 18-64 in most of these other countries. The last column in Table 1 calculates the extent of these gender differences, with the slightly (1-2 hour) higher sleep levels for women in the Americas also in evidence -- but mainly in more Western and Northern Europe than in more Southern and Eastern countries (like Estonia and Slovenia), where there are generally no significant gender differences; and it is reversed slightly in Bulgaria. In Japan, moreover, it is men who gain 1½ more hours of sleep than women. Thus, the American finding of slightly more sleep for women tends to be confined to more Northern and Western Europe, and here possibly explained again by education and employment as in the US and Canada.

## **6 Multinational trends across decades**

The next question, then, is whether sleep times in these other countries in Table 1 have decreased over the years, as for the US and Canada. Unfortunately, trend diary data from earlier decades are not readily available for most of the countries in Table 1. However, they are available for the five of them (Belgium, Bulgaria, France, Germany and Poland) that were part of Szalai's (1972) initial multinational diary study in 1965, and these comparative 1965 sleep figures are shown in Table 2, alongside the most recent data from Table 1.

**Table 1**  
**Recent (1998-2005) multinational sleep time (in hours per week)**

	<b>Total</b>	<b>Men</b>	<b>Women</b>	<b>Women-Men</b>
US	58.5	57.6	59.5	+1.9 Hrs.
Canada	58.4	57.7	59.0	+1.3
Australia	58.9	58.7	59.2	+0.5
UK	58.8	58.1	59.5	+1.4
Netherlands	59.3	57.9	60.7	+2.9
Germany	57.3	56.8	57.7	+0.9
Belgium	58.6	57.4	59.6	+2.2
France	61.1	60.6	62.0	+1.4
Spain	59.0	59.3	58.9	-0.2
Italy	57.3	57.2	57.4	-0.2
Norway	56.2	55.6	57.0	+1.4
Sweden	56.5	55.8	57.2	+1.4
Finland	59.0	58.5	59.5	+1.0
Estonia	58.5	58.5	58.4	-0.1
Latvia	59.9	59.5	60.1	+0.6
Lithuania	58.9	58.7	59.0	+0.3
Poland	58.7	58.0	59.4	+1.4
Bulgaria	62.4	62.8	62.2	-0.6
Slovenia	58.1	58.0	58.5	+0.5
Korea	54.4	54.6	54.3	-0.3
Japan	53.7	54.5	53.0	-1.5
Brazil	56.4	54.8	57.6	+2.8

Source: Fisher and Robinson (2010).

It needs to be noted in advance that these Szalai data are not exactly comparable with the current Table 1 data for several reasons. Perhaps the most important is that the 1965 Bulgarian and Polish data were only collected in single cities, and the Belgian, French and German data in selected cities, rather than being fully national. Second is that the 1965 data in all 1965 countries excluded rural residents and households in which no one was employed. The third is that different field and field procedures were employed in the initial and latest diary surveys, along with possible differences in diary reporting and activity coding. Moreover, 1965 data were not collected in either Canada or Japan, nor in the other countries, so that the diary studies in these countries began in later decades – 1986 in Canada and 1975 in Japan.

At the same time, there are plausible methodological bases for this comparison. First, there have been multiple efforts to ensure equivalence in basic sample selection, diary procedures and coding and interpretation across countries. Second, the empirical results from single cities were found to match with national diary data results in countries in which both national and single-city data were collected (as in the 7.8 hours of sleep in the US national sample vs. the 7.9 hours in the single city of Jackson (MI), and the 8.4 hours in the West German national sample with the 8.5 hours in the single city of Osnabruck). Thirdly, in the US at least, explicit attempts have been made to ensure that exactly the same Szalai diary and coding procedures were in place; it is also the case that there is evidence from several separate US methods stud-



ies that the diary figures are extremely robust using different procedures and conditions (Robinson and Godbey, 1999). Similarly, the data from Canada and the UK have been monitored closely to ensure cross-time equivalence.

**Table 2**  
**Sleep time trends (1965-2000s) across countries (in hours per week for those aged 18-64)**

	Total		Men		Women	
	2000s	1960s	2000s	1960s	2000s	1960s
US	58.5+	54.8	57.6+	56.5	59.2+	56.9
Canada	58.4+	57.2*	57.7+	56.5*	59.0+	58.0*
Australia	58.9	NA	58.7	NA	59.2	NA
UK	58.8	NA	58.1	NA	59.5	NA
Netherlands	59.3	NA	57.9	NA	60.7	NA
Germany	57.3-	59.5	56.8-	57.9	57.7-	59.6
Belgium	58.6-	59.1	57.4	57.6	59.6+	58.4
France	61.1+	58.1	60.6+	57.2	62.0+	59.2
Spain	59.0	NA	59.3	NA	58.9	NA
Italy	57.3	NA	57.2	NA	57.4	NA
Norway	56.2	NA	55.6	NA	57.0	NA
Sweden	56.5	NA	55.8	NA	57.2	NA
Finland	59.0	NA	58.5	NA	59.5	NA
Estonia	58.5	NA	58.5	NA	58.4	NA
Latvia	59.9	NA	59.5	NA	60.1	NA
Lithuania	58.9	NA	58.7	NA	59.0	NA
Poland	58.7+	54.5	58.0+	53.7	59.4+	54.3
Bulgaria	62.4+	54.6	62.8+	55.3	62.2+	57.4
Slovenia	58.1	NA	58.0	NA	58.5	NA
Korea	54.4	NA	54.6	NA	54.3	NA
Japan	53.7-	56.5**	54.5-	57.8**	53.0-	55.5**

Notes: \* 1986 GSS data (+ = increased sleep), \*\* 1975 NHK data (- = decreased sleep), NA = no data available.

Source: Fisher and Robinson (2010) for latest data and Szalai (1972) Appendix for 1965 data.

However, it again needs to be emphasized at the outset that conclusions from Table 2 are subject to the several important caveats noted above. All this understood, the pattern in Table 2 is somewhat mixed, as noted by the + and – signs in Table 2. In addition to the constancy in the US and Canadian data near constancy across time, it seems also the case in Belgium (with a – minus sign in Table 2 but for less than an hour per week), as further verified by Van Tienoven et al. (2010). Increased sleep times are found for France, and more notably in the Eastern nations of Poland and Bulgaria.

At the same time, Table 2 shows there are two country trends that *do* show less sleep time, and these are for Germany and for Japan, both of which show 2-3 weekly hours of sleep decline. This provides some offset to the lack of sleep decline in the other five countries for which trend data are available. Perhaps, these are forerunner countries for a future time crunch.

## **7 Summary and conclusions**

In contrast to mass media coverage of sleep surveys and related stories about sleep deprivation and insomnia, data from American time-diary studies - in which respondents keep detailed track of all their daily activities for a single day - show no decrease in how many hours of sleep they average per day over the last 40+ years. Indeed, data from the very large ATUS diary study conducted by the US Census Bureau indicate that Americans in 2003 to 2007 were actually averaging more weekly hours of sleep than they did 10-40 years previously. Diaries from the GSS of Statistics Canada similarly show Canadians have also recently increased their weekly hours of sleep. Thus, there is no hint from either country of any decline in sleep - consistent with earlier studies showing no long-term decrease in free time or effects of a 24/7 economy as a reflection of a societal time crunch from work, family or other demands.

Table 1 show that these current US and Canadian sleep times for both men and women are at about the same levels as in most other European counties, which are slightly higher than the proverbial 8 hours of sleep. As in the Americas, women in Western and Northern (but not in other) European countries report 1-2 more weekly hours of sleep than men, although in the Americas these gender differences are mainly due to employment, education and other demographic predictors of sleep. Moreover, in some Eastern countries, and particularly in Japan, it is men who average slightly more sleep time.

While cross-time trend data on sleep are only available for 8 of the 23 countries in Table 1, data from France, Poland and Bulgaria show increases of 2-4 hours a week, and Belgium no significant decline, which are consistent with the US-Canadian findings in Figure 1. Long-term declines in sleep hours were found in Germany and Japan, perhaps indicating these to be forerunner countries in experiencing time crunch. However, the latest free-time figures for Germany show an increase since 1965, casting doubt on that dynamic.

In the US, the discrepancy between survey time estimates and time-diary data documented in Figure 1 is not unique to sleep. Survey respondents also seriously underestimate the amount of free time they have each week, and also over-report their hours of housework, paid work and volunteering (Robinson and Godbey, 1999). Indeed, it seems part of a larger picture of Americans giving time estimates that are in a “socially desirable” direction, in terms of portraying their daily lives as busier, more productive or less sedentary.

Nonetheless, the importance of sleep should not be taken lightly. When US diary respondents in earlier university diary studies were asked to rate all their daily activities on a 0-10 enjoyment scale, sleep emerged as one of life’s most enjoyable activities, higher than TV and most other free-time activities (Robinson and Godbey, 1999). For Americans who are getting less sleep than they want or need, that could signal a significant decrease in the quality of their lives.

Nor should these sleep results be used to minimize the severe problems many people face from insomnia, truncated sleep or insufficient “down time”. It simply means that survey respondents mis-estimate how much time they spend sleeping, giving estimates that are at odds with what they report when asked to provide much more detailed accounts of where their daily time goes. At the same time, the NSF figures are based on respondents’ single-question *perceptions* of what their sleeping lives *feel* like; and if that is how people perceive their sleep lives, these probably reflect real felt time pressures. As noted above, the latest NSF surveys show a decline, possibly reflecting people’s *perceptions* that they are sleeping less). (Of course, sleeping more might also be a sign that increasingly hectic waking hours are tiring people out, or looking for some escape from their daily routine).

Finally, declining sleep is not the only media “story” about time that is at odds with sleep time in the ATUS diaries. Michelson (2010) has used ATUS data to show that, despite the reported physical dysfunctions accompanying the annual transitions to daylight saving time (DST) and back, time changes have minimal lingering effects on the sleep Americans get - especially because the time changes occur on the night between Saturday and Sunday, when people typically have fewer binding obligations bearing on how much sleep they are able to get, which, even when an hour in the night is lost, is much more than typical weeknight sleep durations.

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