

## PRETESTING THE SURVEY OF RESPIRATOR USES AND PRACTICES (SRUP): COGNITIVE AND FIELD TESTING OF A NEW ESTABLISHMENT SURVEY

Sylvia Kay Fisher, Kelley Frampton, Ramona Tran  
Bureau of Labor Statistics, 2 Massachusetts Avenue N.E., Washington DC 20212

**ABSTRACT:** Respirators are used to minimize or eliminate potential health risks to employees stemming from occupational hazards found in many industries. The National Institute for Occupational Safety and Health (NIOSH) has developed a new survey, the "Survey of Respirator Uses and Practices (SRUP)," to collect accurate information about respirator use in U.S. establishments. This paper describes pretesting activities conducted to refine and evaluate the SRUP, including 12 cognitive interviews conducted with 11 large, medium, and small establishments with varied respirator usage. Interviews assessed concepts, forms design, problem-solving and data retrieval approaches, and potential response problems associated with the form and establishment record-keeping process. Results were incorporated within a field test version of the SRUP completed by 95 U.S. establishments. Field test follow-up activities included telephone interviews with both respondents and non-respondents. Study results provide insight into establishment respondents' ability to navigate through a complex form with multiple skip patterns and technical terminology.

**KEY WORDS:** *Establishment surveys, pretesting methods, cognitive interviews, field testing*

### BACKGROUND AND STUDY PURPOSE

Respirators are devices used to protect workers from potentially hazardous environments. They are designed to facilitate breathing and exist in two general forms: air-purifying respirators (which filter the air entering the respirator) and air-supplied respirators (which provide compressed air supplied by airline). Employers are required to provide respirators to workers when such equipment is necessary to protect the health of the employee, such as when employees are working in potentially hazardous work environments. In addition, employers should establish and maintain a respiratory protection program to educate employees about proper respirator use, hazardous conditions, and appropriate procedures to maintain respirators.

The National Institute of Occupational Safety & Health (NIOSH) has assumed that employers are generally meeting these standards, but is aware there is little substantive data to estimate actual current respirator usage in U.S. establishments. Therefore, NIOSH decided it would be appropriate to survey private U.S. establishments to better understand current usage rates and identify those respirator practices that are prevalent. NIOSH was hopeful that information gleaned from the survey could be used to

evaluate standards and pinpoint areas where education and training efforts are needed.

In 2000, NIOSH contracted with the BLS Office of Occupational Safety and Health (OSH) to develop, design, and administer a survey of private U.S. establishments on respirator use and practices. Specifically, NIOSH wanted to learn about: 1) the prevalence of respirator use; 2) how respirators were used in U.S. establishments; and 3) whether establishments were following prescribed OSHA (Occupational Safety and Health Administration) guidelines regarding respirator use and practices.

For these reasons, NIOSH contracted the Bureau of Labor Statistics (BLS) through an inter-agency agreement to conduct a survey of United States employers regarding the use of respiratory protective devices. As specified in the agreement, BLS conducted several cognitive interviews and a small field test to develop a final version of the Survey of Respirator Use and Practices (SRUP).

SRUP was designed iteratively using qualitative and field test results, with the goal of developing an instrument clearly understood by respondents and relatively easy for them to complete, yet comprehensive in its coverage of relevant topics. NIOSH wanted to obtain the following information by industrial sector and establishment size:

- ❖ distribution of respirator use

- ❖ types of respirators used
- ❖ hazards respirators protect against
- ❖ training of respirator users
- ❖ extent and type of medical examinations and fit testing procedures used to qualify workers for respirator use
- ❖ types and distribution of fit testing methods conducted by employers
- ❖ characteristics of respirator programs
- ❖ type and level of training of respirator program administrators
- ❖ usefulness of respirator manufacturer instructions and NIOSH certification labels

The final SRUP version will be administered to approximately 40,000 U.S. establishments drawn from the sample used for the 1999 Survey of Occupational Injuries and Illnesses. The results will be used to provide direction to formal efforts to protect workers. It will also provide researchers with information to develop educational interventions for specific populations to improve workplace respirator use.

## PRETESTING ACTIVITIES

**Instrument Development.** NIOSH assisted in the development of SRUP by providing BLS with direction in technical matters such as regulations associated with respirators, tutorials concerning the different types of respirators, and the specific substances that require respirator use. NIOSH also developed the original questions that comprised the initial version of the survey.

BLS redesigned this version of the survey using Dillman's total forms design principles (CITATION HERE). The pretest survey version used during the cognitive interviews looked vastly different from the initial version, but was substantively the same in terms of content, language, and item structure. The goal was to test the semantic and linguistic features during pretesting, and obtain respondent reaction to the redesigned SRUP.

**Cognitive Interviews.** Twelve (N=12) cognitive interviews were conducted with 11 establishments during two rounds of pretesting. Nine establishments participated in the first round of interviews, which focused on developing a satisfactory field test instrument. The final three interviews were completed during a second round of testing, which addressed outstanding issues raised by expert reviewers and the field test results.

**Participating Establishments.** The following eleven companies participated in the interviews:

- ❖ Five large companies with heavy employee respirator usage: a steel firm, a utilities company, a ship repair company, a construction firm, and a paint producing and distribution company (this firm participated in two separate interviews). All five sites had one or two safety coordinator/manager(s) and/or industrial hygienist(s) at the company who completed the interview.
- ❖ Four mid-size companies (two reporting minimal or occasional respirator use, and one reporting moderate respirator usage): a sheet metal production company, two construction companies, and a scaffolding company. All four sites had a safety coordinator/manager and/or industrial hygienist at the company who participated in the interview. Three respondents participated in the cognitive interview with one of the construction firms.
- ❖ Two small companies (one reporting minimal use of respirators, and the second reporting a significant amount of respirator usage): a scrap metal company and an auto body repair and paint shop. Neither company had a safety coordinator/manager and/or industrial hygienist, so the company owner and/or office manager completed the interview.

All interviews were conducted on-site at the establishments, with a BLS OSH staff member accompanying the interviewer. Interviews were audiotaped with respondent permission. Respondents were guaranteed confidentiality. Interviews averaged about 90 minutes. None of the respondents were compensated for their participation.

**Cognitive Interview Protocol.** NIOSH provided a survey draft that formed the basis for developing the cognitive interview protocol. The protocol was modified iteratively with successive interviews; that is, issues emerging in the interview process were incorporated within latter interviews. The revised survey form was shown to respondents (Rs) during cognitive interviews

The protocol was designed to assess respondent comprehension and ease in responding, and identify any response problems ensuing from the form. The protocol queried respondents about:

- ❖ Survey title, introduction, survey routing throughout the establishment; survey

completion time; initial respondent reactions

- ❖ Definition of major terms
- ❖ Relevant documentation at the establishment
- ❖ Air-purifying respirators [APRs] & air-supplied respirators [ASRs]
- ❖ Establishment's respirator program & its administration
- ❖ Respirator fit testing
- ❖ Other issues

**Cognitive Pretesting Results.** Numerous findings stemming from this phase of pretesting resulted in dozens of changes to the original instrument provided by NIOSH; however, only those the most significant findings are described here. A very important finding emerged after the first few interviews were conducted with larger establishments exhibiting moderate to heavy respirator usage. Respondents appeared to understand a large proportion of the terminology used in the survey, indicating there was less of a need to define terms than originally anticipated. However, as one respondent himself pointed out, these respondents were generally safety experts with extensive training in industrial hygiene and safety issues who should be expected to respond appropriately to a survey on respirators.

To test a hunch, two additional interviews were conducted with small companies (50 or fewer employees) to see if any differences emerged. Indeed, significant differences were obtained between large- and middle-sized companies and smaller firms. Specifically, small company respondents had little or no specialized training, were less familiar with survey terminology, did not maintain records of respirator use, and did not necessarily conduct (or even know about) fit testing and/or air sampling procedures. These respondents also exhibited greater difficulty understanding definitions of many technical terms used in the survey.

Cognitive interview results addressed in the field test version of the SRUP are presented by major area below:

#### **Data Collection**

- ❖ Respondents uniformly agreed the topic of respirators was an important one and appropriate for a large-scale NIOSH survey. This finding is important, because if a survey seems to be important or of value to

respondents, they may be more likely to complete that survey.

- ❖ Rs generally acknowledged the importance of and need for a survey on respirator use, but stated some non-compliant Rs may NOT complete the survey because they would fear that a regulatory body would visit them. Rs suggested adding a disclaimer at the front of the survey to the effect that data collected in SRUP would be confidential and that the results would in no way generate any OSHA inspections. This suggestion was implemented in the final version of SRUP.
- ❖ There was some concern that the voluntary nature of SRUP could reduce or de-motivate respondents; however, pretesting results indicate that many highly invested stakeholder/respondents [e.g., safety & health personnel] would be likely to participate. It is unclear whether human resources or other company personnel would participate.

#### **Data Retrieval**

- ❖ Some respondents (Rs) reported they could only report training figures from their training records, not "actual" figures representing "actual/true" respirator use; NIOSH was deeply concerned about this because they wanted to have an accurate estimate of "true" respirator usage, not an approximation of this number or, worse yet, a measure of the number of trained employees.
- ❖ Large and medium establishments may have a great deal of off-site usage and may not be able to report who *actually* wore a respirator; they have absolutely no way to track usage as records are not maintained.
- ❖ Some Rs (especially small establishments) did NOT know they were supposed to be fit testing or adhering to many OSHA guidelines and, therefore, do NOT maintain any records about employee respirator use and fit testing.
- ❖ Some Rs reported it was virtually impossible to distinguish "voluntary" from "routine" respirator use, because:
  - they did NOT track employee voluntary use in their record-keeping procedures
  - some establishments require all employees to complete a regular use respirator program (instead of a separate voluntary-use program) to protect against

liability, and therefore, never track whether employees are wearing respirators

- they did NOT know if and when employees voluntarily wore respirators (especially during off-site voluntary respirator use)

### ***Definitions and Terminology***

- ❖ The term “establishment” was not meaningful for all Rs. This commonly obtained finding was reiterated in this study, with Rs pointing out the term was ambiguous. Specifically, should the respondent include only this establishment site, field operations, other locations, branch units? They suggested using other terms like “physical location” or ‘work site,’ which respondents would more easily recognize.
- ❖ Many Rs did not know that “dustmasks (with two bands)” are a form of respirator – although respondents in small establishments particularly exhibited this problem, two safety professionals from larger establishments were also unaware of this fact. This raised a concern that some respondents may believe the survey does not pertain to them (many establishments only use “dustmasks”) and fail to return the survey. At first, NIOSH objected to the inclusion of “dustmasks” in the screening question on the grounds that respondents should know that “dustmasks” are respirators. They were only persuaded to make this change after pretesting results clearly demonstrated there could be a significant loss in the number of returned forms if respondents failed to understand that “dustmasks” were a type of respirator.
- ❖ Some terms for different types of respirators were unknown to some Rs (e.g., “half-mask dust-mask,” “mouth-bit respirators,” and “loose-fitting facepiece”). “Mouth-bit respirators” was dropped from the list.
- ❖ Some definitions were refined by Rs, particularly for “air-purifying respirators,” “air-supplied respirators,” and “fit testing.”
- ❖ Rs offered additions to both lists of substances, some of which were added to the final SRUP.
- ❖ Some Rs did not know what “air sampling” was (of course, they also had no records to consult to report air sampling information).

### ***Forms Design***

- ❖ Respondents generally liked the layout and design of the SRUP. There were few concerns articulated about the survey’s format, and most respondents found the order and sequencing of the questions to be fairly easy to follow.
- ❖ Respondents were generally able to navigate throughout the form, and favored the use of arrows for skip directions, reporting little or no difficulty in tracking the arrows and the large number of associated skip patterns.
- ❖ Rs liked the format, especially the use of double columns, which helped them to track questions more easily across shorter rows.
- ❖ Boxed definitions set aside from the text were well-received and Rs encouraged their use; a positive finding is that there were no reports of respondents “skipping” over and missing the boxed definitions.
- ❖ Rs wanted illustrations of the different types of respirators included within the survey, and some suggested that illustrations would be helpful to poor readers, non-English speakers, and respondents ignorant about the intricacies of respirators. NIOSH objected stringently on the grounds that the inclusion of illustrations would “give away” the answers to survey items. NIOSH was finally persuaded to allow illustrations to be included in the field test version of the SRUP because of the large number of respondent requests for them. However, they insisted that the illustrations not be labeled to minimize the likelihood of Rs “guessing” the correct response to questions.
- ❖ Some Rs thought the lengthy Table appearing in Question 12 was intimidating for some respondents, but suggested reducing the number of columns. This and other strategies were implemented to make the two tasks required in Table 12 more apparent to Rs and to minimize the potential for respondent confusion.
- ❖ One respondent suggested that a Section V be added to the form entitled “Fit Testing” with a skip-out option for those respondents who do not need to do fit testing. This suggestion was implemented in the final version of the survey.

**Expert Review: Labor Relations Advisory Council.** BLS also collected feedback from the program committee of the Labor Research Advisory Council (LRAC), the purpose of which was to solicit advice and recommendations for program changes and improvements. LRAC raised several issues that were addressed during the field test and second round of cognitive testing, most importantly:

- ❖ The prevalence of “voluntary” vs. “routine” respirator use and how these two forms of use differ in participating establishments.
- ❖ The prevalence of “regular” vs. “emergency” respirator use and how these two forms of use differ in participating establishments.
- ❖ The duration of respirator use once workers have put them on (e.g., how long do employees wear respirators after putting them on and when do they take them off).

**Field Test Activities.** A field test was conducted with 120 establishments to obtain additional data to examine cognitive, linguistic, and measurement issues surrounding the collection of respirator use data. Data collected from the field test was used to develop the final version of the survey.

Participating establishments were selected on a statistically representative basis from the sampling frame to be used when SRUP is administered nationally. Respondents were given 30 days to complete survey forms. None were compensated for their participation.

Respondents who failed to respond to the initial mail-out received a telephone follow-up call after the 30-day collection period had expired. Follow-up interviews were conducted with:

- ❖ “completers” to obtain their feedback about the survey completion process
- ❖ “non-completers” to obtain their data by phone or fax and learn their opinions
- ❖ “non-completers” who refused to comply to learn why they failed to do so

The initial response rate was 42 percent (N=50). Telephone follow-up procedures resulted in the collection of an additional 38 percent (N=45) of the forms, resulting in a final overall field test response rate of 80 percent (N=95). Thus, 20% of field-test participants refused to participate or failed to comply with mail and telephone requests to do so.

Establishments with respirator usage took about 1-½ hours to complete the form. Establishments with no respirator usage reported it took about 15 minutes to complete the form.

**Field Test Results.** Telephone follow-up activities clearly were successful, resulting in the collection of an additional 38 percent of the total number of mailed forms. The largest proportion of non-respondents said they were just too busy to complete the form in the amount of time allotted to them. A review of non-respondent comments indicated there were several reasons for non-response or failure to comply including:

- ❖ the fact that it was a voluntary survey
- ❖ the form was too long (e.g., too many pages)
- ❖ believing the SRUP was only for large establishments and not pertaining to small companies, like themselves
- ❖ agreeing to complete the survey when speaking to the telephone interviewer, but never followed up and returning the survey

A review of negative comments elicited from telephone interviews indicated concerns revolved around the relevance of the survey to the respondent (e.g., “a lot of questions are a bit difficult to apply to my small business”); the form length (e.g., “too many pages – reduce the length, if possible”); and to some confusion about form navigation (e.g., “I felt confused by jumping around”). These comments were articulated by a relatively small proportion of respondents, but were duly noted and addressed in the final version of the SRUP.

Some issues, such as page length, were unable to be adequately addressed, but every effort was made to improve the instructions to help the respondent navigate throughout the form. Fortunately, respondents were generally OK with the number of pages of the survey form, despite its eight-page length. Only a small proportion of “non-completers” reported they failed to complete the form because it was too long. Other findings from the field test and the follow-up telephone interviews included:

- ❖ The cover letter generally encouraged participation and did not “turn off” Rs.
- ❖ The Survey Introduction page functioned effectively in that Rs obtained an overview of the survey and its purpose; Rs reported little or no ambiguity about the survey purpose and content after reading this page.
- ❖ The survey format was fairly successful; Rs particularly favored the double columns and form layout, as in the cognitive interviews.
- ❖ Several skip directions using braces were missed by Rs and were enlarged and reformatted for the final version of the SRUP.

- ❖ Both tables for respirators types by hazard types were too complex for Rs to follow - they had difficulty figuring out what their task was. The font size was enlarged and reverse-printing was substituted by a light shade of titles.
- ❖ The definitions were effective, clearly understood, and appeared to function well. There were very few respondent reports of ambiguity or confusion about terms. It is likely the iterative testing of several terms resulted in definitions that were understandable to more Rs.
- ❖ As expected, some Rs were unable to generate an accurate response for #8, because they could NOT distinguish “voluntary” from “required” use. They strongly recommended clear definitions be provided for these terms, but did not believe they could report more accurately, because of issues described earlier in this paper. Definitions for “voluntary” and “required” use were refined and tested during the final three interviews. A final version of the items was included in the final version of SRUP.
- ❖ A few Rs had difficulty with the two-part task of identifying their environmental hazards and whether they conducted air sampling for each substance (or why they had NOT done so). The directions for this item were expanded to make clear to Rs they are being asked to perform two tasks in the item. The tasks themselves were described more clearly. The columns were highlighted to increase the visibility of the two tasks. Response boxes were enlarged.
- ❖ Rs wanted definitions provided for “emergency use” and “routine use.” Definitions were tested during the final three cognitive interviews and NIOSH approved those incorporated within the final version of SRUP.
- ❖ The final fit testing section performed in a satisfactory manner. Those Rs who knew what the purpose of fit testing was within an establishment’s respirator program, reported they understood the questions as asked.
- ❖ Except for a few non-respondents, Rs did not appear to be affected greatly by the “voluntary” nature of the survey and willingly participated. Non-completers appear to have mixed reasons for failure to participate, but these generally involved

being too busy or not having information needed to respond to the survey. None of the non-completers reported they declined to participate because SRUP was voluntary.

## **CONCLUSIONS**

This paper has described the pretesting activities conducted to develop a survey of U.S. establishments on the prevalence and use of respirators, including cognitive interviews, expert review, and a small field test. The most positive finding from this study is the amount of revision resulting from the application of these pretesting methods. Indeed the empirical findings were largely responsible for the adoption of several significant survey components by the survey sponsor. Without this evidence, it is unlikely that SRUP would look much like its final form.

For those interested in methodological issues, this study provided an excellent opportunity to compare the types of findings resulting from two widely used pretesting methods. The authors observed that cognitive interview results don’t always indicate what will be found in real field experience. For one thing, mail respondents are sometimes less demanding than those who participate in face-to-face cognitive interviews. Interview respondents sometimes feel compelled to find survey “flaws” and often do because they are looking at the survey so closely. In a surprising number of telephone interviews, respondents reacted favorably and relatively uncritically to the survey and the survey completion process.

On the other hand, the intense scrutiny and personalized probing about the respondent’s thinking process that occurs in cognitive pretesting, often yields unforeseen, immediate, and pressing insights, as well as some highly idiosyncratic (and not always significant) findings.

This paper does not provide a true test comparing the two methods, nor was it designed to do so. It would, however, be interesting to see a study comparing both pretesting methods used in this study. Such a test could use the same form for a series of cognitive interviews and an independently conducted field test with telephone follow-up activities to see how respondent feedback received from these two pretesting methods would differ. It would be even more interesting to see how the same form would morph as a result of the two pretesting methods. Would they look the same or be vastly different products? This question would be worth future investigation.