

The Development of a Hearing Conservation Attitude Survey

Prepared by

Curry Business Systems, Inc.

for the

National Institute for Occupational Safety and Health

Prepared under NIOSH Contract 211-93-0006.
Final Report
September 26, 1994

Acknowledgments

This project has succeeded due to the oversight of Dr. John Franks, Chief, Bioacoustics and Occupational Vibration Section. Dr. Mark R. Stephenson, Research Audiologist, served as COTR, and provided extensive guidance. Mr. Kenny Holland of the Laborers Local Union No. 894 and Mr. Steve Kasarnich, Carpenters District Council - Akron Regional Office supported the project's efforts to contact their unions' membership. Finally, the project could not have succeeded without the assistance of hundreds of construction workers affiliated with Laborers Local Union No. 894 and Locals 69 and 639 of the Carpenters District Council - Akron Regional Office. The cooperation of all these individuals is sincerely appreciated.

Overview

This report documents the work conducted in the development of an attitude survey for Contract 211-93-0006, *Produce a survey to assess pre- and post-intervention the attitude of workers toward the use of occupational safety equipment and toward protecting themselves from occupational noise-induced hearing loss.*

The contract was conducted in four phases. During Phase I, a detailed work plan for the project was prepared and approved. This work plan included an item specification plan which detailed the content areas that the survey would address. In Phase II, the item pool was developed and finalized. In addition, an item tryout was conducted by administering the item pool to a sample of construction workers. Analyses of the response data permitted the development of two forms of the final survey. Phase II ended with the collection of test-retest reliability data for the survey. In Phase III, additional test-retest data were collected. The final report was prepared in Phase IV.

The Requirements of NIOSH

NIOSH requested a survey that could be self-administered accurately to those who are functionally literate. The survey would need to have a short administration time. NIOSH sought two equivalent forms.

Construction workers tend to have limited formal education and often have very limited reading skills. This required the survey to contain very clear self-administration instructions and items that are comprehensible to those with very limited reading skills. In addition, the survey needed to be able to detect unmotivated respondents or those with very severe literacy problems. The identification of such respondents would permit their exclusion from data analyses.

Survey Participants

Any survey development project requires the cooperation of respondents in completing the survey. Based on consultation with NIOSH staff, the population of potential sample members was defined as construction workers in any of these four categories:

- Commercial construction
- Residential construction
- Road/highway/bridge/tunnel construction
- Demolition.

Volunteers were solicited from the membership roles of the Laborers Local Union No. 894 located in Akron, Ohio and the Carpenters District Council - Akron Regional Office, Locals 69 and 639.

Volunteers were needed in Phase II of the project for three purposes. First, volunteers were needed for a focus group in which the survey was reviewed and evaluated concerning its breadth of coverage and the comprehensibility of its items. Second, volunteers were needed to complete a survey consisting of the full item pool. Their responses permitted the refinement of the surveys. Third, volunteers, who initially completed the survey, were asked to complete the final form of the survey to permit an analysis of the test-retest reliability of the survey. Volunteers were also needed in Phase III where additional test-retest reliability data were collected.

Item development

Table 1 presents the 12 content areas assessed by the final version of the survey. The justification of 10 of the 12 content area rests on one of two attitude-behavior models.

The first model, the Health Belief Model¹, has four main components:

- Perceived susceptibility (e.g., susceptibility to hearing loss)
- Perceived seriousness (e.g., seriousness of suffering hearing loss)
- Perceived benefits of preventive action (e.g., benefits of proactive behavior to avoid hearing loss)
- Perceived barriers to preventive action. (e.g., barrier related to the perceived discomfort of hearing protectors)

The item specification plan included all four components and divided the *Perceived barriers to preventive action* into three subcategories: comfort, muffle important sounds, and inconvenience. Initially, a fourth subcategory, labelled the *wimp factor*, was considered. Analyses based on administration of the item pool revealed that the wimp items were not highly related to other perceived barriers scales, but appeared to be an additional approach to measuring perceived susceptibility to hearing loss (i.e., one is susceptible to hearing loss even if one is a tough individual). Thus, the wimp content area was dropped and its items were merged into the *Perceived susceptibility to hearing loss* content area.

The second model, the Ajzen-Fishbein model of attitudes and behavior², argues that attitudes affect behavior through the mediating variable of behavioral intentions:

Attitude -----> Behavioral intention -----> Behavior

This model, which like the Health Belief Model has received substantial empirical support, holds that the correlation between behavioral intentions and behavior will be larger than the attitude-behavior correlation. Consistent with research on the Ajzen-Fishbein model, we divided behavior into three scales: present behavior, past behavior, and the behavior of others, which we called the social norms scale.

The final substantive content area, *Desire for greater hearing knowledge*, was suggested by construction workers during a focus group used to collect feedback on a draft of the survey.

The final content area, labelled *Random response*, contains items designed to identify careless or inattentive responders. *The items would also identify respondents whose reading skills were so poor that they could not complete the survey in a meaningful fashion. An example of a random response item is: "I can hear a fly buzzing over one block away." These items are designed so that only one or a limited number of responses (e.g., disagree or strongly disagree) would be a reasonable response. Those who do not provide reasonable responses to some number of these items are inferred to be careless responders or lacking in the reading skills necessary to complete the survey meaningfully. In analyses for this project, respondents who answered inappropriately to two or more of the random response items were dropped from the sample.

Table 1
Hearing Conservation Attitude Survey Content Areas

¹ Rosenstock, I. M. (1974) The Health Belief Model and Preventive Health Behavior. In M. H. Becker (Ed.) *The Health Belief Model and personal health behavior*. Thorofare, NJ: Charles B. Slack, Inc.

² Ajzen, I. (1988). *Attitudes, personality, and behavior*. Chicago: Dorsey Press.

Perceived susceptibility to hearing loss
Perceived severity of consequences of hearing loss
Perceived benefits of preventive action
Perceived barriers to preventive action: Comfort
Perceived barriers to preventive action: Muffle important sounds
Perceived barriers to preventive action: Inconvenience
Behavioral intentions
Social norms
Present behavior
Past behavior
Desire for greater hearing knowledge
Random response

Items were written for each content area. Each item was reviewed judgmentally for comprehensibility. Items were developed to be short, have few clauses, lack complex vocabulary, and shun gender-related terms (e.g., his, her). In addition, items were reviewed by NIOSH staff. Finally, items were reviewed in a focus group setting by a sample of construction workers from the population to be surveyed. Items were revised as needed. Appendix A presents the 262 item pool administered in the item tryout.

Item Tryout

For the item tryout, the item pool items were divided into two forms. The items in each form were shuffled so that items from each content area were intermingled. The two forms were assembled into one survey booklet which also contained a background data sheet. Each respondent completed both forms. The forms were counterbalanced. Thus, some respondents first completed Form 1 and the remaining respondents completed Form 2 first. The background data information sheet contained items concerning type of work performed, age, and sex. It also contained one item concerning a self-assessment of current hearing. This background data sheet is provided in Appendix B.

A total of 700 survey booklets, each with a cover letter, were mailed to samples of carpenter's and laborer's union members in the northeast Ohio area with the cooperation of their unions' leadership. Five hundred surveys were sent to members of the carpenter's union. The carpenter's union sample was drawn randomly. The laborer's union sample constituted the first 200 union members in alphabetical order. The survey achieved a 33% return rate.

Data entry was audited to ensure accuracy. One respondent was deleted from the sample because he rewrote many items prior to responding to them. If a respondent gave a response of *agree* or *strongly agree* to more than one of the 10 random response items, the respondent was dropped from the sample. Nine respondents were dropped from the sample due to the random response screening, resulting in an analysis sample of 220 respondents. To contribute to the item analysis of a given form of a scale, a respondent needed to answer all the items in the final form of the scale. Scattered unanswered items resulted in the sample for each scale to be somewhat less than 220.

Characteristics of the Sample Used for the Item Tryout

Responses from the background data sheet administered in the item tryout (see Appendix B) permitted an analysis of the characteristics of the sample. Of the 220 surveys analyzed, 158 (72%) were from carpenter's union members, 52 (24%) were from laborer's union members, and ten respondents altered their survey so their union membership information could not be identified. The age of the respondents ranged from 20 to 84 with a median age of 42. Eighty-eight percent of the respondents stated that they usually work commercial construction. Thirty-nine percent of the respondents stated that they usually work in residential construction. Thirty-nine percent of the sample reported that they usually work in road/highway/bridge/tunnel construction. Twenty-six percent responded that they usually work in demolition. The sum of these percentages far exceed 100% because the respondents often marked more than one type of construction as their usual type of work. Only 10 of 220 respondents identified themselves as female.

Respondents were asked to rate their present hearing. Twenty-nine percent of the respondents stated that their hearing was perfect. Forty-one percent indicated that they had a very minor hearing loss. Twenty-eight percent indicated that they had a moderate hearing loss. Two percent indicated that they had a severe hearing loss.

Analyses to Develop the Final Forms of Each Scale

Items were arranged into 12 substantive items sets and one random response item set. Coefficient alpha was calculated separately for each item set. Item scale-total correlations were used to identify the items which contributed most to scale homogeneity. Such items were then divided into two forms. For each scale and each form separately, iterative alpha analyses were conducted until the alpha reliabilities, and scale means and standard deviations for each form of a scale were approximately equal. In the item selection process, considerations of scale brevity, breadth, alpha reliability, and parallel forms reliability were balanced judgmentally. The item set labelled *Perceived barriers to preventive action - The wimp factor* was not highly related to the other perceived barrier item sets and was primarily related to the item set *Perceived susceptibility to hearing loss*. Thus, the wimp items were merged into the perceived susceptibility item set when developing scales.

Appendix C presents the scale statistics for each of the 11 remaining substantive scales. The items assigned to each form are presented as well as summary statistics for each form. The random response items for each form are also presented. Item analyses are inappropriate for random response scales and are not presented. The summary statistics indicate the number of respondents contributing to the item analysis for the scale form. The number of respondents varies somewhat across analyses due to missing data. The number of items in each form is presented and is shown to be constant across forms for a given scale. The scale means and standard deviations are presented.

When calculating scale scores, items responses were transformed, as needed, so that high scores represented behaviors or perceptions consistent with hearing conservation³. Thus, those who score high on the first two scales recognize their susceptibility to hearing loss and that a hearing loss has severe consequences. Those scoring high on the third scale perceive preventive action as effective. Those scoring high on the three barriers scales state that hearing protectors can be comfortable to wear, are less likely to agree that hearing protectors muffle important sounds, and consider hearing protectors convenient to use. Those scoring high on the behavioral intention scale state that they intend to wear hearing protectors. High scorers on the social norms scale have coworkers who wear hearing protectors. High scorers on the present and past behavior scales report wearing hearing protectors in the present and past. Those with high scores on the desire for greater hearing knowledge scale indicate that they would like more education concerning hearing conservation.

The two forms of each scale can be separately combined to yield two parallel instruments. Each instrument has 66 items assigned to substantive scales and four items assigned to a random

³ In Appendix C, the item responses from the italicized items did not require transformation. The item responses from the items in non-italicized text required transformation.

response scale. Based on survey administration time data collected during the item tryout, the average respondent will complete the survey in eleven minutes. Eighty percent of the respondents will complete the form in 15 minutes. The final forms of the scales are presented in Appendix D. This appendix also includes the background data sheet used in the administration of the final forms of the survey.

Reliability Evidence for the Scales

Appendix C presents the reliability statistics for the 11 substantive scales. Reliability statistics describe the degree to which the scales are free of random error. The greater the reliability, the more accurate are the scale scores. Three types of reliability data are presented: Alpha, parallel-forms, and test-retest. Each of these types of reliability data address the accuracy of the scales from different perspectives.

Alpha reliability is a measure of the internal consistency of the scale. The high alpha reliability for each scale indicates that the items in each scale are highly related to each other and provide substantially redundant information. This redundancy permits one to place great confidence in the accuracy of the scale scores.

A parallel forms reliability coefficient estimates the extent to which two forms of the same scale measure the same content area. It is calculated by correlating the two form scores for each scale. The high parallel forms reliabilities for each scale indicates that the two forms of each scale assess the same content and are interchangeable.

An additional statistic presented, related to the parallel forms reliability, is the correlation between the form scores corrected for measurement error⁴. This coefficient assesses the relationship between the two forms at the construct level.⁵ These coefficients are extremely high which provide additional support for the assertion that the two forms of each scale measure the same construct.

A test-retest reliability coefficient assesses the stability of scores over time. Two estimates of test-retest reliability are available. As part of Phase II, the final forms of the survey were readministered to a subsample of the respondents who participated in the item tryout. The time period between the two testings was approximately nine weeks. In Phase III, the final forms of the survey were administered twice to a new sample.⁶ The time period between the two testings in Phase III was approximately two weeks.

The test-retest reliabilities for the two-week time interval are of acceptable magnitude for both forms of all scales. For the nine-week testing interval, the test-retest reliabilites for the scales

⁴ The measurement error statistics used for this correction were the alpha reliabilities for the forms of the given scale.

⁵ Scales are said to be measures of constructs or latent variables when the measurement is free of measurement error.

⁶ Of the 500 surveys administered by mail in Phase III, 99 respondents returned the first wave of surveys for a response rate of 20%. We suggest that this response rate is lower than that obtained in the item pool tryout (a 33% response rate) because of the differing times of the year. The item tryout was administered during the winter months when many construction workers were unemployed or underemployed and thus may have had more free time in which to complete the survey. The Phase III test-retest was administered in the late Spring and early summer when construction workers tend to be very busy and thus might have less time to complete the survey.

In Phase III, of the 99 respondents who completed the first testing, 80 returned the second testing. Of these 80 respondents, 5 respondents were dropped from the analysis sample because they appeared to be random responders on at least one scale administration. This makes the analysis sample size for the test -retest reliability (with the two week interval) to be 75. Scattered unanswered items occasionally reduces the number of respondents for a given test-retest coefficient to be less than 75.

are acceptable with the exception of the two forms of the scale *Perceived severity of consequences*. For this scale, the test-retest reliabilities of the two forms are .32 and .09. We suggest that the perceived severity of consequences of hearing loss is not a stable belief over a nine week period for these respondents. That is, these respondents changed their mind concerning the severity of consequences of hearing loss. The mean scores showed little change (Form 1: 28.9 vs. 29.3; Form 2: 29.4 vs 29.8) indicating that there was not a systematic change in one direction. Some people changed their belief to perceive more severe consequences while others changed their belief to perceive less severe consequences. Future research should reexamine the test-retest reliability of this scale to determine if it truly has low temporal stability over a nine week period or whether the observed low temporal stability was due to random or systematic sampling error in the item tryout.

As would be expected, the test-retest reliabilities for the two week time interval are larger in most all scales (19 of 22) than the test-retest reliabilities for the 9-week time interval. Longer time periods provide more opportunity for score change.

Validity Evidence for the Scales

The validity of a scale concerns the confidence one may place in inferences drawn from scale scores. Validity evidence can be classified into three interrelated types: Content, criterion-related, and construct.

Content Validity

The hearing conservation scales are intended primarily to be criterion in the evaluation of hearing conservation interventions. By criterion, we mean that the scores on the scales will be examined to assess the extent to which the hearing conservation intervention affects the intervention participants' attitudes concerning hearing conservation. The validity of a criterion is primarily assessed by content validity. A scale is content valid to the extent that one can present logical arguments that the scale assesses that which it is intended to measure. We offer that any reasonable person reviewing the scales would agree that the scales measure the domain they were designed to assess. For example, consider the scale *Perceived barriers to preventive action: Comfort* and a few of its items:

- Even well-fitted hearing protectors can be uncomfortable.
- Hearing protectors place uncomfortable pressure on my ears.
- I don't like the pressure that hearing protectors place on my ears.

Clearly, the items measure the intended content area and thus have content validity.

Criterion-related Validity

Evidence for the criterion-related validity of a scale is garnered when the scale is correlated with a criterion. For example, Graduate Record Examination (GRE) scores have criterion-related validity to the extent that they predict the criterion of graduate school grades. Criterion-related validity evidence may be classified into two types: predictive and concurrent. A scale shows predictive validity when the scale, measured at one point in time, predicts a criterion measured at a later point in time. For example, a scale measuring behavioral intentions to wear hearing protectors would be expected to predict hearing loss in the future. In a concurrent validity paradigm, both the scale and the criterion are measured at the same time.

Table 2 presents concurrent validity evidence for the hearing conservation scales by detailing the correlation between each scale and self-reported hearing loss. These analyses are based on the 220 respondents in item tryout analysis sample. The column labelled *operational population coefficient* is the proper coefficient to interpret.⁷ In these analyses, the scales serve as

⁷ The operational population correlation is the observed correlation corrected for measurement error in the single item hearing loss scale. A reliability of .89 was employed. For information on the reliability of the hearing loss item, see the report section titled "Reliability of Hearing Loss Variables."

predictors and the hearing loss item serves as the criterion. Two scales were positively associated with hearing loss. Those who reported hearing loss were more likely to perceive susceptibility to hearing loss and were more likely to seek more education concerning hearing loss.

Seven scales were negatively related to hearing loss. Those who perceived benefits to preventive action were likely to have good hearing. Those who found hearing protectors to be comfortable to wear and who were not concerned about hearing protectors muffling important sounds tended to have good hearing. Those who found hearing protectors convenient to wear reported good hearing. Likewise, those who have typically worn hearing protectors in the past, who wear hearing protection in the present, and whose coworkers usually wear hearing protectors report good hearing.

To assess the joint contribution of the substantive scales for predicting concurrent hearing loss, a multiple regression equation was calculated. The single item hearing loss scale served as the dependent variable. The eleven substantive scales served as the independent variables. Given sample size restrictions, no interaction terms were considered. The multiple R was .43. This level of prediction is likely to be an overestimate of the predictive value due to capitalization on sampling error.

No predictive validity evidence has been collected for these scales. Should such data be collected in the future, we expect some of the predictive validity coefficients to be different from the concurrent validity coefficients. Consider the scale designed to measure perceived susceptibility to hearing loss. In the concurrent validity data shown in Table 2, those who presently have hearing loss also exhibit attitudes indicating likely susceptibility to hearing loss. In other words, those who have a hearing loss know that they can suffer a hearing loss. In a predictive validity analysis, one would expect the sign of the correlation to reverse. Specifically, those who, at present, believe that they are susceptible to hearing loss are likely to take action to reduce the probability of hearing loss. Thus, in the future, these individuals would be expected to have better hearing, on average, than those who, at present, do not believe that they are susceptible to hearing loss.

Construct Validity

Construct validity evidence is generated when one shows that a measure has reasonable correlates with other measures. The concurrent criterion-related validities discussed above could also be cited as evidence supporting construct validity. Those data are construct validity evidence in that the scales are shown to have reasonable correlates with the hearing loss item.

Table 2

Hearing Conservation Attitude Survey Scale Correlates of Hearing Loss⁸

Scales	Operational Population Correlation	Correlation Coefficient
Perceived susceptibility to hearing loss	.19	.18
Perceived severity of consequences of hearing loss	.00	.00
Perceived benefits of preventive action	-.12	-.11
Perceived barriers to preventive action: Comfort	-.14	-.13
Perceived barriers to preventive action: Muffle important sounds	-.18	-.17

⁸ The operational population correlation is the observed correlation corrected for measurement error in the single item hearing loss scale. A reliability of .89 was employed. For information on the reliability of the hearing loss item, see the report section titled "Reliability of Hearing Loss Variables."

Perceived barriers to preventive action: Inconvenience	-.19	-.18
Behavioral intentions	-.04	-.04
Social norms	-.20	-.19
Present behavior	-.11	-.10
Past behavior	-.22	-.21
Desire for greater hearing knowledge	.24	.23

Demographic and Type of Work Correlates of Hearing Loss

Table 3 presents demographic correlates of hearing loss. These analyses are based on the 220 respondents in item tryout analysis sample. The column labelled *operational population coefficient* is the proper coefficient to interpret.⁸ Age is the best predictor of hearing loss. Older workers report more hearing loss than younger workers. Sex is largely unrelated to hearing loss. However, the limited number of females in the sample limits the ability of sex to correlate with any other variable. Those in commercial and residential construction report slightly worse hearing than those not so employed. Those in road/ highway/bridge/tunnel construction report slightly better hearing than those not so employed. There is no relation between working in demolition and hearing loss. However, the analyses of type of construction work performed may be somewhat distorted by the unequal distribution of age across types of employment. Commercial and residential construction workers are somewhat older (46 and 48 years old) than workers in the other two types of construction (43 and 43 years old).

Table 3
Demographic and Type of Work Correlates of Hearing Loss

Demographic and type of work variables	Operational Population Correlation	Correlation Coefficient
Age	.48	.45
Sex	.10	.09
Commercial construction	.27	.25
Residential construction	.15	.14
Road/Highway/Bridge Tunnel construction	-.18	-.17
Demolition	.00	.00

Demographic Correlates of Scales

Table 4 presents the demographic correlates of the eleven substantive scales. These analyses are based on the 220 respondents in item tryout analysis sample. In general, the type of construction work performed has little relation to the first six scales which measure perceptions. For the behavioral intentions scale, those working in road/highway/bridge/ tunnel construction and those in demolition work, have behavioral intentions consistent with hearing conservation. For the social norms scale, commercial and residential construction workers report that their coworkers generally do not wear hearing protectors. In contrast, those who work road/highway/bridge/ tunnel construction report that their coworkers usually wear hearing protection. For both present and past behavior, those who work in road/highway/bridge/tunnel construction as well as demolition, tend

to report present and past behavior consistent with hearing conservation. The desire for greater hearing knowledge is unrelated to type of work typically performed.

Overall, those working in commercial and residential construction have attitudes which are the most inconsistent with hearing conservation. Those who work demolition have attitudes which support hearing conservation. Those workers in road/highway/bridge/tunnel construction have the strongest attitudes in support of hearing conservation. These attitudinal data are very consistent with the correlates of self-reported hearing loss reported in Table 3. In that analysis, commercial and construction workers reported the most hearing loss, demolition work was unrelated to hearing loss, and road/highway/bridge/tunnel workers reported the least hearing loss. These data argue that, at least for this sample, hearing conservation efforts are most needed for commercial and residential construction workers.

Age provided fairly consistent correlations with the attitude scales. Younger workers showed attitudes that were supportive of hearing conservation. Older workers had less supportive attitudes.

Table 4

Demographic Correlates of Scales

Scale variables	Demographic variables				
	Work Commercial Construction	Work Residential Construction	Work Road/Highway/ Bridge/Tunnel Construction	Work Demolition	Age
Scale Variables					
Perceived susceptibility to hearing loss	.08	.03	.04	.20	-.00
Perceived severity of consequences of hearing loss	.01	.04	.02	.08	-.06
Perceived benefits of preventive action	.03	.00	.04	.12	-.26
Perceived barriers to preventive action: Comfort	.03	-.06	.03	.18	-.07
Perceived barriers to preventive action: Muffle important sounds	-.02	-.14	.01	.05	-.12
Perceived barriers to preventive action: Inconvenience	-.05	-.09	.08	.11	-.08
Behavioral intentions	-.06	-.04	.17	.14	-.12
Social norms	-.17	-.21	.25	.06	-.09
Present behavior	-.07	-.11	.18	.11	-.12
Past behavior	-.14	-.12	.23	.08	-.17
Desire for greater hearing knowledge	-.01	.08	.06	.08	.11

Reliability of Hearing Loss Variables

The background data sheet used in the item tryout administration contained this background question:

4. How would you rate your hearing? (circle one)
 - a. My hearing is perfect
 - b. I have a very minor hearing loss
 - c. I have a moderate hearing loss
 - d. I have a severe hearing loss

The retest survey administration that concluded Phase II and the survey administrations conducted in Phase III included that item plus an additional four items. (See Appendix D for a listing of all five hearing loss items.) The five item scale has an internal consistency reliability of .93. The original hearing item (Item 4 above) has a test-retest reliability of .89.

Recommendation for Use of Random Response Scale

For all analyses reported, we excluded the data from those who responded to more than one random response item with a response of *agree* or *strongly agree*. For all items in the random response scales, a response of *disagree* or *strongly disagree* is the appropriate answer. A few of the respondents used the response option *neither agree nor disagree*. Although a disagree response is preferred, it is not unreasonable for a person to respond *neither agree nor disagree* when presented with an unusual item such as one from the random response set. Thus, we did not consider such a response as aberrant.

We suggest that users of the survey may wish to use our cutoff rule defining a random responder as one who answers inappropriately to more than one of the random response items. However, those researchers who have substantial sample sizes may wish to exclude data from any respondent who answers more than zero of the random response items inappropriately.

Data file documentation

The documentation for the data files is contained in Appendix E. The diskette provided to NIOSH contains all data collected for the project. Names and addresses of the respondents have been stripped from the data files.

Summary

This report has documented the development and validation of a survey to assess attitudes toward hearing conservation. The survey meets NIOSH requirements for the survey to be self-administered accurately to those who are functionally literate, to have a short administration time, and to be available in two equivalent forms. The survey assesses attitudes in 11 substantive areas. Each area is assessed by a scale with proven reliability. All scales have content validity and several lines of evidence support the scales' criterion-related and construct validity.

Appendix A
Item Pool Used in Item Tryout

Perceived susceptibility to hearing loss

- A1. Exposure to noise at work may damage my hearing.
- A2. Exposure to loud machinery at work will damage my hearing.
- A3. Exposure to loud machinery at work may damage my hearing.
- A4. Exposure to noise at work will damage my hearing.

- A5. *My hearing is not hurt by exposure to loud noises at work.*
- A6. *Exposure to loud machinery and equipment noises at work will not damage my hearing.*
- A7. *My hearing is not hurt by exposure to loud machinery and equipment noises at work.*
- A8. *Exposure to loud noises at work will not damage my hearing.*

- A9. Exposure to loud machinery and equipment noise would eventually damage my hearing.
- A10. My hearing may suffer from exposure to loud machinery and equipment noises.
- A11. My hearing will suffer from exposure to loud machinery and equipment noises.
- A12. Exposure to loud machinery and equipment noise might eventually damage my hearing.

- A13. *I expect my hearing to be fine even after years of exposure to loud noises at work.*
- A14. *I know my hearing will be good even after years of exposure to loud equipment.*
- A15. *I expect my hearing to be good even after years of exposure to loud equipment.*
- A16. *I know my hearing will be fine even after years of exposure to loud noises at work.*

- A17. Over time one's hearing will be damaged due to loud noises at work.
- A18. Over time one's hearing could suffer due to loud machinery noises at work.
- A19. Over time one's hearing will be damaged due to loud machinery noises at work.
- A20. Over time one's hearing could suffer due to loud noises at work.

- A21. *I can work near loud noise without hurting my hearing.*
- A22. *Working around noisy equipment will not damage hearing.*
- A23. *I can work around noisy equipment without hurting my hearing.*
- A24. *Working near loud noises will not damage my hearing.*

- A25. I expect to lose much of my hearing because of exposure to loud noises at work.
- A26. I might damage my hearing because of my exposure to loud machinery noise.
- A27. I expect to damage my hearing because of my exposure to loud machinery noise.
- A28. I might lose much of my hearing because of exposure to loud noises at work.

- A29. Daily exposure to loud noise will eventually damage my hearing.
- A30. Daily exposure to loud machinery and equipment may eventually damage my hearing.
- A31. Daily exposure to loud machinery and equipment will eventually damage my hearing.
- A32. Daily exposure to loud noise may eventually damage my hearing.

- A33. *I can work near loud machinery without damage to my hearing.*
- A34. *I can probably work around noisy equipment without hurting my hearing.*
- A35. *I can work around noisy tools without hurting my hearing.*
- A36. *I can work near loud machinery with very little damage to my hearing.*

Perceived severity of consequences of hearing loss

- B1. A hearing loss would make every day of my life difficult.
- B2. A hearing loss might cause big problems in my life.
- B3. A hearing loss would cause big problems in my life.
- B4. A hearing loss might make my life difficult.

- B5. Damaged hearing would reduce the enjoyment of talking with friends.
- B6. Impaired hearing would make it difficult to have a conversation with friends.
- B7. Impaired hearing would reduce the enjoyment of talking with friends.
- B8. Damaged hearing would make it difficult to have a conversation with friends.

- B9. A hearing loss would cause me to avoid people.
- B10. I might be fairly isolated if I lost my hearing.
- B11. I would be fairly isolated if I lost my hearing.
- B12. A hearing loss might make me want to avoid people.

- B13. Losing part of my hearing would be a major problem.
- B14. A hearing loss would probably be a big inconvenience.
- B15. A hearing loss would be a big inconvenience.
- B16. Losing part of my hearing might become a big problem.

- B17. I would really suffer if I lost much of my hearing.
- B18. It would probably be bad to lose much of my hearing.
- B19. It would be very bad to lose much of my hearing.
- B20. I would probably suffer if I lost much of my hearing.

- B21. *I would enjoy life even if I lost most of my hearing.*
- B22. *Life would still be enjoyable even if I lost some of my hearing.*
- B23. *Life would be enjoyable even if I lost some of my hearing.*
- B24. *I would probably enjoy life even if I lost most of my hearing.*

- B25. It would definitely be a problem to lose my hearing.
- B26. I would dislike losing my hearing.
- B27. I would hate to lose my hearing.
- B28. It could be a big problem if I lost my hearing.

Perceived benefits of preventive action

- C1. Ear muffs will prevent hearing loss.
- C2. Ear plugs will keep me from losing my hearing.
- C3. Ear plugs will prevent hearing loss.
- C4. Ear muffs will keep me from losing my hearing.

- C5. Hearing protectors will prevent hearing loss.
- C6. Hearing protectors can help me maintain good hearing.
- C7. Hearing protectors can help prevent hearing loss.
- C8. Hearing protectors can usually prevent hearing loss.

- C9. *Ear muffs don't protect one from hearing loss.*
- C10. *Ear plugs are not effective in preventing hearing loss.*
- C11. *Ear plugs don't protect one from hearing loss.*
- C12. *Ear muffs are not effective in preventing hearing loss.*

- C13. I can save my hearing by wearing hearing protectors.
- C14. I can maintain good hearing if I wear hearing protectors.
- C15. I can prevent hearing loss by wearing hearing protectors.
- C16. I can keep my hearing if I wear hearing protectors.

- C17. *Hearing protectors seldom prevent hearing loss.*
- C18. *Hearing protectors don't offer much protection against hearing loss.*
- C19. *Hearing protectors never prevent hearing loss.*
- C20. *Hearing protectors do little to prevent hearing loss.*

- C21. I can save my hearing by wearing ear plugs or ear muffs.
- C22. I can maintain good hearing if I wear ear muffs or ear plugs.
- C23. I can prevent hearing loss by wearing ear plugs or ear muffs.
- C24. I can keep my hearing if I wear ear muffs or ear plugs.

- C25. Hearing protectors can be very effective in preventing hearing loss.
- C26. Hearing protectors work very well in preventing hearing loss.
- C27. Hearing protectors work well in preventing hearing loss.
- C28. Hearing protectors can be very useful in preventing hearing loss.

- C29. *Hearing protectors usually don't work.*
- C30. *Hearing protectors never work.*
- C31. *Hearing protectors seldom work.*
- C32. *Hearing protectors rarely work.*

- C33. Hearing protectors can help me retain my hearing.
- C34. My hearing can be saved through the use of hearing protectors.
- C35. Hearing protectors can assist me in retaining my hearing.
- C36. My hearing can be retained with hearing protectors.

Perceived barriers to preventive action - comfort

- D1. Hearing protectors can be adjusted to fit comfortably.
- D2. Hearing protectors usually fit comfortably.
- D3. Hearing protectors often need little adjustment to fit comfortably.
- D4. I can easily adjust my hearing protectors to fit comfortably.

- D5. *Hearing protectors seldom fit well.*
- D6. *It is difficult to get hearing protectors to fit well.*
- D7. *It is often hard to get hearing protectors to fit well.*
- D8. *Hearing protectors don't fit me very well.*

- D9. *Even well-fitted hearing protectors are uncomfortable.*
- D10. *Hearing protectors are uncomfortable no matter how you adjust them.*
- D11. *Hearing protectors can't be adjusted to make them comfortable.*
- D12. *Even well-fitted hearing protectors can be uncomfortable.*

- D13. *Hearing protectors place uncomfortable pressure on my ears.*
- D14. *I don't like the pressure that hearing protectors place on my ears.*
- D15. *Hearing protectors create uncomfortable pressure on my ears.*
- D16. *I don't like the pressure that hearing protectors create on my ears.*

- D17. *Hearing protectors cause my ears to get too warm.*
- D18. *My head sweats too much from ear muffs.*
- D19. *Hearing protectors often cause my ears to get too warm.*
- D20. *My head often sweats too much from ear muffs.*

Perceived barriers to preventive action - the wimp factor

- E1. Even rugged individuals need hearing protectors when near noisy machinery.
- E2. Strong workers have need to wear hearing protectors around loud equipment.
- E3. Even strong workers need to wear hearing protectors when near noisy machinery.
- E4. Rugged individuals need hearing protectors around loud equipment.

- E5. *Tough workers don't wear hearing protectors.*
- E6. *Rugged workers don't use hearing protectors.*
- E7. *Rugged workers don't wear hearing protectors.*
- E8. *Tough workers don't use hearing protectors.*

- E9. Even muscular workers need to wear hearing protectors when near loud equipment.
- E10. Wearing hearing protectors is never a sign of weakness.
- E11. Wearing hearing protectors is not a sign of weakness.
- E12. Muscular workers need to wear hearing protectors when near loud machinery.

- E13. *Wearing hearing protectors may be a sign of weakness.*
- E14. *Wearing hearing protectors could be a sign of weakness.*
- E15. *Wearing hearing protectors is often a sign of weakness.*
- E16. *Wearing hearing protectors is a sign of weakness.*

- E17. *You don't need hearing protectors once your ears get tough.*
- E18. *When your ears get tough, you don't need hearing protectors.*
- E19. *You usually don't need hearing protectors once your ears get tough.*
- E20. *When your ears get tough, you usually don't need hearing protectors.*

Perceived barriers to preventive action - muffle important sounds

- F1. *I can't listen for problems with my equipment if I wear hearing protectors.*
- F2. *I can't hear problems with my tools and machinery if I wear hearing protectors.*
- F3. *I can't listen for problems with my tools and machinery if I wear hearing protectors.*
- F4. *I can't hear problems with my equipment if I wear hearing protectors.*

- F5. *Hearing protectors keep me from listening for problems with my equipment.*
- F6. *Hearing protectors limit my ability to hear problems with my tools and machinery.*
- F7. *Hearing protectors keep me from listening for problems with my tools and machinery.*
- F8. *Hearing protectors limit my ability to hear problems with my equipment.*

- F9. *I can't hear my coworkers when I wear hearing protectors.*
- F10. *It is often hard to hear my coworkers when I wear hearing protectors.*
- F11. *It is hard to hear my coworkers when I wear hearing protectors.*
- F12. *I often can't hear my coworkers when I wear hearing protectors.*

- F13. *I can't hear warning signals when I wear hearing protectors.*
- F14. *It is often hard to hear warning signals when I wear hearing protectors.*
- F15. *It is hard to hear warning signals when I wear hearing protectors.*
- F16. *I often can't hear warning signals when I wear hearing protectors.*

Perceived barriers to preventive action - inconvenience

- G1. *It is often inconvenient to wear hearing protectors.*
- G2. *Wearing hearing protectors is often inconvenient.*
- G3. *Often it is inconvenient to wear hearing protectors.*
- G4. *Wearing hearing protectors is usually inconvenient.*

- G5. *Wearing hearing protectors is often a hassle.*
- G6. *Hearing protectors are often a nuisance.*
- G7. *Wearing hearing protectors is often annoying.*
- G8. *Hearing protectors are usually a nuisance.*

- G9. *Hearing protectors are often aggravating to wear.*
- G10. *Hearing protectors are usually annoying to wear.*
- G11. *Hearing protectors are usually aggravating to wear.*
- G12. *Hearing protectors are often annoying to wear.*

Behavioral intentions

- H1. *I do not intend to wear hearing protectors near loud noises.*
- H2. *I do not intend to wear hearing protectors when I work near loud tools or equipment.*
- H3. *I do not intend to wear hearing protectors near loud tools or equipment.*
- H4. *I do not intend to wear hearing protectors when I work near loud noises.*

- H5. *I intend to wear hearing protection every time I work near loud noises.*
- H6. *I intend to wear hearing protection every time I work with loud tools or equipment.*
- H7. *I plan to wear hearing protection almost every time I work with loud tools or equipment.*
- H8. *I plan to wear hearing protection almost every time I work near loud noises.*

- H9. *I won't wear hearing protectors near loud noises.*
- H10. *I won't wear hearing protectors when I work near loud machinery.*
- H11. *I won't wear hearing protectors near loud machinery.*
- H12. *I won't wear hearing protectors when I work near loud noises.*

Social norms

- I1. *Few of my coworkers want to wear hearing protectors.*
- I2. *Few of my coworkers wear hearing protectors.*
- I3. *My coworkers don't usually wear hearing protectors.*
- I4. *My coworkers often avoid wearing hearing protectors.*

- I5. *Most of my coworkers wear hearing protectors around loud tools or equipment.*
- I6. *Most of my coworkers wear hearing protectors around noisy machinery.*
- I7. *Most of my coworkers wear hearing protectors around noise.*
- I8. *Most of my coworkers wear hearing protectors around noisy equipment.*

- I9. *Almost none of the people I work with wear hearing protectors.*
- I10. *Few of the people I work with wear hearing protectors.*
- I11. *Almost none of my coworkers wear hearing protectors.*
- I12. *Few of my coworkers wear hearing protectors.*

- I13. *Most people I work with usually wear hearing protectors around loud tools or equipment.*
- I14. *Almost all the people I work with wear hearing protectors around noisy machinery.*
- I15. *Most people I work with usually wear hearing protectors around noisy machinery.*
- I16. *Almost all the people I work with wear hearing protectors around loud tools or equipment.*

- I17. *When off work my coworkers seldom wear hearing protectors around loud noise.*
- I18. *Few of my coworkers wear hearing protectors when near loud noise at home.*
- I19. *When off work few of my coworkers wear hearing protectors around loud noise.*
- I20. *My coworkers seldom wear hearing protectors when near loud noise at home.*

Present behavior

- J1. I wear hearing protectors whenever I work around loud noises.
- J2. I usually wear hearing protectors whenever I work around noisy machinery.
- J3. I wear hearing protectors whenever I work around noisy machinery.
- J4. I usually wear hearing protectors whenever I work around loud noises.

- J5. *I seldom wear hearing protectors when I work around loud noises.*
- J6. *I seldom wear hearing protectors when I work around noisy machinery.*
- J7. *I don't wear hearing protectors when I work around noisy machinery.*
- J8. *I don't wear hearing protectors when I work around loud noises.*

- J9. Recently I have worn hearing protectors when I work around loud noises.
- J10. Lately I have worn hearing protectors when I work with noisy tools or equipment.
- J11. Recently I have worn hearing protectors when I work with noisy tools or equipment.
- J12. Lately I have worn hearing protectors when I work around loud noises.

- J13. *Recently I have not worn hearing protectors when I work around loud noises.*
- J14. *Lately I have not worn hearing protectors when I work with noisy tools or equipment.*
- J15. *Recently I have not worn hearing protectors when I work with noisy tools or equipment.*
- J16. *Lately I have not worn hearing protectors when I work around loud noises.*

- J17. *I don't wear hearing protectors when near loud noise at home.*
- J18. *When off work I seldom wear hearing protectors around loud noise.*
- J19. *I seldom wear hearing protectors when near loud noise at home.*
- J20. *When off work I don't wear hearing protectors around loud noise.*

- J21. *I often need to be reminded to wear hearing protectors.*
- J22. *People need to remind me to wear hearing protection.*
- J23. *I need to be reminded to wear hearing protectors.*
- J24. *People often need to remind me to wear hearing protection.*

Past behavior

- K1. *I have never worn hearing protectors when I worked around loud noises.*
K2. *I have seldom worn hearing protectors when I worked around noisy machinery.*
K3. *I have never worn hearing protectors when I worked around noisy machinery.*
K4. *I have seldom worn hearing protectors when I worked around loud noises.*
- K5. In the past I have worn hearing protectors when I work around loud noises.
K6. In the past I usually wore hearing protectors when I worked with noisy tools or equipment.
K7. In the past I have worn hearing protectors when I work with noisy tools or equipment.
K8. In the past I have usually worn hearing protectors when I work around loud noises.
- K9. *In the past I have never worn hearing protectors when I worked around loud noises.*
K10. *In the past I have seldom worn hearing protectors when I worked around noisy machinery.*
K11. *In the past I have never worn hearing protectors when I worked around noisy machinery.*
K12. *In the past I have seldom worn hearing protectors when I worked around loud noises.*
- K13. For several years I have worn hearing protectors when I work around loud noises.
K14. For several years I usually wore hearing protectors when near noisy tools or equipment.
K15. For several years I have worn hearing protectors when near noisy tools or equipment.
K16. For several years I have usually worn hearing protectors when I work around loud noises.
- K17. *In the past I haven't worn hearing protectors when near loud noise at home.*
K18. *For several years I have not worn hearing protectors off the job when around loud noise.*
K19. *In the past I seldom wore hearing protectors when near loud noise at home.*
K20. *In past years I have seldom worn hearing protectors off the job when near loud noise.*

Desire for greater hearing knowledge

- L1. I would like to know more about hearing loss.
- L2. I would like to know more about ways to keep my hearing.
- L3. I want to know more about hearing loss.
- L4. I want to know more about ways to keep my hearing.

- L5. I wish I had more education concerning hearing protection.
- L6. I would like some safety training on hearing protection.
- L7. I would like more education concerning hearing protection.
- L8. I want more safety training on hearing protection.

Random response

- M1. I have my hearing checked about once a week.
- M2. I own twenty types of hearing protectors.
- M3. I own ten books describing hearing protectors.
- M4. I received hearing protectors as a birthday present.
- M5. Most hearing protectors cost thousands of dollars.
- M6. I can hear a fly buzzing over one block away.
- M7. Steel-toe shoes are a good hearing protector.
- M8. I can hear a car engine two miles away.
- M9. I wear hearing protectors when I am watching television.
- M10. I can hear a jackhammer two miles away.

Appendix B
Background Data Sheet Used in Item Tryout

Attitudes Toward Hearing Conservation

Id: _____

Thank you for agreeing to assist in this project. The National Institute for Occupational Health and Safety (NIOSH) has contracted with Curry Business Systems, Inc. to prepare a survey of attitudes toward hearing conservation. You will be completing a draft of the survey today. When the survey is finalized, NIOSH will use it when evaluating hearing conservation training programs for construction workers. Your cooperation in completing this survey will assist in developing the final survey.

The survey that you will complete today is four times as long as the final survey. The additional questions are included so that we can determine which questions are best for the final form of the survey. Many of the questions are similar to other items. We include many questions on the same topic to help determine which questions are best.

Many of the survey items refer to hearing protectors. As you might know, hearing protectors are devices worn over the ears or in the ears in an attempt to protect a worker's ear from damage when the worker is exposed to loud machinery noise. Some hearing protectors that cover the ears are called ear muffs. Other hearing protectors that are worn inside the ear are called ear plugs.

1. Please check the types of construction work that you usually do. Check all that apply:

- ☐ Commercial construction
- ☐ Residential construction
- ☐ Road/Highway/Bridge/Tunnel construction
- ☐ Demolition

2. What is your age: _____

3. What is your sex: _____

4. How would you rate your hearing? (circle one):

- a. My hearing is perfect
- b. I have a very minor hearing loss
- c. I have a moderate hearing loss
- d. I have a severe hearing loss

Appendix D

Background Data Sheet and Final Forms of The Survey

Background Questionnaire

1. Please check the types of construction work that you usually do. Check all that apply:

- ☐ Commercial construction
- ☐ Residential construction
- ☐ Road/Highway/Bridge/Tunnel construction
- ☐ Demolition

2. What is your age: _____

3. What is your sex: _____

4. How would you rate your hearing? (circle one)

- a. My hearing is perfect
- b. I have a very minor hearing loss
- c. I have a moderate hearing loss
- d. I have a severe hearing loss

5. How often do you have difficulty in hearing? (circle one)

- a. Very often
- b. Sometimes
- c. Very rarely
- d. Never

6. How often do you have trouble hearing a speaker at a public gathering? (circle one)

- a. Very often
- b. Sometimes
- c. Very rarely
- d. Never

7. How often do you have trouble understanding speech in face-to-face conversation? (circle one)

- a. Very often
- b. Sometimes
- c. Very rarely
- d. Never

8. How often do you have trouble understanding speech on a telephone? (circle one)

- a. Very often
- b. Sometimes
- c. Very rarely
- d. Never

Attitudes Toward Hearing Conservation

Form 1

Id: _____

Instructions: Circle the number which best describes your level of agreement with the statement.

Example:

1. I would like to keep my hearing.

<i>Strongly Agree</i>	<i>Agree</i>	<i>Neither Agree Nor Disagree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
1	2	3	4	5

In this example, the number "1" was circled because the worker strongly agreed with the statement.

Many of the statements refer to hearing protectors. As you might know, hearing protectors are devices worn over the ears or in the ears in an attempt to protect a worker's ear from damage when the worker is exposed to loud machinery noise. Some hearing protectors that cover the ears are called ear muffs. Other hearing protectors that are worn inside the ear are called ear plugs.

Please read each item and circle the number which best describes your level of agreement with the statement.

	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neither Agree Nor Disagree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
1. Exposure to loud machinery and equipment noise would eventually damage my hearing.	1	2	3	4	5
2. Hearing protectors cause my ears to get too warm.	1	2	3	4	5
3. Hearing protectors seldom prevent hearing loss.	1	2	3	4	5
4. Lately I have worn hearing protectors when I work with noisy tools or equipment.	1	2	3	4	5
5. When off work my coworkers seldom wear hearing protectors around loud noise.	1	2	3	4	5
6. I don't wear hearing protectors when near loud noise at home.	1	2	3	4	5
7. In the past I have seldom worn hearing protectors when I worked around noisy machinery.	1	2	3	4	5
8. Working near loud noises will not damage my hearing.	1	2	3	4	5
9. I would like to know more about hearing loss.	1	2	3	4	5

	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neither Agree Nor Disagree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
10. I usually wear hearing protectors whenever I work around noisy machinery.	1	2	3	4	5
11. I have my hearing checked about once a week.	1	2	3	4	5
12. Hearing protectors do little to prevent hearing loss.	1	2	3	4	5
13. I can work near loud machinery without damage to my hearing.	1	2	3	4	5
14. In the past I have usually worn hearing protectors when I work around loud noises.	1	2	3	4	5
15. I do not intend to wear hearing protectors near loud noises.	1	2	3	4	5
16. I might be fairly isolated if I lost my hearing.	1	2	3	4	5
17. Hearing protectors are often aggravating to wear.	1	2	3	4	5
18. I can work near loud machinery with very little damage to my hearing.	1	2	3	4	5
19. I would like to know more about ways to keep my hearing.	1	2	3	4	5
20. Losing part of my hearing would be a major problem.	1	2	3	4	5
21. When your ears get tough, you usually don't need hearing protectors.	1	2	3	4	5
22. I would probably suffer if I lost much of my hearing.	1	2	3	4	5
23. Even well-fitted hearing protectors can be uncomfortable.	1	2	3	4	5
24. I know my hearing will be fine even after years of exposure to loud noises at work.	1	2	3	4	5
25. Impaired hearing would reduce the enjoyment of talking with friends.	1	2	3	4	5
26. I own twenty types of hearing protectors.	1	2	3	4	5
27. I wish I had more education concerning hearing protection.	1	2	3	4	5
28. Hearing protectors work very well in preventing hearing loss.	1	2	3	4	5
29. Exposure to loud noises at work will not damage my hearing.	1	2	3	4	5
30. I can't hear problems with my tools and machinery if I wear hearing protectors.	1	2	3	4	5
31. Hearing protectors usually don't work.	1	2	3	4	5

	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neither Agree Nor Disagree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
32. Damaged hearing would reduce the enjoyment of talking with friends.	1	2	3	4	5
33. I won't wear hearing protectors when I work near loud noises.	1	2	3	4	5
34. Few of the people I work with wear hearing protectors.	1	2	3	4	5
35. I own ten books describing hearing protectors.	1	2	3	4	5
36. I can't listen for problems with my equipment if I wear hearing protectors.	1	2	3	4	5
37. I do not intend to wear hearing protectors when I work near loud tools or equipment.	1	2	3	4	5
38. A hearing loss would make every day of my life difficult.	1	2	3	4	5
39. Hearing protectors are uncomfortable no matter how you adjust them.	1	2	3	4	5
40. It is often inconvenient to wear hearing protectors.	1	2	3	4	5
41. I have seldom worn hearing protectors when I worked around noisy machinery.	1	2	3	4	5
42. Hearing protectors limit my ability to hear problems with my tools and machinery.	1	2	3	4	5
43. Hearing protectors are usually annoying to wear.	1	2	3	4	5
44. I intend to wear hearing protection every time I work near loud noises.	1	2	3	4	5
45. Most of my coworkers wear hearing protectors around loud tools or equipment.	1	2	3	4	5
46. I can't hear warning signals when I wear hearing protectors.	1	2	3	4	5
47. Recently I have not worn hearing protectors when I work with noisy tools or equipment.	1	2	3	4	5
48. Most people I work with usually wear hearing protectors around loud tools or equipment.	1	2	3	4	5
49. Wearing hearing protectors is often a hassle.	1	2	3	4	5
50. In the past I usually wore hearing protectors when I worked with noisy tools or equipment.	1	2	3	4	5
51. I would like some safety training on hearing protection.	1	2	3	4	5

	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neither Agree Nor Disagree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
52. I plan to wear hearing protection almost every time I work with loud tools or equipment.	1	2	3	4	5
53. A hearing loss would be a big inconvenience.	1	2	3	4	5
54. Hearing protectors keep me from listening for problems with my equipment.	1	2	3	4	5
55. I can work around noisy tools without hurting my hearing.	1	2	3	4	5
56. You don't need hearing protectors once your ears get tough.	1	2	3	4	5
57. Ear plugs will keep me from losing my hearing.	1	2	3	4	5
58. For several years I have not worn hearing protectors off the job when around loud noise.	1	2	3	4	5
59. I might lose much of my hearing because of exposure to loud noises at work.	1	2	3	4	5
60. Almost all the people I work with wear hearing protectors around noisy machinery.	1	2	3	4	5
61. Recently I have not worn hearing protectors when I work around loud noises.	1	2	3	4	5
62. Wearing hearing protectors is often inconvenient.	1	2	3	4	5
63. Over time one's hearing will be damaged due to loud machinery noises at work.	1	2	3	4	5
64. I can hear a jackhammer two miles away.	1	2	3	4	5
65. Even well-fitted hearing protectors are uncomfortable.	1	2	3	4	5
66. Hearing protectors can help me maintain good hearing.	1	2	3	4	5
67. Hearing protectors can be adjusted to fit comfortably.	1	2	3	4	5
68. I can maintain good hearing if I wear hearing protectors.	1	2	3	4	5
69. I won't wear hearing protectors near loud noises.	1	2	3	4	5
70. Hearing protectors place uncomfortable pressure on my ears.	1	2	3	4	5

- | | | | | | | |
|----|---|---|---|---|---|---|
| 1. | I can't hear problems with my equipment if I wear hearing protectors. | 1 | 2 | 3 | 4 | 5 |
| 2. | My head often sweats too much from ear muffs. | 1 | 2 | 3 | 4 | 5 |
| 3. | Hearing protectors don't offer much protection against hearing loss. | 1 | 2 | 3 | 4 | 5 |
| 4. | I want to know more about ways to keep my hearing. | 1 | 2 | 3 | 4 | 5 |
| 5. | Most of my coworkers wear hearing protectors around noise. | 1 | 2 | 3 | 4 | 5 |
| 6. | Hearing protectors are usually aggravating to wear. | 1 | 2 | 3 | 4 | 5 |
| 7. | I don't wear hearing protectors when I work around loud noises. | 1 | 2 | 3 | 4 | 5 |
| 8. | Impaired hearing would make it difficult to have a conversation with friends. | 1 | 2 | 3 | 4 | 5 |
| 9. | I can probably work around noisy equipment without hurting my hearing. | 1 | 2 | 3 | 4 | 5 |

	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neither Agree Nor Disagree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
10. I plan to wear hearing protection almost every time I work near loud noises.	1	2	3	4	5
11. My coworkers don't usually wear hearing protectors.	1	2	3	4	5
12. It is often hard to hear warning signals when I wear hearing protectors.	1	2	3	4	5
13. I want to know more about hearing loss.	1	2	3	4	5
14. Steel-toe shoes are a good hearing protector.	1	2	3	4	5
15. I seldom wear hearing protectors when I work around loud noises.	1	2	3	4	5
16. Daily exposure to loud machinery and equipment may eventually damage my hearing.	1	2	3	4	5
17. For several years I have worn hearing protectors when near noisy tools or equipment.	1	2	3	4	5
18. Hearing protectors keep me from listening for problems with my tools and machinery.	1	2	3	4	5
19. I do not intend to wear hearing protectors when I work near loud noises.	1	2	3	4	5
20. Almost none of my coworkers wear hearing protectors.	1	2	3	4	5
21. I have seldom worn hearing protectors when I worked around loud noises.	1	2	3	4	5
22. My hearing is not hurt by exposure to loud machinery and equipment noises at work.	1	2	3	4	5
23. I can't listen for problems with my tools and machinery if I wear hearing protectors.	1	2	3	4	5
24. I won't wear hearing protectors when I work near loud machinery.	1	2	3	4	5
25. I usually wear hearing protectors whenever I work around loud noises.	1	2	3	4	5
26. Wearing hearing protectors is often annoying.	1	2	3	4	5
27. Hearing protectors limit my ability to hear problems with my equipment.	1	2	3	4	5
28. You usually don't need hearing protectors once your ears get tough.	1	2	3	4	5

	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neither Agree Nor Disagree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
29. I can save my hearing by wearing hearing protectors.	1	2	3	4	5
30. Daily exposure to loud machinery and equipment will eventually damage my hearing.	1	2	3	4	5
31. For several years I have usually worn hearing protectors when I work around loud noises.	1	2	3	4	5
32. I can hear a car engine two miles away.	1	2	3	4	5
33. I want more safety training on hearing protection.	1	2	3	4	5
34. Most people I work with usually wear hearing protectors around noisy machinery.	1	2	3	4	5
35. Ear plugs are not effective in preventing hearing loss.	1	2	3	4	5
36. My hearing will suffer from exposure to loud machinery and equipment noises.	1	2	3	4	5
37. Few of my coworkers wear hearing protectors when near loud noise at home.	1	2	3	4	5
38. Hearing protectors are often annoying to wear.	1	2	3	4	5
39. Hearing protectors will prevent hearing loss.	1	2	3	4	5
40. It could be a big problem if I lost my hearing.	1	2	3	4	5
41. I won't wear hearing protectors near loud machinery.	1	2	3	4	5
42. I would like more education concerning hearing protection.	1	2	3	4	5
43. Lately I have worn hearing protectors when I work around loud noises.	1	2	3	4	5
44. Daily exposure to loud noise may eventually damage my hearing.	1	2	3	4	5
45. In the past I haven't worn hearing protectors when near loud noise at home.	1	2	3	4	5
46. Damaged hearing would make it difficult to have a conversation with friends.	1	2	3	4	5
47. When your ears get tough, you don't need hearing protectors.	1	2	3	4	5
48. I can hear a fly buzzing over one block away.	1	2	3	4	5
49. I can keep my hearing if I wear hearing protectors.	1	2	3	4	5

	<i>Strongly Agree</i>	<i>Agree</i>	<i>Neither Agree Nor Disagree</i>	<i>Disagree</i>	<i>Strongly Disagree</i>
50. I seldom wear hearing protectors when near loud noise at home.	1	2	3	4	5
51. A hearing loss might make my life difficult.	1	2	3	4	5
52. Exposure to loud machinery at work will damage my hearing.	1	2	3	4	5
53. Losing part of my hearing might become a big problem.	1	2	3	4	5
54. Hearing protectors often cause my ears to get too warm.	1	2	3	4	5
55. I can work around noisy equipment without hurting my hearing.	1	2	3	4	5
56. A hearing loss might cause big problems in my life.	1	2	3	4	5
57. My head sweats too much from ear muffs.	1	2	3	4	5
58. For several years I have worn hearing protectors when I work around loud noises.	1	2	3	4	5
59. I expect my hearing to be good even after years of exposure to loud equipment.	1	2	3	4	5
60. I do not intend to wear hearing protectors near loud tools or equipment.	1	2	3	4	5
61. I can prevent hearing loss by wearing hearing protectors.	1	2	3	4	5
62. I don't like the pressure that hearing protectors create on my ears.	1	2	3	4	5
63. Often it is inconvenient to wear hearing protectors.	1	2	3	4	5
64. My hearing can be saved through the use of hearing protectors.	1	2	3	4	5
65. I can easily adjust my hearing protectors to fit comfortably.	1	2	3	4	5
66. I intend to wear hearing protection every time I work with loud tools or equipment.	1	2	3	4	5
67. I wear hearing protectors when I am watching television.	1	2	3	4	5
68. A hearing loss would cause big problems in my life.	1	2	3	4	5
69. Wearing hearing protectors is usually inconvenient.	1	2	3	4	5
70. Hearing protectors usually fit comfortably.	1	2	3	4	5

Appendix E

Documentation on the Data Diskette Supplied to NIOSH

Documentation Concerning Data, Program, and Word Perfect Files

These three diskettes contain data, programs, and Word Perfect 5.1 files prepared under NIOSH Contract 211-93-0006, *Produce a survey to assess pre- and post-intervention the attitude of workers toward the use of occupational safety equipment and toward protecting themselves from occupational noise-induced hearing loss*. This data diskette was prepared by Curry Business Systems, Inc. Questions may be addressed to Michael A. McDaniel, (216) 686-7912.

The data set contains four ASCII data files:

PH2_1.DAT	This file contains survey responses from the initial administration of the survey. This administration is referred to as the "initial item tryout." Two 131 item surveys were administered. These data were collected as part of Phase II of the contract.
PH2_2.DAT	This file contains survey responses from the second administration of the survey during Phase II. Two 70 items surveys were administered. These surveys are the final forms of the surveys prepared under this contract. Sample members for this sample are a subset of the sample contributing data stored in PH2_1.DAT. A comparison of the responses stored in PH2_1.DAT with the responses for the same subjects stored in PH2_2.DAT permit the assessment of test-retest reliability.
PH3_1.DAT	This file contains survey responses from the first administration of the survey in Phase III. Two 70 items surveys were administered.
PH3_2.DAT	This file contains survey responses from the second administration of the survey in Phase III. Two 70 items surveys were administered. Sample members for this sample are a subset of the sample contributing data stored in PH3_1.DAT. A comparison of the responses stored in PH3_1.DAT with the responses for the same subjects stored in PH3_2.DAT permit the assessment of test-retest reliability.

The diskette contains nine SAS system files created in SAS 6.04 for DOS. The files are:

TEMP2_A.SSD	This SAS system file was created by SAS program file PH2_1.SAS. It reads the ASCII file PH2_1.DAT.
PH2_A.SSD	This SAS system file was created by SAS program file PH2_1.SAS. It reads the SAS system file TEMP2_A.SSD and deletes respondents who were judged to be random responders.
TEMP2_B.SSD	This SAS system file was created by SAS program file PH2_2.SAS. It reads the ASCII file PH2_2.DAT.
PH2_B.SSD	This SAS system file was created by SAS program file PH2_2.SAS. It reads the SAS system file TEMP2_B.SSD and deletes respondents who were judged to be random responders.
TEMP3_A.SSD	This SAS system file was created by SAS program file PH3_1.SAS. It reads the ASCII file PH3_1.DAT.
PH3_A.SSD	This SAS system file was created by SAS program file PH3_1.SAS. It reads the SAS system file TEMP3_A.SSD and deletes respondents who were judged to be random responders.

TEMP3_B.SSD	This SAS system file was created by SAS program file PH3_1.SAS. It reads the ASCII file PH3_2.DAT.
PH3_B.SSD	This SAS system file was created by SAS program file PH3_1.SAS. It reads the SAS system file TEMP3_B.SSD and deletes respondents who were judged to be random responders.
TRANSPORT.SAS	This file is in SAS transport format. It contains the other eight SAS system files. It was created using PROC CPORT in SAS for DOS 6.04.

The diskette contains four SAS program files in ASCII format:

PH2_1.SAS	This program reads the ASCII data file PH2_1.DAT and creates two SAS system files: TEMP2_A.SSD and PH2_A.SSD.
PH2_2.SAS	This program reads the ASCII data file PH2_2.DAT and creates two SAS system files: TEMP2_B.SSD and PH2_B.SSD.
PH2_3.SAS	This program reads the ASCII data files PH3_1.DAT and PH3_2.DAT and creates four SAS system files: TEMP3_A.SSD, PH3_A.SSD, TEMP3_B.SSD, and PH3_B.SSD.
CPORT.SAS	This programs transports all the SAS system files into a sequential file (TRANSPORT.SAS) in transport format.

Note that these SAS program files assume that all ASCII and SAS system files exist in a directory called 'C:\NIOSH\HEAR'. If the files are placed in a different subdirectory, one needs to edit the FILENAME and LIBNAME statements.

Recommendations of which data files to use:

1. If one seeks to conduct any structural equation modeling, I would recommend that one concatenate PH2_A.SSD with PH3_A.SSD. This would give one the maximum number of observations consisting of subjects who took the final survey items for the first time, excluding those who are likely to be random responders. One would restrict the analysis to those items contained in the final forms of the surveys.
2. If one seeks to obtain test-retest reliability data on items or scales, one should merge PH2_A.SSD with PH2_B.SSD. This would permit test-rest reliability analysis with an approximate nine-week time lag. Two-week time lag reliabilities can be calculated by merging PH3_A.SSD with PH3_B.SSD. This would give one the maximum number of observations excluding those who are likely to be random responders.

This diskette contains six files in Word Perfect 5.1 format for DOS:

INITIAL.F1	This is Form 1 of the survey administered in the initial item tryout. It contains 131 items.
INITIAL.F2	This is Form 2 of the survey administered in the initial item tryout. It contains 131 items.
FINAL.F1	This is Form 1 of the final survey. It contains 70 items.
FINAL.F2	This is Form 2 of the final survey. It contains 70 items.
FINAL.REP	This is the final contract report, excluding Appendix C.

APPENDIX.C

This is Appendix C of the final contract report.

Printer vary in their capacity to print documents as intended. These documents were designed to print on a Hewlett Packard Laserjet Series II printer. Fonts were provided by Facelift for Word Perfect.