

SUPPORTING JUSTIFICATION – Part B

The Impact of Commute Times on the Fatigue and Safety of Locomotive Engineers and Conductors

OMB No. 2130-NEW

Form Number FRA F 6180.158

1. Description of sampling method to be used.

The potential respondent universe is the 69,000 locomotive engineers and conductors in the United States. The rail industry in the U.S. is highly unionized; thus, potential respondents will be recruited through multiple rail labor unions. The Brotherhood of Locomotive Engineers (BLET) and the International Association of Sheet Metal, Air, Rail and Transportation (SMART) Workers are two of the largest railroad operating unions in North America with more than 150,000 members. Both of these unions represent rail workers other than locomotive engineers and conductors, such as trainmen; thus, the survey will incorporate a screening question at the beginning to ensure potential respondents who are completing the survey are locomotive engineers or conductors. Working with the rail labor unions represents the most ideal and effective method to distribute the survey as widely as possible. Representatives from the BLET and SMART Transportation Division have agreed to assist with distribution of the survey to their members and discussions are currently underway with a number of other organizations [e.g., Railroad Workers United (RWU) and the Association of American Railroads (AAR)] to secure their assistance with the data collection effort.

This collection has not been conducted previously, so the response rate must be estimated from other similar efforts. This study is not targeting a representative sample, but rather a convenience sample. Email recruitment is likely to result in response rates lower than face-to-face recruitment. Pilot test response rates from the Commercial Driver Safety Risk Factors Study conducted by the VTTI research team, which used a similar email recruitment method (i.e., identifying potential participants from an email distribution list) had a ~15% response rate (Hickman et al., under Agency review).¹ This data collection effort will use a similar strategy; however, a higher response rate may be expected given the support from the rail unions. More specifically, the email recruitment letter will come from a known entity (i.e., rail union) rather than an unknown entity (i.e., the VTTI research team). Thus, the 15% response rate may be viewed as the minimum response rate, which will result in approximately 10,350 completed surveys.

2. Description of procedures for information collection, including statistical methodology for stratification and sample selection.

The survey will be conducted online using the online tool Qualtrics to perform the data collection. Qualtrics is a survey service provided through Virginia Tech. The VTTI research team has successfully used Qualtrics to create and administer online surveys in the past.

¹ Hickman, J.S., Mabry, J.E., Glenn, L., Guo, F., Mao, H., Hanowski, R.J., Whiteman, J., Herbert, W. (under Agency review). *Commercial Driver Study Risk Factors Study (CDSRF)*. Washington, DC: Federal Motor Carrier Safety Administration.

To ensure a 15% response rate will provide a large enough sample size to obtain a representative sample of the population of locomotive engineers and conductors in the U.S., the following calculations were completed using the industry standard of 95% confidence intervals. A 50/50 distribution of proportions is assumed because it is the most conservative and this study is not focused on testing any particular population differences. Sampling error is directly related to acceptable margin of error and for this study we are setting this at +/- 2%. This low margin of error adds to the precision of our understanding of this population, although it does increase the number of responses necessary.

The following formula is used to compute sample size (Dillman, 2007, p.206):²

$$n = \frac{(N) (p) (1-p)}{(N - 1) (B/C)^2 + (p) (1-p)} \quad \text{Equation (1)}$$

n = sample size needed

N = population size

p = proportion of population differences

B = acceptable amount of sampling error

C = Z statistic associated with the confidence level; 1.96 for 95% level

Using an estimated 69,000 locomotive engineers and conductors with a 2% margin of error, the following computation (Equation 2) estimates a sample size of 2,320.

$$n = \frac{69,000 * .5 * (1-.5)}{(69,000 - 1) (.02/1.96)^2 + (.5) * (1-.5)} \quad \text{Equation (2)}$$

Thus, a 15% response rate, if attained, is more than adequate for the requirements of this project.

3. Description of methods to maximize response rate and to deal with non-response issues.

This survey data collection effort will be carried out in collaboration with relevant rail labor unions. Their support of the effort and acknowledgement of the importance of the information will be of considerable assistance in eliciting railroad employee cooperation. They will be involved in initial requests for cooperation and in follow-up communications and reminders.

A standard introductory email will be created by the VTTI research team. This email will alert the population that they may receive an invitation to participate in the survey. VTTI will also create and distribute to the labor unions the invitation email and the reminder emails – to ensure that all potential participants receive the same information. Additionally, unions may publicize the survey via union newsletters and at union meetings.

The introductory emails sent to respondents will come from labor union leaders using official email addresses. The introductory emails will explicitly state the purpose of the study and the estimated time to complete the survey. The letters will also stress that no special preparation is needed to participate. The survey will be extensively pilot tested to

² Dillman, D. (2007). *Mail and Internet Surveys: The Tailored Design Method*. Wiley: USA.

ensure the questions use simple and straightforward language.

Union leaders will encourage participation by indicating that the survey data will be used to design targeted safety campaigns, and peer to peer interventions. By completing the survey, railroad employees will be able to influence how these interventions are designed and implemented. The opportunity to influence these interventions should provide more than adequate motivation for participation. Having the request come from labor union leaders rather than from FRA or railroad management will increase the likelihood of participation. Additionally, respondents will be given the option to enter a raffle to win one of twenty \$50 gift cards as a reward for their time and effort in completing the survey.

In summary, the following steps will be taken:

- Distribution of study summary. Summary will describe the procedures and goals of the study in simple terms.
- Participants will have the option of completing the survey through a secure internet site or via a paper version.
- Descriptions of the survey will de-emphasize the government's role in the survey and emphasize University sponsorship. The rationale for this is that given the authoritative role of the government in imposing regulations on the transportation industry, these rail workers may feel more comfortable discussing issues such as fatigue and safety with third-party researchers who do not have authority over them.
- The initial recruitment email containing the survey information and link to the secure survey site will also provide the name and contact details of the Principal Investigator from VTTI.
- Measures have been designed to provide the most essential and important information relating to fatigue and safety while minimizing items that may be considered offensive or intrusive.

There are limited options to deal with nonresponse bias in this case. These include:

1. Generalize results to the respondents only. This strategy avoids making erroneous inferences about the larger population.
2. Send reminder emails to nonrespondents. Nonrespondents will be contacted to assess why they did not respond to help determine the extent of response bias. Nonrespondents who cannot be contacted can continue to bias the sample estimates.
3. Compare data from union membership on respondents and nonrespondents. If data (e.g., gender, age, race) is available, the composition of respondents will be compared with that of nonrespondents to see if there are any differences. The presence of differences indicates response bias and that caution is necessary in making inferences.

In addition, a small number of focus groups will be conducted to elicit expert judgment concerning the validity of the results of the survey and to delve deeper into the issue of commute times and the resulting impact on fatigue and safety. The focus groups will comprise of locomotive engineers, safety managers, union representatives, and rail industry representatives familiar with engineer job functions. The focus groups will be asked to elaborate on key findings from the survey to allow for a more in-depth

understanding of the issues faced by locomotive engineers and possible ways to mitigate them.

4. Describe any test procedures for procedures or methods to be undertaken.

A pilot survey with no more than 9 participants will be conducted to refine the data collection procedure and instruments. This will ensure questions are appropriately worded to acquire the desired information and the online survey is working correctly. Participants in the pilot survey will not be compensated but their feedback will help to make sure the project is a success.

5. Provide name and phone number of individuals consulted on statistical aspects of study design and other persons who will collect/analyze information for agency.

FRA has contracted the services of Virginia Tech Transportation Institute for the conduct of this study. VTTI will be responsible for data collection, information coding, and analysis.

The primary point of contact from VTTI for this work is:

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