

NATIONAL SURVEY OF U.S. LONG HAUL TRUCK DRIVER INJURY AND  
HEALTH

Request for Office of Management and Budget (OMB) Review and Approval  
for a Federally Sponsored Data Collection

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## B. COLLECTION OF INFORMATION EMPLOYING STATISTICAL METHODS

To provide for the occupational safety and health surveillance needs of truck drivers, the National Institute for Occupational Safety and Health is planning to develop and conduct a national survey of long-haul truck drivers. The major objectives of the survey will be to: (1) collect basic information about truck drivers and their working environment; (2) determine the prevalence of selected health conditions and risk factors in this occupational group; (3) characterize drivers' working conditions, occupational injuries, and health behaviors; and (4) explore the associations among health status, individual risk factors, occupational injuries and occupational exposures related to work organization.

### B1. Respondent Universe and Sampling Methods

#### Definition of the Target Population

The target population for a survey is the entire set of population units about which the survey data are to be used to make inferences. The target population for the National Survey of U.S. Long-Haul Truck Driver Safety and Health will be drivers who: have truck driving as their main job; drive a truck with 3 or more axles (requiring the driver to have a commercial driver's license and be 18 years of age or older); have been a heavy truck driver 12 months or longer; and who usually take at least one mandatory 10-hour rest period away from home during each delivery run.

Long-haul truck drivers eligible for this survey are a subset of the occupational group, 'heavy and tractor-trailer truck driver', used in governmental surveys. This occupational group is defined as drivers who: Drive a tractor-trailer combination or a truck with a capacity of at least 26,000 GVW [gross vehicle weight] to transport and deliver goods, livestock, or materials in liquid, loose, or packaged form. They may be required to unload trucks and may require use of automated routing equipment. A commercial driver's license is required [Bureau of Labor Statistics 2008b].

An estimated 1,672,580 workers were employed as heavy and tractor-trailer truck drivers in 2008 [see Table 1]. Table 1 also shows those industries where the greatest number of heavy and tractor-trailer truck drivers was employed. Industries employing the greatest numbers of heavy and tractor-trailer truck drivers in 2008 were General Freight Trucking (598,320); Specialized Freight Trucking (217,440); Cement and Concrete Product Manufacturing (72,580); Grocery and Related Product Wholesalers (67,590); and Other Specialty Trade Contractors [Construction] (45,890).

Table 1. Employment characteristics for Heavy and Tractor-Trailer Truck Drivers, United States, 2008<sup>i</sup>

Industries with highest levels of employment	Truck Drivers Employed, Heavy and Tractor-Trailer
General Freight Trucking	598,320
Specialized Freight Trucking	217,440
Cement and Concrete Product Manufacturing	72,580
Grocery and Related Product Merchant Wholesalers	67,590
Other Specialty Trade Contractors	45,890
Total employed	1,672,580

<sup>1</sup> Bureau of Labor Statistics [2008b]

Data on the gender, race, and ethnic composition of the study population are not available for heavy and tractor-trailer truck drivers as a single occupational group. Rather, the Current Population Survey, a nationally representative household survey, combines this group with driver-sales workers. However, driver-sales workers have a relatively small impact on the total estimate, as this group makes up only about 8% of truck drivers in the truck transportation industry [Bureau of Labor Statistics 2008b]. Data for 2007 indicate that workers in the combined category were predominantly male (86%). Eighty-three percent were white. The remainder was African-Americans (14%), Asian or Pacific Islanders (2%), Native Americans (1%), and other or multiple races. Sixteen percent of the combined category was Hispanic [Bureau of Labor Statistics 2007c, NIOSH analysis of unpublished data].

## Definition and Construction of the Sampling Frame

The sampling frame for a survey is the list or mechanism used to enumerate target population members for sample selection purposes. In the National Survey of U.S. Long-Haul Truck Driver Injury and Health, long-haul truck drivers will be interviewed while they are stopped at truck stops. This intercept approach to the survey is necessary because long-haul truck drivers are a mobile and hard-to-reach population and opportunities for contact and interview with them are limited. Their presence at a truck stop for rest, etc. offers the best opportunity to survey them.

The sampling frame for the National Survey of U.S. Long-Haul Truck Driver Safety and Health will consist of all continental U.S. truck stops offering diesel fuels and paved overnight truck parking facilities. A listing of all such diesel truck stops in the U.S. and Canada is included in the publication "*The Trucker's Friend and National Truck Stop Directory*" [Brice TA 2008]. The *Trucker's Friend and National Truck Stop Directory* is the only non-atlas trucking publication available listing all locations in the U.S. and Canada offering diesel fuel and which can accommodate the tractor-trailer combinations or trucks with a capacity of at least 26,000 GVW [gross vehicle weight] long-haul truck drivers would drive. The listings were developed from

several sources including state transportation agencies and departments of taxation (for locations where diesel fuel is sold), and are updated annually. Listings include truck stop location, address, telephone number, and facilities available at that truck stop. They also include a measure of size of the truck stop (number of paved parking spaces). Both truck stop chains and independent truck stops are included in the listing. The size and location for each truck stop will be used during sample selection for the National Survey of U.S. Long-Haul Truck Driver Injury and Health. The National Association of Truck Stop Operators (NATSO), a national trade association, also maintains a list of member truck stops, but the NATSO list is limited to its membership and is not a universal or exhaustive list of all truck stops.

### Specification of Sample Selection Procedures

A two-stage sampling approach will be used in the National Survey of U.S. Long-Haul Truck Driver Safety and Health. The first stage will be selection of truck stops where survey administration will occur, and the second stage will be selection of truck drivers at each truck stop to whom the survey will be administered. This is the most efficient and effective way of obtaining a representative sample of drivers for administration. In order to ensure that long-haul truck drivers stopping at truck stops along both heavily-traveled routes and lesser-traveled ones will be represented in the survey sample, a sample strategy has been developed in which a randomly selected sample of drivers stopping at each type of truck stop will be included. Survey administration including interview administration and anthropometric measurements will be done during personal interviews of selected drivers.

The sample of truck stops at which drivers will be interviewed will be selected from strata defined by truck traffic flow and geographical region. Since the number of interviews to be completed at each truck stop during the data collection period is not expected to be the same and will depend on the traffic flow through that truck stop, truck stops are defined as 'high-flow' and 'low-flow' truck stops. High- or low-flow truck stops are determined by the truck stop's location on traffic corridors with truck traffic flows of 10,000 or more trucks per day, based on the Freight Analysis Framework Version 2 [Federal Highway Administration 2007]. The Freight Analysis Framework (FAF) integrates data from a variety of sources to estimate commodity flows and related freight transportation activity among states, regions, and major international gateways between 2002 and 2035. High-flow truck stops will be those stops along routes in the National Highway System (NHS) which had (in 2002) estimated traffic volume of 10,000 trucks or more per day for more than half of their length. Low-flow truck stops will include all truck stops which are not located on these high-flow routes. They will be selected from truck stops in individual states. Truck stops will also be classified into 5 geographical regions of the U.S. defined by state: Northeast, South, Great Lakes, Central, and West.

Size of truck stop will be defined by the number of overnight parking spaces available at the stop: small (5-24 parking spaces), medium (25-84 parking spaces), large (85-149 parking spaces), or extra-large (150 or more parking spaces). Truck stops to be selected for survey within each traffic flow-region stratum will be determined with probability proportional to size (PPS) in that stratum.

A sample of truck drivers entering the truck stop during periods of data collection will be selected for personal interview. To ensure random selection of drivers, as an interviewer is about to become available the very next driver entering the truck stop will be invited to participate in the study. Each truck driver who enters during a period when an interviewer is available for administration will then have an equal chance of selection in this process (i.e., the process of selecting the next driver will be objective and not subject to the discretion of the recruiter). It is also assumed that time entries of drivers into the truck stops are sufficiently inherently random so that there will be no systematic bias generated from not being able to interview drivers who enter when another interview is still being done. There will be no recruitment for interviews during periods when an interviewer is not available. Recruitment and interview administration periods will include morning and lunch periods as well as the late afternoon/dinner period.

The number of truck drivers  $m$  to be interviewed at each of the  $n$  sampled truck stops was determined by minimizing the variance of estimator  $\hat{Y}$  of characteristic  $Y$  under the sample design. Those values corresponding to a standard error equal to 1.24% were determined. A standard error of 1.24% corresponds to a 95 percent confidence interval for a prevalence  $P=0.5$  of plus or minus 0.025 (indicating, in this study, a prevalence of a given health condition equal to 50% with 95% confidence interval plus or minus 2.5%). Assuming that the flow of truck drivers in the low-flow sites is about half that of high-flow sites, that travel costs to low-flow sites are twice those for high-flow sites, and that correlation within truck stops is 0.01, a total  $n=2,457$  interviews will be needed. Survey administration will take place at 41 high-flow truck stops and 9 low-flow truck stops. Fifty-four interviews are expected to be administered in each high-flow truck stop and 27 interviews at each low-flow truck stop, resulting in a total 2,214 interview administrations at high-flow truck stops and 243 administrations at low-flow truck stops. Table 2 shows expected allocations of truck stops and numbers of interviews in the National Survey of U.S. Long-Haul Truck Driver Injury and Health.

Response rates in excess of 80% are expected for eligible drivers in the National Survey of U.S. Long-Haul Truck Driver Injury and Health based on findings from a survey of parking needs of truck drivers [Federal Highway Administration 2002]. The parking survey involved direct interaction between the driver and surveyor. The National Survey of U.S. Long-Haul Truck Driver Injury and Health also involves direct interaction between interviewer and respondent. The use of incentives, along with wide-spread publicity of the survey and vigorous attempts at refusal conversion, will also help us to achieve an 80% response rate. Taking into account an expected 20 percent refusal rate for participation in either the eligibility screening or the non-respondent interviews [Federal Highway Administration 2002] and estimated 12% driver ineligibility rate for the main interview (Belman et al 2005), a total of 3,500 truck drivers should take the eligibility screening interview for study participation in order to obtain the 2,457 long-haul truck driver participants needed for the main interview.

Attachment H contains detailed stratification and sample size guidelines.

Table 2. Expected Sample Allocation

Type of Truck Stop	All U.S. Truck Stops <sup>1</sup>	Sample	Number of Interviews
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High Flow	1802	41	2214
Low Flow	2412	9	243
Truck Stop Size			
Small	1784	21	1026
Medium	1356	16	783
Large	541	6	297
Extra-Large	533	7	351
Total	4214	50	2457

<sup>1</sup> listings from Trucker’s Friend: 2008 National Truck Stop Directory [Brice 2008].

## B2. Procedures for the Collection of Information

### Overview

The target population for the National Survey of U.S. Long-Haul Truck Driver Injury and Health will be drivers who: have truck driving as their main job; drive a truck with 3 or more axles (requiring the driver to have a commercial driver’s license and be 18 years of age or older); have been a heavy truck driver 12 months or longer; and who usually take at least one mandatory 10-hour rest period away from home during each delivery run.

The sequence of administration of the eligibility screening, non-respondent, and main interviews for driver recruitment is shown in the flowchart (Attachment F2) and is described in more detail in the following sections. Drivers entering the truck stop who indicate to the recruiter an interest in participating in a survey on health and safety issues (Attachment F1) will be administered an eligibility screening interview (Attachment F3) to determine survey eligibility. If the driver is found to be eligible and agrees to participate, the main interview (Attachment F5) and consent materials (Attachments E1, E2, E3) will be administered. If the driver is found to be eligible but refuses further participation in the main interview, a short series of questions designed to obtain basic demographic information will be asked. If the driver refuses the interview, a short non-respondent interview to collect eligibility and basic demographic information (Attachment F4) will be offered. Thus basic eligibility and demographic data will be collected both from drivers who take part in the non-respondent interview, and also from those who answer eligibility questions in the eligibility screening interview but do not participate in the main interview. This information will be important to understand how respondents to the main interview and non-respondents differ. Incentives of \$2 for completion of the non-respondent interview or basic demographic questions in the eligibility screening interviews (for those eligible drivers not participating in the main interview) will be offered to encourage participation, with a \$25 incentive for completion of the main interview.



NIOSH has contracted with Westat, Inc., for assistance with the development of the study design and for conduct of the data collection and data management phases of the national survey. Survey administration and driver recruitment at each truck stop will be done by teams consisting of three individuals: one member to recruit participants and two members to administer personal interviews. Interviews are to be conducted during a 3-day period at each truck stop. During the three day period, truck drivers will be selected randomly to be interviewed during different time periods each day. All data collection will be completed in one year.

## Data Collection Procedure

Prior to the start of data collection at a site, the data collection team will meet with the truck stop manager. They will tour the facility's public areas; obtain instructions on where they can set up for recruiting, administering the interview, and taking anthropometric measurements; and become familiar with the emergency plan at that truck stop. It will be important to identify whether or not there is a separate entrance for truck drivers. If so, the team will set up their recruitment station by this entrance, to maximize recruitment of eligible participants. Otherwise, they will ask the truck stop manager where they should set up. The manager will also advise them of any rules and regulations such as where flyers may be posted. The team leader will collect information on the number of parking spaces, peak periods of use, amenities provided, and the truck stop layout. This will include the manager's estimate of the number of drivers who use the facility on weekdays and weekends. A checklist of amenities such as the number and types of restaurants, a service bay, shower and laundry facilities, recreation areas, fitness areas, a gift shop, supplies stores, etc. will be completed for each stop. A simple diagram of the facility that includes the number of entrances will be completed. The team leader will also purchase the gift cards that will be used as incentives for participants. The project team will also be instructed to follow that truck stop's emergency plan. If there is no emergency plan, the team will be instructed to call 911 in case of emergency.

Pre-survey publicity will be done with announcements (Attachment G1) about the survey in trade publications, newspapers available at truck stops, radio, and through on-line trucking Web sites. Advertisement and promotion of the study will also be done at truck shows and with the support of trucking unions or groups. Dates or locations of survey administrations will not be provided in any announcements or advertisements.

Flyers (Attachment G2) will be posted in high-visibility areas throughout the truck stop on days of data collection. Flyers will also be posted at the fueling station. The flyers will notify potential participants that interviews are being conducted that day at the truck stop, and that there is an incentive provided for their participation.

## Driver Recruitment

One member of the three-person data collection team will serve as a recruiter. The other two members will administer the interview and consent documents. The recruiter will be responsible for verbally recruiting potential participants as they enter the truck stop as well as administering the screening and non-respondent interviews. A flowchart illustrating the sequence of administration of

the eligibility screening, non-respondent, and main interviews to potential participants is shown in Attachment F2.

One interviewer will tally the number of drivers entering the truck stop. This will be done at randomly selected time intervals while the team is at the truck stop. To ensure random selection of drivers, as an interviewer is becoming available, the very next driver entering the truck stop will be approached by the recruiter. The recruiter will approach individuals and ask, “Good morning (afternoon, etc.), are you a truck driver? I’m recruiting drivers to participate in a survey about health and safety issues. We are offering \$25 as an incentive to participants. Would you be interested?” (Attachment F1) If the individual seems interested in participating, the recruiter will transition into the administration of the eligibility screening interview (Attachment F3) to determine if that individual is eligible for the study. The interviewer would continue to tally individuals during this period while the recruiter is in conversation with potential respondents.

A total 3,500 drivers will be recruited to take the eligibility screening interview (Attachment F3). Drivers will first be asked whether they are willing to answer further questions during the interview (question 1 in Attachment F3). Assuming a 20% refusal rate for further participation in the eligibility screening interview [Federal Highway Administration 2002], an estimated 2800 respondents will continue to answer eligibility questions (questions 4a-8) while 700 drivers will refuse further participation. Refusing drivers will be asked to participate in a short 2-minute non-respondent interview (question 2). A \$2 incentive will be offered for completion of the non-respondent interview. Of the 700 drivers refusing the eligibility screening questionnaire, 140 are expected also to refuse the non-respondent interview. Thus 560 individuals are expected to agree to the non-respondent interview.

Drivers agreeing to further questions in the eligibility screening interview will answer eligibility screening questions (questions 4a-8 in Attachment F3). Assuming 12% of the truck drivers will not be long-haul truck drivers (Belman et al. 2005) and so will not be eligible for the main interview, 2464 drivers are expected to be eligible for the main interview and 336 drivers not to be eligible. If the driver is found to be eligible (Questions 4a-8) and agrees to participate (Question 9), the main interview (Attachment F5) and consent materials (Attachments E1, E2, E3) will be administered. A total 2429 eligible drivers are expected to agree to participate in the main interview, while 35 drivers will not. The 35 eligible drivers who decline participation in the main interview will be offered a \$2 incentive to answer a short series of questions (question 11) to obtain basic demographic information on gender, approximate age, height, weight, and cigarette use (questions 12-16 in Attachment F3). Offering a short series of questions with a \$2 incentive will capture eligible drivers who are not willing or not able to participate for the entire main interview. Thirty individuals are expected to agree to answer this series of questions, while 5 drivers are expected to refuse. Individuals completing questions 12-16 will be further encouraged to participate in the main interview (question 17). Of the 30 eligible drivers agreeing to questions 12-16, ten are expected to agree to participate in the main interview and the remaining twenty drivers will refuse further participation.

Drivers who refuse the eligibility screening interview (question 1 in Attachment F3) will be offered a \$2 incentive for use at the truck stop as incentive for completion of the non-respondent interview (question 2 in Attachment F3). Of the 700 drivers refusing the eligibility screening questionnaire

(question 1 in Attachment F3), 140 are expected also to refuse the non-respondent interview (question 2 in Attachment F3). Thus 560 individuals are expected to agree to the non-respondent interview. (Attachment F4).

The non-respondent interview (Attachment F4) collects basic demographic data including the individual's gender, approximate age, height, weight, cigarette use (questions 5b-9) and also includes interview eligibility questions (questions 1-5a and 10). Any individual who completes the non-respondent interview will be further encouraged to participate in the main interview (question 11). Eighteen drivers are expected to agree to participate in the main interview after taking the non-respondent interview and sixty-seven drivers are expected to be found not to be eligible for the main interview, leaving 475 drivers refusing further participation in the main interview.

Thus eligibility and basic demographic data will be collected both from drivers who decide to take part only in the non-respondent interview, and also from those who take the eligibility screening interview but decide not to participate in the main interview. This information will be important to understand how respondents and non-respondents differ. It will also allow calculation of accurate nonresponse rates by identifying those nonrespondents who are ineligible. If refusal conversion for participation in the main interview is not possible at any point during an interview, the recruiter will attempt to determine why that driver does not wish to participate further (questions 3, 10, 18 in the eligibility screening interview and question 12 in the non-respondent interview). This approach will provide the recruiter an opportunity to overcome driver objections to participation and thus lower the nonresponse rate. Possible reasons for non-participation might include not being at the truck stop long enough for the entire interview, being too tired, busy with other matters, concern over privacy considerations, or little interest in the survey topic. Incentives of \$2 for completion of the non-respondent interview or basic demographic questions in the eligibility screening interviews (for those eligible drivers not participating in the main interview) will be offered to encourage participation, with a \$25 incentive for completion of the main interview.

Of the 3,500 truck drivers recruited and answering any questions during the eligibility screening interview (Attachment F3), a total 2,457 long-haul truck drivers are expected to agree to the main interview (Attachment F5), while 560 truck drivers are expected to agree to the non-respondent interview (Attachment F4).

Recruitment will continue until an individual is found to be eligible and agrees to participate. Once an eligible participant is identified, he/she will be taken to the interview area where the consent form (Attachments E2 and E3) will be administered and the interview conducted. The interview area will be a location away from the recruiting area and free from most distractions such as television or other noise. The location of interviews may vary from one truck stop to another. During the pilot study the back part of the truck stop's sit-down restaurant was used to conduct interviews. The area was closed to other patrons and provided a quiet but safe location for the interviews. We will attempt to use a similar space in all truck stops. Adjacent to interview space a temporary screen will be set up for the anthropometric measurements. Maintaining interviewer safety requires setting up both interviewing and measurement space in a non-isolated location. The recruitment process will be repeated as interviewers become available and eligible and willing participants are found.

This recruitment system will help to ensure that respondents are not waiting an excessive amount of time to participate in the survey and will help to avoid any frustration or anger on their part. It will also help to promote variety in the types of drivers recruited since participants arriving at the truck stop at different times are more likely to be recruited. The recruiter will use a log sheet to keep track of when interviews start and end so that he/she can accurately estimate a schedule. The recruiter will also maintain a tally sheet of individuals who: refused without giving a reason; refused while giving a reason; or are not eligible.

Hours at each truck stop will be scheduled based on discussions between the survey team and the truck stop manager. These discussions will include hours of peak usage at the truck stop as well as other times throughout the day when adequate numbers of drivers may be present for interview. During the cognitive interviews and the pretests, truck stop managers indicated that the best time to recruit participants and data collection would be 2:00 PM or later. This is the time period when the truck stops tend to be the busiest. However, to obtain a representative sample, drivers stopping at other times of the day will be included. These periods will include morning and lunch periods (8-10 AM and 12-2 PM) as well as the late afternoon/dinner period. Note that, for safety reasons, data collectors will not stay at the truck stop beyond 7:30 p.m. during the winter months, or after dark during the summer.

By limiting interview to certain time periods during the day, we will be missing a percentage of eligible drivers, those who only come into truck stops at night. From conversations with truck stop managers, we believe this will be a very small percentage of eligible drivers. Extending interview hours to include those missing eligible drivers will, however, reduce the percentage missed and reduce any bias from this source. During the first month of data collection interview hours will therefore be shifted on some days to capture drivers entering the truck stop before 8 AM or after 7:30 PM. Results of interviews conducted at the earlier or later times will be compared with those conducted during other morning, lunch, and late afternoon/dinner periods to determine if there are systematic differences in driver responses at each time. These comparisons will help to ensure that interviewing times are scheduled efficiently. Additional considerations in extending interview hours include the safety concerns of interviewing (and set up) in the dark and the increased cost for interviewers if they work hours when few eligible truck drivers come to the truck stop,

## Consent Form

A waiver of documentation of informed consent has been requested. Once an individual is found to be eligible and agrees to participate in the survey administration, the interviewer will take that individual to the interview area where he/she will be provided with a verbal explanation of the study, including a description of the study, potential risks of participating, the right to terminate participation at any point in time, steps taken to protect anonymity, and how the interview information will be handled and used by the study (Attachment E2). Participants will be reminded that they have the right to not answer any questions they are uncomfortable with or terminate their participation at any point in the interview. Any questions participants may have about study procedures or their rights as a participant will be answered at this time. Contact information will be

provided should participants have any questions about the study or their rights at any point during the study. It will also be stressed that study staff will make their best effort to protect participants' privacy and that no names will be recorded during interviews. Printed material (Attachment E3) including the verbal explanation and all other information which would normally be included in a written consent form will also be available for respondents. The respondent will be interviewed alone and not with a non-driving or driving partner so that respondents do not alter their intended responses due to another person being present. The consent script has a Flesch-Kincaid Grade Level score of 7.8, indicating that, based on average sentence length and average number of syllables per word, it is at a 7th grade reading level. Also, an interviewer will be able to provide wording clarification, if needed.

## Survey Administration

Once informed consent has been obtained, the interviewer will administer the main interview and record answers as well as any notes. The main interview (Attachment F5) includes both an interviewer-administered interview and a self-administered sleep and activity diary. The self-administered diary will be completed while the interviewer is present and immediately after completion of the interviewer- portion. The interviewer will collect the diary when the respondent finishes it and will include it with the interviewer-administered portion. Time spent by the respondent completing the activity diary will enable the interviewer to scan previous responses for completeness. Anthropometric measurements of height, weight, and neck size will be taken after the diary is completed. Total time for survey administration will be approximately 50 minutes.

The interview (Attachment F5) uses a standard question and answer format. Some responses are to be recorded verbatim for later recoding. Throughout the main interview there are a number of questions that have numeric values or scales assigned to the response options. A series of show cards (Attachment F6) will be used when the interviewer is administering these particular questions. The scale cards help the respondent better understand the answer responses and have been tested during the pretests.

The driver sleep and activity diary was incorporated to capture sleep related data. It is based on a form truck drivers routinely use to record driving hours, and on an activity diary developed at the National Institute for Occupational Safety and Health [Caruso et al 2005] The respondent will complete the activity diary after completing the interview. The diary will be included with the survey questionnaire form as a two page form with large, easy to read font and diagrams. It will include instructions and an identification number to link it to the interviewer-administered questionnaire. The activity diary will be accompanied by a sticker, which the respondent can use to seal the form upon completion. This way, the diary can be closed and sealed by the respondent and handed back to the interviewer. Designing the diary this way may help the respondent feel more comfortable about answering honestly and increase confidence that their response will not be reviewed by the interviewer. Both written instructions and a brief tutorial on how to complete the diary will be provided. This will help participants better understand how to complete the diary and improve accuracy of the data.

Measurements of respondent height, weight, and neck size will be collected by the interviewer after the respondent completes the activity diary. Collecting this data at the end allows the interviewer time to build a rapport with the respondent, thus allowing the respondent to feel more comfortable about having these parameters measured. Measurements will be collected in a private setting, such as behind a curtain in a less-travelled area of the truck stop. Measurements will be taken by a same-sex member of the data collection team, if possible. Measurements will be taken following standard anthropometric measurement protocols [Centers for Disease Control 2007, U.S. Department of the Army 2006].

## Data Management

Since an interviewer-administered hardcopy questionnaire will be used, data collection will be done using a traditional paper-and-pencil approach followed by return of the form to the home office for data processing. The survey Field Director will stay in regular contact with each of the interview team leaders with a daily status report. To maintain quality control, a document control and tracking system will be used involving receipt control of all study documents and internal document tracking.

Data editing will involve both manual and machine editing. While the participant is completing the activity diary, the interviewer will conduct a scan edit of the interview form for completeness. Any missed items will be asked of the respondent after he/she completes the diary. Nightly, the team leader will scan edit all forms completed that day so any problems can be identified and discussed with the team.

All forms will be comprehensively edited following a detailed edit guide. Manual editing will include checking for illegible answers, incorrectly followed skip instructions, and items not answered.

All data will be double-entered by coders. Discrepancies will be reviewed and resolved by the data manager. Verification of coding will be conducted on at least 10 percent of the sample as a check of the accuracy of coding, and will be carried out by independent recoding. Discrepancies between the coder and verifier will be resolved by the data manager.

Once the data have been keyed, automatically generated machine edit checks will be run. These include alpha versus numeric code checks; range checks to verify that each field contains only allowable codes; skip pattern checks; and data consistency checks to compare data in different fields to ensure internal consistency. The result of the machine edits check will be an edit error report, which lists the case, highlighting items that have failed a range or logic check. Data management staff will review the report, refer to the hard copy of the original form for the case flagged, and attempt to resolve the error.

Attachment H contains detailed procedures for data collection.

### B3. Methods to Maximize Response Rates and Deal with Nonresponse

#### Methods to Maximize Response Rate

Interviews in the National Survey of U.S. Long-Haul Truck Driver Injury and Health are to be administered at locations operated by both truck stop chains and independent owners. Response at the truck stop level will be maximized by obtaining corporate approval to conduct interviews at truck stop chain locations. Approval to conduct interviews at independently-owned truck stops will be sought from the truck stop manager. In conversations with truck stop managers for the pretest and pilot test, managers were found to be agreeable, especially when it was explained that the incentive payment could be used in their location.

Truck drivers represent a mobile and difficult-to-reach population. A previous study reported that long-distance drivers slept at home an average of only 7 days per month, making them a difficult population to survey via mail or telephone [Federal Highway Administration 2002]. Appropriate techniques are necessary to ensure positive contact with them and encourage maximal participation in the study.

In one study to determine how best to distribute a survey at a truck stop, researchers distributed surveys to be completed by the driver and returned in two ways; 1) directly to the driver from a member of the research team and back to the team when completed; or 2) placed in collection boxes which were sent to participating truck stops, and truck stop managers were asked to return the collection boxes via mail. Even though both methods were initiated at the truck stop, Method 2, which involved no personal contact, achieved only a 24% response rate, while Method 1 involving personal contact achieved a response rate of better than 80% [Federal Highway Administration 2002]. The Survey of U.S. Long-Haul Truck Driver Injury and Health is modeled after Method 1 involving personal contact with truck drivers.

Since the National Survey of Truck Driver Injury and Health will be completely anonymous, follow-up with non-respondents will not be possible. Therefore, we will offer a financial incentive during recruitment. It has been demonstrated that incentives increase participation and reduce nonresponse bias among drivers [Dillman 1996, as reported by Shettle and Mooney 1999]. Belman et al. [2005] offered a monetary incentive of \$20 for participation in their study, achieving a 70% participation rate for the study. The Survey of U.S. Long-Haul Truck Driver Injury and Health will use personal interviews and a \$25 incentive for individuals completing the main interview and a \$2 incentive for individuals completing the eligibility and basic demographic questions of the eligibility screening interview, or the non-respondent interview. Comments received during focus groups, the recruitment and screening stages of the cognitive interviews, and pretests indicated that the incentive and survey topic would encourage drivers to participate in this study.

Approaches in addition to the use of an incentive and personal interviews are being used to increase participation and response rate in this survey. Pre-survey publicity will be done with the support of trucking unions or groups, and with announcements about the survey in trade publications,

newspapers available at truck stops, radio, and through on-line trucking Web sites. Questions and phrasing have been revised to be most applicable and understandable to this population. A conversational tone is to be used throughout all survey administrations. Anonymity of responses is also stressed in the Consent form and during survey administration. There are also multiple opportunities during the eligibility screening and non-respondent interviews for interviewers to attempt refusal conversion.

Response rates in excess of 80% are expected for eligible drivers in the National Survey of U.S. Long-Haul Truck Driver Injury and Health. Taking into account an expected 20 percent refusal rate for participation in either the eligibility screening or the non-respondent interviews [Federal Highway Administration 2002] and estimated 12% driver ineligibility rate for the main interview (Belman et al 2005), a total of 3,500 truck drivers should take the eligibility screening interview for study participation in order to obtain the 2,457 long-haul truck driver participants needed for the main interview.

## Methods To Deal With Non-Response

Non-response at the truck stop level may occur at two points: at the corporate level and at the individual truck stop. As a result of the pilot test permission from the corporate office of one of the largest truck stop chains has already been obtained. We are seeking permission to conduct interviews at three other chains as well. It is possible that a given truck stop manager may not want to participate, however. A reserve sample of truck stops will be selected at the same time as the overall sample, so that if an individual truck stop refuses to participate the reserve sample in that sampling unit (the state-artery segment for a high-flow site or state truck stop list for low-flow sites). In this way probabilities of selection in that sampling unit will be able to be adjusted to reflect the inclusion of both the primary and reserve samples. In that case both truck stops will be included in the nonresponse calculations and in the survey weights. Minimal, if any, nonresponse at the truck stop level is expected, since truck stop managers were very agreeable during our interviews with them and pilot, especially when corporate approval was obtained and use of the incentive payment in their location was explained.

Potential survey participants will be administered an eligibility screening interview by the recruiter (Attachment F3) to determine eligibility for study participation. Potential participants declining to participate in the eligibility screening interview will be offered a non-respondent interview (Attachment F4). Both the eligibility screening and non-respondent interviews include provision to collect information on reasons for potential non-response and also basic eligibility and demographic data on non-respondents. Possible outcomes of the eligibility screening interview are: 1) not eligible for the study, 2) eligible for the survey and willing to participate by taking the main interview, 3) eligible for the survey but not willing to participate, or 4) not willing to participate.

Those drivers not eligible for the survey are not truck drivers or those who do not meet the study criteria (truck driving as the main occupation, having driven a vehicle with 3 axles or more for 12 months or more, sleeping away from home at least once per each delivery run). There is a temporal



aspect to these definitions for truck drivers. Some drivers may be part-time or seasonal drivers. Such drivers who do not have truck driving as their main job will not meet the eligibility criteria for the National Survey of U.S. Long-Haul Truck Driver Injury and Health.

Drivers meeting all eligibility criteria will be asked if they are willing to participate in administration of the main interview (Attachment F5). Those eligible drivers who agree to participate will then be administered the main interview. Possible reasons for eligible drivers refusing further participation could be that they are not at the truck stop long enough, too tired, busy with other matters, concerned over privacy considerations, or that the interview may be of little interest to them. Eligible drivers unwilling to participate will be asked the reason for refusal, followed by attempts at conversion to participate in the interviews. If no conversion is possible, basic demographic data (gender, age, height, weight, and cigarette smoking) will be collected from those drivers.

Incentives for eligible drivers completing the main interview will be \$25. Incentives for drivers completing only the basic demographic questions of the eligibility screening interview or the non-respondent interview will be \$2. These incentives will be in a form that can be used at multiple locations by the driver. If the interview is conducted at a truck stop that is part of a chain, the incentive will take the form of a gift card that will be accepted at any stop in that chain. If the interview is conducted at an independent truck stop, the incentive will take the form of a cash card useable anywhere that accepts major credit cards. The \$2 incentive will always be in the form of cash. Data collection techniques will be reviewed periodically to determine if survey methods or approaches may be modified to increase participation and minimize non-response. Other opportunities to assess nonresponse bias are limited due to a lack of an accurate frame of eligible truck drivers. Although a list of drivers holding commercial driving licenses (CDL) is maintained by the Federal Motor Carrier Safety Administration (FMCSA), it is not known whether those drivers listed are active or are long-haul truck drivers eligible for this study. Without such control totals we are restricted to information on nonrespondents gained from the nonresponse surveys collected at the truck stops. Data obtained in the nonresponse, screening, and main interviews will be compared for respondents and nonrespondents. A nonresponse adjustment based on any characteristics related to response propensity will also be included in the weighting process. The analysis will also be extended to comparisons between high- and low-flow truck stops.

## B4. Tests of Procedures or Methods to be Undertaken

### Data Collection Forms

Most questions included in the data collection instrument used in the Survey of U.S. Long-Haul Truck Driver Injury and Health are derived from previously developed and validated instruments. The source of these questions, including OMB number and expiration date is shown in Attachment F7. In many cases it was also necessary to revise original question wordings to make them more applicable to truck drivers and to a survey of injury and health. The survey instrument combines items from some questionnaires, includes some original items, and in some cases changes the mode

of administration. Therefore, review of the survey instrument by subject matter experts and testing of the survey instrument with truck drivers has been critical to ensure successful administration of the survey instrument.

Individuals reviewing the survey instrument are listed in Part A. Nine cognitive interviews with active long-haul truck drivers were also conducted to examine the processes that respondents would go through when answering the survey questions. Comments from these interviews resulted in: 1) rewording of several individual questions, 2) clearer definitions of terms used in the interview, and 3) changes in length and format of the interview to ensure easy understanding and flow. Respondents in particular had a difficult time answering questions dealing with the average amount of time spent doing an activity, so a specific time frame was indicated in all questions.

## Pretest

One pretest was conducted to determine the logistics of administering the survey at a truck stop. Discussions were held with 2 truck stop managers, 2 truck stop employees, and 5 drivers stopping at the truck stop. Discussions with the truck stop manager included approaches for securing the cooperation of other truck stops, whether or not approval from regional supervisors would be required for larger corporations and whether reimbursement would be necessary to secure business cooperation, the willingness of businesses to display promotional materials within their facilities to assist in recruiting drivers for survey participation, and thoughts on the best way to approach drivers about the survey as well as the best time(s) of day to have interviewers available.

Topics discussed with drivers entering the truck stop included their thoughts on the best way to approach other drivers about the survey, the best time(s) of day to have interviewers available at a facility, and what incentives would encourage them to participate in the main survey.

Findings at the truck stop indicated that there is no uniformity among different truck stops for best places to recruit and administer the survey, and that hours of peak operation are 8-10 AM and 4 PM – midnight. Some truck stops, for example, have a separate entrance for drivers, however. A larger percentage of patrons are truck drivers during the middle of the week (Tuesday-Thursday) and during the winter months. Managers stressed the importance of getting corporate approval first before attempting to get permission to use a specific truck stop, and commented on the use of terms ‘long-haul’ vs. ‘regional’ to describe driver eligibility for the survey. In response, it was decided not to use the term ‘long-haul’ during survey administration, and definition of eligibility for the survey was revised to include only drivers who sleep away from home at least once per delivery run. The \$25 gift card incentive was well received by both managers and drivers. These findings were used to determine appropriate field procedures for the protocol and pilot study.

## Pilot Study

A pilot study with was conducted September 2009 at a truck stop along Interstate 70 in New Paris, Ohio. The purpose of this pilot test was to evaluate the effectiveness of recruitment methodology, the interview, and survey procedures in acquiring complete, high quality data from 9 respondent

truck drivers. Objective data collected in the pilot study included overall response rates and individual item responses. Subjective data were collected using participant debriefing interviews. Information captured from this study was used to guide improvements to maximize the performance of the various components of the national survey and to assess the field procedures and interview for ease of administration, clarity, time, and acceptance by study participants.

Findings from the pretest indicated the need for better definitions of terms such as ‘yard work’, job activities and some time periods, and the need to repeat certain phrases and cues during interview administration. Interview timing resulted in shortening of certain introductory sections. The activity log was also revised and enhanced. A protocol for recruitment and administration of the eligibility screening interview, including follow-up if the respondent refuses participation and administration of non-response questions was developed.

After reviewing comments from the pilot study respondents regarding some sections of the interview (e.g., training), NIOSH made further revisions. Some descriptive material and questionnaire items were rewritten to provide further clarification. Additionally, the format for some sections (e.g., work schedules), was significantly updated. Changes to specific questions are detailed in Attachment I.

## B5. Individuals Consulted on Statistical Aspects and/or Analyzing Data

NIOSH has contracted with Westat, Inc., for assistance with the development of the study design and for conduct of the national survey. The following individuals have worked as consultants on the design of the survey materials and development of study methodology, and will provide assistance with conducting the data collection phase of the national survey and will provide consultation to NIOSH on the calculation of the sampling weights and the statistical analysis of the study data.

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## LIST OF ATTACHMENTS

Attachment E1: NIOSH HSRB Approval and CDC Form 0.1379 Signature Page  
For Human Subject Review

Attachment E2: Oral Consent Script For All Participants

Attachment E3: Printed Material Available For Participants

Attachment F1: Recruitment Procedure/Script To Be Used At Truck Stop

Attachment F2: Flowchart For Administration of Eligibility Screening, Non-Respondent, and Main Interviews



Attachment F3: Eligibility Screening Interview

Attachment F4: Non-Respondent Interview



Attachment F5: Main Interview

Attachment F6: Show Cards For Main Interview

## Attachment F7: Previous Data Collection Instruments Used

Attachment G1: Text for Pre-Survey Publicity





Attachment G2: Publicity Flyer To Be Posted at Truck Stop

Attachment H: Sample Size and Sample Plan

Attachment I: Summary of Pilot Study Results