



U.S. Department  
Of Transportation

Federal Railroad  
Administration

# Research Results

RR07-09  
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## WORK SCHEDULES AND SLEEP PATTERNS OF RAILROAD DISPATCHERS

### SUMMARY

The Federal Railroad Administration (FRA) Office of Research and Development sponsored a project to study the work schedules and sleep patterns of U.S. railroad dispatchers and to examine the relationship between these schedules and level of alertness of the individuals working the schedules. The methodology for this study was a survey of a random sample of currently working U.S. dispatchers who completed a background survey and kept a daily log for 2 weeks. Railroad dispatchers are a predominantly healthy middle-aged male population, but 14 percent are women. Dispatchers work as either a trick dispatcher, subject to the limitations of the Hours of Service Law, or an assistant chief dispatcher who oversees the trick dispatchers. All dispatching jobs have a 40-hour nominal workweek, but assistant chief dispatchers average nearly 45 hours per week. Dispatchers are a shiftwork population. Many are subject to working nights and a variable work schedule, making it difficult to get adequate quality sleep. Overall, 39 percent of dispatchers average 6 or fewer hours of sleep in 24 hours while 29 percent of U.S. adults get this amount of sleep. Across all three shifts, dispatcher alertness on workdays peaked after arrival at work and then declined through the workday. The decline was greatest for those working third shift.

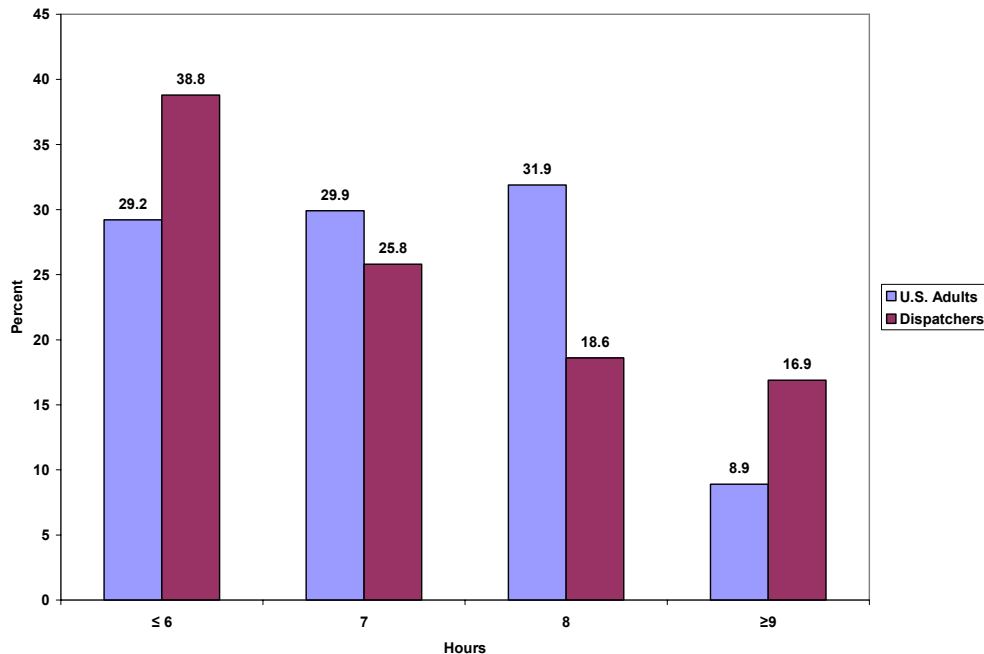


Figure 1. Sleep in 24 hours for railroad dispatchers versus U.S. adults



## BACKGROUND

In 2001, FRA suggested, and the North American Rail Alertness Partnership agreed, on the need to study fatigue issues of the non-operating crafts. An initial study focused on signalmen (see Research Results RR05-04), and a subsequent study focused on maintenance of way workers (see Research Results RR06-05). The study described here focused on railroad dispatchers.

Dispatcher jobs fall into two categories, trick dispatcher and assistant chief dispatcher. Trick dispatchers manage and control access to a specific territory or track. The assistant chief dispatcher oversees several trick dispatchers and assists them as necessary. Because an assistant chief dispatcher does not directly control train movements, this position is not subject to the daily work hour limitations of the Hours of Service Law.

The work schedules for both dispatcher job types are similar, with shifts that cover 24 hours of each day, 7 days a week. Three types of work schedules exist for dispatchers: regular daily shift, relief, and extra board. Regular jobs work 5 consecutive days on the same shift followed by 2 consecutive days off. Relief jobs work 5 consecutive days by rotating through the shifts. While the regular and relief dispatchers work the same days each week, the extra board jobs do not have a fixed schedule because these dispatchers fill in for regular and relief dispatchers who cannot work their assigned shift.

## OBJECTIVES

The objectives of the research were to:

- Document and characterize the work/rest schedules and sleep patterns of U.S. railroad dispatchers
- Examine the relationship between these schedules and level of alertness/fatigue for the dispatchers who work the schedules

## METHODS

This research involved a survey of actively working U.S. railroad dispatchers. The study used two survey instruments, a background survey and a daily log. Survey participants used the background survey to provide demographic

information, descriptive data for their job type and work schedule, and a self-assessment of overall health. The daily log provided a place for recording sleep and work periods on both workdays and non-workdays for a 2-week period.

Mailing of the survey materials to a random sample of 963 U.S. dispatchers occurred in April 2006. The overall response rate was 46 percent.

## RESULTS

### *Dispatcher Demographics*

The majority of survey respondents (87 percent) held trick dispatcher jobs. Ten percent held an assistant chief position, and the remaining 3 percent reported their job type as other. Fourteen percent of the survey respondents were female.

Average dispatcher experience was 14 years, but the average for women was 11 years while that of their male counterparts was 15 years. Nearly half were 50 years or older, with male dispatchers being, on average, 3 years older than the female dispatchers. At the time of the study, 76 percent were married.

Nearly 85 percent of dispatchers rated their health as good or excellent. While the majority of dispatchers rated their health as good or excellent, this group averaged 5.6 workdays lost due to illness annually. In comparison, U.S. employed adults with paid sick time averaged 3.6 days. The higher rate of use of sick time may be due to the stressful nature of the job or, for those working an irregular schedule, the need to catch up on sleep.

Approximately 9 percent of this population of railroad workers reported having a diagnosed sleep disorder, and 7 percent reported having sleep apnea. A third has gone without treatment. The norm for the prevalence of sleep apnea among U.S. working adults is 4 percent.

### *Job Characteristics*

The around-the-clock nature of railroading requires railroads to staff a dispatching center with three 8-hour shifts. Dispatchers working permanent first, second, or third shifts rarely work outside their typical schedules. Table 1 contains the distribution of dispatchers across the five work schedules. Chief dispatchers do



not have extra board schedules because dispatching centers use trick dispatchers who are qualified to work an assistant chief position when a vacancy exists.

**Table 1. Work schedule by type of job (percent)**

| Work Schedule* | Job Type         |                            |
|----------------|------------------|----------------------------|
|                | Trick Dispatcher | Assistant Chief Dispatcher |
| 1              | 26.2             | 19.0                       |
| 2              | 19.5             | 31.0                       |
| 3              | 22.3             | 25.9                       |
| Relief         | 18.2             | 22.4                       |
| Extra Board    | 13.8             | 1.7                        |

\*1 = first or day shift, 2 = second or evening shift, 3 = third or night shift

Both trick dispatchers and assistant chiefs have a nominal 40-hour workweek. While trick dispatchers averaged close to 40 hours of work during the study, assistant chiefs averaged approximately 45 hours of work per week.

Railroad dispatchers have no contractual provisions for breaks. Nearly a third of the time, both groups of dispatchers took no breaks during their shift. Trick dispatchers averaged 2 breaks per day with their longest break averaging 8 minutes. Assistant chiefs averaged 1½ breaks per shift with the longest break averaging 10 minutes. Despite the lack of breaks, this was not a primary source of stress for dispatchers.

Shift variability can lead to fatigue if it disrupts a worker's normal sleep pattern. The study defined a shift variation as a change in shift from the previous day. Relief jobs involve rotating through different shifts so some level of variability is the expectation, as the data in Table 2 show. The nature of extra board jobs also implies high shift variability; however, this was not the case. A third of the dispatchers working extra board jobs had no shift variability because they were filling in for dispatchers with regular jobs who were on vacation or other extended absence.

Dispatchers commute, on average, 37 minutes to work. Most first shift positions began at 6:30 a.m., thus requiring that the dispatcher arise between 5 and 5:30 a.m. and leave home before 6 a.m. This early start time may compromise the first shift dispatcher's nighttime sleep.

**Table 2. Shift variability for dispatchers working relief and extra board work schedules (percent)**

| Number of Shift Variations in 2-Week Period | Work Schedule |             |
|---------------------------------------------|---------------|-------------|
|                                             | Relief        | Extra Board |
| 0                                           | 2.4           | 35.2        |
| 1                                           | 9.6           | 22.2        |
| 2                                           | 32.5          | 27.8        |
| 3                                           | 19.3          | 13.0        |
| 4                                           | 33.7          | 1.9         |
| 5+                                          | 2.4           | .0          |

*Sleep Characteristics*

Dispatchers working permanent first shift jobs get considerably less total sleep on workdays than those with other work schedules, but these dispatchers appear to make up for their loss of sleep on non-workdays. In comparison with shiftwork norms, railroad dispatchers get less primary sleep than other shiftwork populations (see Table 3).

**Table 3. Primary sleep by shift worked (h:min)**

| Shift Worked | Mean Primary Sleep | Shiftwork Norm* |
|--------------|--------------------|-----------------|
| 1            | 6:08               | 7:00            |
| 2            | 7:06               | 7:34            |
| 3            | 5:54               | 6:36            |

\*Pilcher, J., Lambert, B.J., & Huffcutt, A.I. (2000). Differential effects of permanent and rotating shifts on self-report sleep length: a meta-analytic review. *Sleep*, 23(2), 155-163.

Because many dispatchers on a permanent third shift use a split sleep strategy on workdays, the napping rate was highest for this group. The majority of workday naps for all dispatchers combined began between 4 and 8 p.m. In contrast, dispatchers' naps on non-workdays tended to start between 12 and 4 p.m., a time that is consistent with the afternoon nadir in the circadian cycle

Comparison of dispatcher sleep with normative data for U.S. adults indicates that, in terms of average daily sleep in 24 hours, railroad dispatchers are getting less sleep than U.S. adults (see Figure 1). Thirty-nine percent of U.S. adults get less than 7 hours of nighttime sleep on workdays in contrast with over two-thirds of U.S. first and second shift dispatchers. (Comparison of regular third shift, relief, and extra board dispatchers with U.S. adult nighttime



sleep norms would be misleading since these dispatchers do not get regular nighttime sleep.) Research has shown that performance declines, even with mild sleep restriction, and sleep-deprived individuals are poor judges of their impaired performance. Dispatchers averaging fewer than 7 hours of sleep on workdays are probably unaware of the extent of their performance degradation and the increased risk of error.

Dispatchers with untreated sleep disorders gave lower ratings to their sleep quality, but no statistically significant differences existed, most likely due to the small number in the untreated sleep disorder category.

#### Alertness

Data from dispatchers' daily logs revealed some differences in alertness levels based on shift worked. For all shifts, alertness peaked after the commute to work but then declined throughout the day. The decline was greatest on third shift.

Dispatchers with diagnosed but untreated sleep disorders had lower alertness ratings throughout the day, but these differences were not statistically significant.

## CONCLUSIONS

Key findings of the study include the following:

- The need of this shiftwork population to catch up on lost sleep and the stressful nature of dispatching may be responsible for the higher number of workdays lost due to illness in contrast with U.S. employed adults.
- The 8-hour workday of a dispatcher plus commute time allow adequate time for sleep and personal activities, but varying and unpredictable schedules for some dispatchers and the need to sleep at times that run counter to human physiology may prevent the dispatcher from getting adequate rest. The lack of a statutory limit on daily hours for assistant chiefs further aggravates this situation.
- Although dispatchers do not have any planned or guaranteed breaks, this was not a major source of stress to either trick dispatchers or assistant chiefs.

- Overall, dispatchers are a sleep-deprived group. Many dispatchers, who perform a safety-critical function on the railroad, may be unaware of their resulting degraded performance.
- Dispatchers with diagnosed but untreated sleep apnea should be encouraged to accept treatment. In addition, fatigue education should point out the possible performance and health consequences of untreated sleep disorders.

Based on the experiences of this study, several methodological changes should be a part of any future studies of this nature. The recommended changes include the following:

- Design and test instructions for third shift workers to use in recording their primary sleep period.
- Separate the question on job type (e.g., trick dispatcher, assistant chief, other) from the one covering work schedule.
- Include a definition of a work break and guidance on recording break information.
- Include a question on the background survey that asks, "How many times have you been married?"

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