

### III. Development of a Standard Questionnaire for Occupational Health Research

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#### *Desirability of a Standard Questionnaire*

The use of nationwide direct surveys is discussed by Ehrenberg in the previous chapter. Information from these surveys can be used to target prevention programs and can provide the normative or reference data for comparison with the results from smaller studies.

Direct worker surveys usually collect health history information using a questionnaire. In addition to questionnaires, certain tests of organ-system function (e.g., audiology, spirometric pulmonary function testing, and collection of blood or urine specimens) are commonly performed. Newer techniques such as computerized neurobehavioral testing have also been introduced into common use.<sup>1</sup> For many of these outcome variables, as for questionnaires, standard methods or protocols for the collection of data do not exist or have not received general adherence.

A standard questionnaire consists of a set of predetermined questions presented in a specific, unvarying order, which provides strict control over interviewer behavior.<sup>2</sup> Without such standardized methods, variation occurs both within and between studies because of differences in questionnaire content or format and differences in interviewer technique.<sup>3</sup> Unfortunately, most epidemiologic surveys that focus on specific morbid conditions in the workplace, whether performed by NIOSH, other government agencies, or other occupational health researchers, have not utilized a consistent standard questionnaire approach. Consequently, data obtained from separate surveys cannot be easily pooled, or even reliably compared. A standard questionnaire is being developed by NIOSH to facilitate the reproducibility of data collection and the pooling or comparison of data obtained from different surveys so that direct worker surveys can be used as a form of health surveillance among exposed populations.

#### *Development of a Questionnaire and Its Intended Use*

Several issues must be considered in developing such a standard questionnaire. First, the purpose of the questionnaire should be clearly specified. In the case of the NIOSH standard questionnaire, the questionnaire is seen as an essential tool in establishing among respondents the presence or absence of selected occupational diseases or work-related disorders (as defined by the World Health Organization<sup>4</sup>). Specific classes of conditions (Table 1) were selected, in part, because self-reported information can, in most circum-

stances, provide reasonably reliable indication of their presence. Furthermore, interviewees can provide meaningful, detailed information on the circumstances of certain important health events (such as acute traumatic injuries) in the recent past.

In addition to a history of specific medical symptoms and adverse health events, the questionnaire will provide important information on relevant demographic characteristics and personal habits that might act as independent risk factors, effect modifiers, or confounding factors in the development of occupational diseases or work-related disorders.<sup>5</sup> Finally, the questionnaire will be used to obtain a relevant occupational history including current and past occupation and industry and the potential for exposure to certain key, identifiable workplace hazards.

Experience with the use of previous standardized questionnaires has demonstrated the importance of specifying the intended purpose for such an instrument to avoid use in inappropriate situations. The large number of potential applications and users of a standard occupational health questionnaire makes this specification particularly important. The questionnaire to be described here is intended primarily for use in: 1) periodic medical evaluations of workers perceived to be at risk as a result of occupational exposures or hazards; and 2) group assessments of workers who participate in etiologic investigations such as epidemiologic studies or Health Hazard Evaluations (HHEs).

With respect to the first application, private industries often perform screening activities in which employees receive periodic medical evaluations; some of these are directed at detecting particular work-related conditions or outcomes, while others are more general. In some instances these periodic evaluations are mandated by regulatory agencies (e.g., the periodic monitoring of workers exposed to lead, cotton dust, and asbestos as prescribed in OSHA regulations). A standard questionnaire used for such routine screening might require minor modifications so that two instruments are used, one to obtain a broad set of baseline data and a second (generally briefer and more focused) to be administered subsequently to elicit interval changes in status.

Although etiologic investigations often consist of cross-sectional medical evaluations without subsequent follow-up, data from separate studies could be pooled through use of a standard questionnaire. Follow-up evaluations of the same population are greatly facilitated by repetitive use of a standard questionnaire.

The current questionnaire is not designed as a diagnostic tool for the clinical assessment of individual workers. The degree of sensitivity and specificity required to make indi-

NOTE: Author affiliations and addresses are listed on p. 7.

TABLE 1—Questionnaire Structure

I. Demographics
II. Occupational History
III. Brief Review of Systems and Past Medical History
IV. Personal Risk Factors and Environmental History
V. Conditions/Symptom-Complex Modules
a. Dermatoses
Irritative contact dermatitis, allergic contact dermatitis, defatting dermatitis, chloracne, and eczema.
b. Mucosal irritations of the eyes, nose, and throat
Mucosal and upper airway irritation and allergic responses associated with chemical agents and biologic agents.
c. Respiratory disorders
Chronic bronchitis, emphysema, asthma, chemically induced pulmonary edema, chemical pneumonitis, hypersensitivity pneumonitis, pneumoconiosis (e.g., silicosis, asbestosis, coal workers' pneumoconiosis, byssinosis), metal fume fever, and respiratory tract malignancies.
d. Cardiovascular disorders
e. Disorders associated with hepatotoxins
Jaundice and chemical hepatitis.
f. Renal diseases
Kidney stones, glomerulonephritis, and tubular disorders.
g. Musculoskeletal disorders
Low back pain syndrome (associated with sprains, strains, disc pathology, arthritis and degenerative joint disease). Repetitive trauma disorders of the hand/wrist (to include carpal tunnel syndrome, ulnar nerve compression, De Quervain's disease, degenerative joint disease/arthritis, trigger finger, and tenosynovitis).
h. Neurotoxic disorders
Peripheral neuropathy, toxic encephalopathy, and seizure disorders.
i. Noise-induced hearing loss
Noise-induced hearing loss/deafness and Meniere's syndrome.
j. Psychologic disorders
k. Infertility and adverse reproductive outcomes
Diminished fertility, spontaneous abortions, tubal pregnancies, stillbirths, prematurity/low birthweight, birth defects, mental retardation, and childhood cancers.
l. Acute injuries
Amputations, contusions, fractures/dislocations, lacerations, sprains, electric shocks, and effects of physical agents.

vidual diagnoses (on which to base treatment plans, for example) exceeds that needed for group assessments and would require detail that is impractical for an epidemiologic instrument. Standard questionnaire instruments may well be useful and desirable for this and other situations and would entail considerable overlap of question content, but the different use necessitates sufficiently different instruments so that no single questionnaire could adequately serve in all circumstances.

Finally, the manner of administering the questionnaire (i.e., self-administered versus interviewer-administered), the length of the questionnaire, and the structure and organization of the questionnaire are also relevant to appropriate application or use of the questionnaire. The current questionnaire is being developed as an interviewer-administered instrument and has a modular construction that incorporates a set of core questions for use in all administrations and a set of modules to be selected and employed as needed. This structure allows the investigator to adapt the questionnaire depending on time constraints, circumstances, and needs. Present modules are based on organ systems or on conditions associated with work-related problems (Table 1). Ultimately, exposure-based modules will be developed for use with workers who are exposed to selected specific agents (e.g., pesticides, solvents, or certain heavy metals) that produce toxic effects manifest in multiple organ systems.

#### Rationale for Inclusion of Conditions

A high priority for development of a module was assigned to conditions if they met the following criteria:

1. The condition or symptoms occur relatively frequently.
2. The attributable risk percentage of the condition or symptoms related to the workplace should be relatively high.

3. The presence (and severity) of the condition or symptoms should be readily and reliably identified using only questionnaire-generated data. It is recognized, however, that in many circumstances the questionnaire would be used in conjunction with diagnostic tests (e.g., pulmonary function tests, blood specimens, etc.).
4. With certain exceptions, the condition should appear on the NIOSH list of the 10 leading work-related diseases and injuries.<sup>6</sup> Although mucosal irritation of the eye, nose, and throat does not appear on the list of the 10 leading work-related diseases and injuries, these symptoms are included because they are extremely common complaints that are encountered frequently in NIOSH Health Hazard Evaluations and workplace investigations conducted by other researchers.
5. The condition should be perceived in the occupational health community as of relatively high importance.
6. The potential benefit of a NIOSH standard set of questions should be relatively great for research into the condition.

#### List of Target Conditions

The following 10 categories of work-related conditions to be included in the proposed questionnaire (Table 1) were chosen according to the rationale presented in the previous section, with particular attention paid to the NIOSH list of 10 leading work-related diseases and injuries and the list of sentinel health events (occupational).<sup>7</sup> The modules cover: 1) dermatologic conditions, 2) mucosal irritation of the eye, nose, and throat, 3) respiratory disorders, 4) hepatic conditions, 5) renal conditions, 6) musculoskeletal disorders, 7) neurotoxic disorders, 8) noise-induced hearing loss,

9) adverse reproductive outcomes, and 10) work-related injuries. In addition, modules will be created that address work-related cardiovascular disorders and work-related psychologic disorders.

#### Source of Questions

When possible, previously standardized or established questionnaires were used as starting points for the creation of modules and as sources of questions. The American Thoracic Society (ATS) Adult Questionnaire<sup>8</sup> was recommended for use because it is considered the standard for addressing respiratory symptoms. Minor modifications have been made in utilizing the ATS questionnaire to facilitate ease of questionnaire administration and to expand the information collected on asthma and other acute respiratory conditions. A set of ancillary questions is included to collect additional information on other specific respiratory conditions.

The Gallaudet Scale, a questionnaire instrument developed to assess functional hearing loss, is included because of its usefulness when audiometric testing is not practical or available. It has been well standardized<sup>9</sup> and was administered in the National Health Interview Survey in 1971 and 1977; these data have already contributed to occupational health surveillance.<sup>10</sup>

The section on the nervous system derives, in part, from a questionnaire developed in Sweden by Hogstedt, *et al*, to assess the prevalence of solvent-related symptoms in exposed workers.<sup>11</sup> This questionnaire was modified in research performed at Harvard University to adapt it to the American worker population and to include symptoms of peripheral nervous system dysfunction.<sup>12</sup>

For other portions of the questionnaire, when generally accepted models did not exist, the results of NIOSH research, additional questions derived directly from NIOSH investigations such as Health Hazard Evaluations and industry-wide studies, and the expertise of NIOSH Committee members were used.

#### Future Work

Although the basic content of each module has been established, several further stages of questionnaire development remain. These include: 1) refining of individual questions, 2) deciding on the final format of the instrument, and 3) pretesting and field-testing the questionnaire. When appropriate, input will be sought from other subject matter experts and interested parties, such as the relevant professional associations.

First, the layout and wording of individual questions will be refined to improve readability and comprehensibility and to minimize potential for bias introduced by the wording of questions. Next, the question formats must be specified to ensure that similar types of information are elicited consistently in different modules. This specification will also assure consistency in the time frames considered, the choice of whether to elicit open-ended or pre-categorized answers, and the scaling of responses. Finally, questionnaire components will require pretesting and field-testing before final publication. This process will address the degree of understanding subjects have regarding what is being queried (and whether their understanding matches the intentions of the investigators), the reliability and reproducibility of answers to the questions, and the validation of answers. To evaluate the questionnaire's specificity, assessments based on questionnaire results will be compared with what would be predicted

for test subjects according to current understanding of the relevant condition, as gleaned from current scientific literature (i.e., does a group known to have a certain exposure demonstrate the effects that would be expected from such exposure?).

After the questionnaire has been made final, an interviewer's guide, comparable to that developed for the ATS questionnaire, will be developed for the questionnaire and its component modules. This document will help members of the occupational safety and health community use the questionnaire easily and appropriately.

#### Summary

Direct surveys of groups of workers can provide valuable occupational health surveillance data, but this requires consistent collection of data. As part of efforts to improve the standardization of such methodology, NIOSH is developing a standard occupational health questionnaire. This questionnaire will be designed to collect demographic and occupational history information in addition to information about the presence of a spectrum of work-related conditions. The questionnaire will have a modular structure and will consist of a core questionnaire and a series of condition-specific modules.

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