

rates in fact did not differ by type of facility ownership.

Our results indicated that the risk of death in a SNF is neither higher nor lower in government-owned facilities, when other factors are taken into consideration. Further, we found that the lower unadjusted mortality rates for the proprietary facilities were because of, in large part, the discharging of seriously ill residents to general hospitals. Probable explanations for this discharge pattern include for-profit SNFs possibly having sicker residents than either nonprofits or the government-owned facilities. This explanation is not supported by our analysis, since for-profits did not appear to have significantly different scores on our measures of illness severity. A more detailed future examination of case mix differences at the individual patient level may help us determine the plausibility of this explanation.

A second explanation is that for-profit facilities are quicker to transfer residents to general hospitals in life threatening situations than other types of SNFs. Given our data, it is not possible to determine the plausibility of this explanation. Our analysis is based on cross-sectional data. Ingram and Barry (7) pointed out that longi-

tudinal studies may provide greater insight into the risk of death in SNFs. Our future work will be aimed at determining whether the lack of an ownership effect is part of an overall trend or whether it is simply an artifact of the year under investigation.

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Cognitive Laboratory Approach to Designing Questionnaires for Surveys of the Elderly

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Synopsis

Data from surveys of the elderly are used by policy analysts to design health services programs. Consequently, the quality of survey data on elderly respondents has important implications for this growing segment of society: improving the quality of data should result in more cost effective programs for the elderly.

However, studies suggest that the quality of responses from the elderly may be less than that for other respondents. Moreover, the increasing needs of policy analysts and health researchers for data have resulted in more complex survey questions that place a high cognitive burden on respondents. New methods for improving the design of these questionnaires are needed.

This project investigated whether new techniques of questionnaire design, adapted from the theories and methods of cognitive psychology, could be effectively used in interviewing older respondents. The techniques used in this study, concurrent think-aloud interviews with followup probe questions, have been shown recently to be effective with younger respondents.

Problems that elderly respondents have in comprehending survey questions, retrieving relevant information from memory, and using decision processes to estimate and provide answers were investigated. Questions on functional ability and social support were taken from the 1984 Supplement on Aging to the National Health Interview Survey.

Analysis of respondents' think-aloud protocols and responses to probes suggest that the cognitive interview procedures were effective in identifying problems with the survey questions that would result in data of poorer

THE DEGREE TO WHICH HEALTH surveys are designed to generate highly accurate information is a matter of great importance to both scientists and public policy makers. For example, data from surveys of the elderly are used by policy analysts to design various health services programs for this rapidly growing segment of society. Studies suggest, however, that survey data obtained from respondents older than 65 may be of lower quality and generalizability than that from younger respondents (1-3).

An important topic in population-based surveys of older people is functional ability (for example, bathing, toileting, shopping, cooking, and managing money). Respondents are asked to make subjective judgments about their ability to perform these tasks, either with or without the use of aids or assistance from other people (for a review, see reference 4).

Data on functional ability have multiple uses in the study of aging. For example, researchers have used longitudinal data to determine the relationship between functional ability and morbidity and mortality over time (5, 6). Moreover, policy analysts use the information from these survey questions to design legislation that will have a profound effect on older people, such as proposals on long-term care.

Despite the many important uses of questions about functional ability, we know little about their validity. Clinicians originally designed the questions for assessment of patients in rehabilitation settings (7); researchers have given little attention to their appropriateness for community-based survey interviews (8). Even the most widely used scales have been subject to very inadequate testing (9). Moreover, no standard set of questions on functional ability exist. Researchers have reported different prevalence estimates with different surveys, but these differences are not due entirely to differences in wording or in sample design (10).

Techniques that could improve data quality, in general, for surveys of those ages 65 and older and, in particular for functional ability data, would be valuable. Researchers (11) have recognized the need for additional research on the design of questions for older respondents about functional ability and health.

Recent studies demonstrate that the quality of survey data can be improved using the methods of cognitive science. These studies indicate that responses to questions designed for general population-based surveys were improved after the questionnaires were redesigned based on the results of cognitive interviews (12-17).

The cognitive method of testing questionnaires differs from the traditional survey method in several ways

(16-18). Traditional survey methods include field tests with large numbers of respondents using standard interviewing procedures. Problems with response errors are identified by nonresponse, such as item refusals and "Don't know" responses. Cognitive interviews are typically conducted with small numbers of respondents. The interviews are very intensive and make extensive use of think-aloud techniques and followup probe questions (15-18). These techniques include concurrent, think-aloud interviews (protocol analysis) (19), retrospective think-aloud interviews, followup probes, and reaction time data. Based on respondents' verbalizations of their thought processes and responses to probe questions, specially trained interviewers deduce the problems that the respondents have in comprehending questions, in retrieving relevant information from memory, and in decision strategies that they used in estimating and providing responses. Cognitive problems identified by the cognitive interview are less likely to be identified in a traditional survey field test (16-18).

Cognitive think-aloud interviews, conducted mainly with younger people, require respondents to verbalize their thought processes as they answer questions. Many respondents find this task difficult to perform. In as much as many investigators have reported age deficits in cognitive performance such as recall (20), the task of verbalizing their thought processes could be particularly difficult for many respondents ages 65 and older.

In this project we investigated whether intensive cognitive interviews would be an effective methodology both for identifying cognitive problems with survey questions designed for elderly respondents and for suggesting improvements in these questions. Problems investigated included those due to respondents' errors in interpreting the questions, recalling the information requested, using appropriate estimation and judgment strategies in deciding on a preliminary answer and, finally, in deciding and providing the final answer. Two distinct age groups were selected to permit investigation of the applicability of cognitive interview procedures to both the old (ages 65-74) and oldest old (ages 80 and older). It was *not* a purpose of the study to compare accuracy of responses between age groups nor was the purpose to redesign the survey instrument using an iterative technique (15, 17, 18).

Methods

Sample. The sample for this study was a purposive one and was *not* designed to be representative of the population. Respondents were 18 community dwelling volun-

teers, of whom 8 (4 men and 4 women) were ages 65–69 (old) and 10 (6 women and 4 men) were ages 80 and above (oldest old). All were recruited from metropolitan Washington, DC, area senior centers. Many of the respondents could not come to NCHS, primarily because of transportation problems; therefore, we conducted most of the interviews at the senior centers they attended. We asked Ms. Dorothy Daggett, Langley Park Multipurpose Senior Center, and Ms. Barbara Dahlman, Margaret Schweinhaut Center at Forest Glen, to recruit respondents from their senior centers whom they considered to have functional limitations in order to test questions on functional ability.

Instruments. The questionnaire consisted of selected items from the 1984 Supplement on Aging (SOA) to the National Health Interview Survey (NHIS) (21). The majority of questions were on functional ability, with other questions on housing, social support, and general health. (The complete questionnaire has been published (21); a copy of the adapted questionnaire with the followup probes used in this study is available from the authors.)

Procedure. Upon arrival at the NCHS laboratory or the room at the senior center used for the interviews, the respondent completed an assurance of confidentiality form and signed a receipt for the interview fee (\$15). The interviewer informed the respondent of the purpose of the interview and gave instructions for responding to the questions. Instructions followed the standard protocol analysis of Ericsson and Simon (19), and the respondents were asked to think aloud as they answered the questions orally, indicating the thought processes they used in arriving at an answer. Previous experience with cognitive interviews has suggested that many respondents find this task difficult, but that interviewer-administered probes are useful supplements (17, 18).

Thus, in addition to the think-aloud procedure, we asked respondents detailed followup probes about how they arrived at an answer before we read the next question. We scripted some of these probes, asking them of all respondents who answered the relevant question (see the accompanying box for examples). We used other, nonscripted probes to obtain more information about particular answers. We administered both types of probes to help us understand why the respondent had answered in the way that he or she had.

It should be pointed out that this interviewing technique is lengthy, taking on average about three times as long to conduct as a standard interview for the same number of items. As a result, the interviews are kept to a maximum of 1 1/2 hours, to limit the response burden. In addition, the technique is effective in research and in pretesting questionnaires for large population-based sur-

veys, but it is not a suitable method for conducting interviews in the main survey (15, 16).

Respondents practiced on two questions to gain experience in the protocol analysis procedure, recalling everything they ate at the meal most recently consumed in a restaurant, and recalling how many windows were in the person's home or apartment.

We either audio or video taped all interviews and took notes on the questionnaire form. We conducted all interviews in October–November 1988; on the average they took about 1 hour to complete.

Results and Discussion

Results indicated that old and oldest-old respondents were often able to verbalize their thought processes as they answered questions in a manner similar to younger respondents. Other results indicated that some special questioning procedures may be necessary for questions which may be ambiguous or require estimates to answer them.

The examples that follow are intended to give a flavor of the type of problems that cognitive interviews can reveal, rather than being an exhaustive list of the findings. The absence of severe physical limitations in our sample, and the fact that most were active people, limits the generalizability of our particular findings to the population as a whole.

Narrative answers. Many respondents answered questions with narrative answers and resisted providing category answers of the type usually sought on national surveys—even when the question was repeated several times. For example, respondents who said that they had used a senior center in the last 12 months were asked whether they used it frequently, sometimes, or rarely. Many respondents initially answered in terms of the number of times per week, and they did not choose one of the response categories until that part of the question was repeated one or more times. One respondent answered the initial question, “In the past 12 months, did YOU use a senior center?” with “I go every Wednesday and every Friday; that’s twice a month.” She gave a numerical answer several times, changing the twice a month to four times a month when the question was repeated. She also answered four times a month to the subsequent frequency question.

These narrative answers suggest that respondents either found it difficult to translate the frequency information that they retrieved from memory into these response categories, or they were reluctant to give a rather vague term after they had given what they thought was a more adequate answer to the question. This result differs from our experience with younger respondents, most of whom appear to have much less

difficulty translating their answers into vague categories. Perhaps the younger generations who have grown up taking multiple choice tests in school are more accustomed to such questions. Some modification of data collection procedures may be necessary to accommodate this tendency; for example, allowing interviewers to choose the response category based on the older respondent's narrative answer.

Functional limitations. One of the most interesting findings was related to the distinction that a number of researchers have made between "capacity" questions (what a person can do), and "performance" questions (what a person does do) (8). McDowell and Newell (8a) categorize the type of questions used in this study (for example, "Do you have ANY difficulty sitting for two hours?") as being intermediate between capacity and performance. However, asking respondents probe questions to determine how they are answering these questions suggested that many were interpreting them as purely capacity questions. Thus, a number of respondents reported no difficulty standing or being on their feet for about 2 hours, or sitting for about 2 hours, even though probing revealed that they had not attempted these activities for many years, either because they had had no need to do so, or a perception that they would suffer some discomfort (which was not always interpreted as meaning that it caused difficulty). Moreover, these probes indicated wide differences in how respondents interpreted these questions (for example, "sitting for 2 hours" was defined by some respondents as including briefly standing during the period, but by others as not standing at all). The occasional act of standing up during the 2 hours was widely reported as making the sitting easier, thereby making it difficult to compare the answers given by respondents who had answered by defining the term "sitting" in different ways.

The question about standing or being on your feet for about 2 hours also was interpreted in somewhat different ways by different respondents, with some thinking only of standing still, and with others thinking of walking. Further probes indicated that the former was perceived as being more difficult, so the answer given could reflect the particular definition the respondent employed.

Respondents were also asked whether they have any difficulty reaching up over their heads. After answering, they were asked what particular activities they were thinking about when answering the question. Respondents differed in how far above their heads they were thinking about when answering, ranging from just a few inches above to a height only reached when on tip-toe. Some respondents also appeared to be thinking of lifting an object, whereas others were not. As reach-

Example of a Question and Probe Concerning Activities of Daily Living

The next questions are about how well you are able to do, certain activities—by yourself and without using special equipment.

1. Because of a health or physical problem, do you have ANY difficulty—
Bathing or showering—
Yes—Probe "What sort of difficulty?" "What causes this difficulty?"
No—Probe "Would you say you don't have any difficulty with bathing or showering?"
2. By yourself and without using special equipment, how much difficulty do you have bathing or showering, some, a lot, or are you unable to do it? Probes: "I said without using special equipment. What sort of things do you think would be special equipment?" "Do you use anything to help you bath or shower?"
3. Do you receive help from another person in bathing or showering?
Yes—Probe "Is this all the time? (Get frequency)"
No—Probe "Do you ever receive help from another person?"
- 4a. Who gives this help?
Anyone else?
- b. Is this help paid for? (If nonrelative and no) Probe "Does _____ get paid by anyone at all?"
- 5a. Do you use any special equipment or aids in bathing or showering?
Yes—Probe "Is this all the time or just some of the time?"
No—Probe "Do you ever use any special equipment or aids in bathing or showering?"
- b. What special equipment or aids do you use?
Anything else?
- 6a. What (other) condition causes the trouble in bathing or showering?
Probe (If don't know or ambiguous reply) "Can you tell me what it is that makes it difficult for you to bath or shower?"
- b. Besides (condition), is there any other condition which causes this trouble in bathing or showering?
Probe (if yes) "Why do you say that?"
- c. Is this trouble in bathing or showering caused by any (other) specific condition?
- d. Which of these conditions (that is (read conditions)) would you say is the MAIN cause of the trouble in bathing or showering?
Probe "Why do you say that (condition) is the main cause?"

ing to a greater height and the lifting of an object would make the activity more difficult, the reported level of difficulty would depend partly on how the respondent interprets these questions.

Another question interpreted inconsistently asked if the respondent stayed in a chair all or most of the time. A probe question was then administered that asked how many hours they sit in a chair in a typical day. Some respondents who had answered "yes" reported sitting in a chair for fewer hours than other respondents who had answered "no," indicating considerable differences in how the term "all or most of the time" was interpreted.

Other questions which proved to be problematic grouped together activities with which respondents had different degrees of difficulty. One question asked if the respondent had any difficulty "Doing heavy housework, like scrubbing floors, or washing windows." Several respondents reported that they could scrub floors but were unable to wash windows (most seemed to be particularly thinking of washing the outside of windows). As only a single answer was permitted, respondents had to decide for which activity to report. This question could be improved by asking only about activities with the same level of difficulty for most respondents, or giving instructions as to how to answer if they had difficulty with some, but not all of the items (for example, "Do you have difficulty doing ANY of the following activities?").

Many respondents compensated for functional limitations, and as a result, denied having problems with specific activities, although when questioned closely, their limitations and compensation were obvious. These facts likely would not have been revealed during normal survey interviews. For example, one respondent denied having any problems getting dressed. However, when questioned more closely, she stated that she wears "loose clothing that buttons down the front. That's just temporary; this will go away hopefully" (referring to her tendonitis). An oldest-old man who had to lean against a door to put on his trousers reported no difficulty dressing, having successfully compensated for a physical problem.

A number of respondents forgot the qualifying phrase "by yourself and not using aids" when reporting that they had no difficulty performing an activity, such as walking for a quarter of a mile. A possible solution to this problem is to ask those who say "no" whether they use anything to help them do the activity, perhaps specifying the most commonly used aids for that activity. If they answer affirmatively, they could then be asked how much difficulty they would have if they did not use the aid.

Many respondents tended to underreport difficulty with functional ability items, consistent with the research of others (22). Respondents appeared to assume that only a level of difficulty beyond what they would expect at their age warranted an affirmative answer. One possible solution that could be investigated

in future research would be to ask older respondents whether they had more difficulty than when they were perhaps 50 years of age. The followup questions that probed for degree and cause of difficulty could be used to exclude from the analyses those respondents who had only a very minor difficulty. An alternative solution might be to specify what is meant by "difficulty." In this way, for example, respondents who get tired doing the activity would report that they have difficulty. The problem with this approach, however, is that the questions would become longer and more complex, adding to the respondent's burden.

Finally, the problems encountered when assessing physical difficulty are accentuated by the subjective nature of the concept. The researcher or clinician observes behavior and makes assessments of difficulty based partly on what he or she sees, whereas from the perspective of the older person, physical sensations such as pain and stiffness, as well as emotional states such as anxiety, are important aspects of the difficulty that they experience. Moreover, the older person may wish to present him or herself in a particular way, and therefore over- or underreport the amount of difficulty that they experience. Although cognitive interviews cannot solve this measurement problem, they provide a methodology that offers clues as to how respondents answer these questions and offers suggestions as to how to improve the usefulness of the respondents' reports of their difficulty.

Memory problems. Asking for temporal information in two different ways resulted in inconsistent answers, suggesting memory problems. For example, respondents who were still married were asked how long they had been married, and then the month and year when they had been married. Widowed, divorced, or separated respondents were asked for the length of time since that event, and then the month and year. Four of the eight married respondents were inconsistent in their answers, indicating that a memory error (or possibly an estimation error) was made for at least one of the two questions. One of the three divorced respondents gave an inconsistent response, reporting being divorced 3 more years than was indicated by the date he had given. Similar effects were found for the question, "How long have you been living here, in this [house/apartment]?" A probe followed which asked, "In what month and year did you move into this [house/apartment]?"

In the absence of validating data, it is not possible to ascertain whether the number of years or the date that was reported was correct for these questions. On some occasions, however, the respondent reported the date almost immediately, but did not report the number of years until several seconds had elapsed. This delay suggests that they were calculating the number of years

from the date that they recalled; at least one respondent made an estimation error while doing this. One possible explanation for these errors is that many respondents may not automatically update the elapsed time since an event took place. Others simply forget the date that an event took place, even an event as major as a wedding. Future research on questions about years and dates might seek validating information to investigate which type of question leads to more accurate responding. If there is no clear pattern, or if resources do not permit this approach, the interviewer could let the respondent choose whether to answer in terms of the date or the number of years.

Conclusions

Although only 18 cognitive interviews were conducted, they proved highly revealing. Based on respondents' ability to verbalize their thought processes as they answered questions, and their responses to probe questions, they appeared to have little or no difficulty comprehending the meaning of some of the questions or providing answers (validation of their answers was not possible); these included questions requiring subjective reports about their overall current health status and about their health status compared with 1 year ago, and questions about their family structure and relationships, including communication with offspring. On many other questions, problems were identified that appeared severe enough to cause serious response error. These questions asked about behaviors that respondents had rarely engaged in, required long recall intervals, contained compound parts, or required responses about frequency.

Comprehension problems appeared to be particularly common. Most commonly they took the form of the question being open to several different interpretations. Respondents' answers to the probe questions provided insights into ways to improve these questions. It is also noteworthy that the comprehension problems were easily identified by the cognitive interviewing technique, in spite of the fact that a majority of respondents provided fast, reasonable-sounding responses to questions. This finding indicates that a standard pretest would probably not have identified difficulties with the definition of the terms used in these questions, given that the standard measure of such problems in survey research is nonresponse (that is, refusals and "Don't know" responses) to individual items. Our results call into question such criteria.

Nevertheless, it would be essential to test new versions of these questions both by means of cognitive interviews, and then, as not all problems that occur in the field are identified with cognitive interviews (17), in a field test as well. It would be particularly useful to

have validation measures available, such as the physical performance measures suggested by Guralnik and coworkers (23), in the field test to determine which version of a question would result in the more accurate data.

Finally, the cognitive methods used in this study are equally applicable to other surveys of older people. Data, not only from the SOA, but also from other health surveys of older people, such as the Long-term Care Survey, are used to design legislation that has important impacts on the amount and kind of health care provided to older people. Although the SOA was selected for evaluation in this study, questions on other surveys of older people, such as the Long-term Care Survey, have not been evaluated and redesigned with an eye toward improving the quality of self-report data. The cognitive laboratory method offers an opportunity to improve the data from surveys on more physically impaired (but not cognitively impaired), and perhaps institutionalized, older people as well.

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Comparison of Three Inducement Techniques to Improve Compliance in a Health Survey Conducted by Telephone

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Synopsis

The use of telephone interviews for epidemiologic and public health studies has increased in recent years.

Since telephone surveys are susceptible to lower response rates than personal interviews, several attempts have been reported to increase respondents' compliance using various precontact procedures. This investigation evaluates the comparative effectiveness of three techniques to enhance compliance with a relatively long telephone interview on epidemiologic topics.

The theoretical and practical applications in the domain of telephone surveys of two techniques, the foot-in-the-door and the low ball, commonly considered nonpressure techniques, are discussed. A newly suggested, combined compliance procedure is also introduced and tested.

Results show that compliance was greater for the new method when compared with each of the other two methods. Moreover, each of the three methods outperformed a control condition. The theoretical models developed to devise and explain the new techniques received empirical support in a public health survey employing 335 adult residents of Tel Aviv, Israel, in May 1988.

TELEPHONE INTERVIEWING is becoming a popular procedure for conducting health surveys. In fact, it is often the sole method of data collection in epidemiologic studies on subjects such as occupational exposure (1, 2), and it is also commonly used in population-based, case-control studies of cancer (3). The validity of telephone interview data depends on respondents' willingness to comply with the request to

be interviewed and to supply full and accurate data to the telephone interviewer (4). In other words, problems associated with refusal are important to survey researchers, primarily because of potential biases that may affect survey estimates.

Achieving a high cooperation rate depends on a number of factors, such as the telephone interviewers (5) and the content of the interview (6). However, the body