

# **CONTEXT EFFECTS IN NATIONAL HEALTH SURVEYS**

## **EFFECTS OF PRECEDING QUESTIONS ON REPORTING SERIOUS DIFFICULTY SEEING AND LEGAL BLINDNESS**

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### **Introduction**

The first task that a respondent faces in a survey interview is to arrive at the intended interpretation of the survey question. Although the wording of the question may seem unambiguous, its pragmatic interpretation may nevertheless be ambiguous. People are concerned with this pragmatic meaning of questions rather than with their literal meaning (see Clark and Schober 1991; Grice 1975; Schwarz 1994, 1996, 1999; Suchman and Jordan 1990; Todorov 1997). To arrive at the intended interpretation of a specific question, respondents may rely on different cues in the context. Among the most potent cues in a survey context are the preceding questions (Bishop, Oldendick, and Tuchfarber 1984; Martin, DeMaio, and Campanelli 1990; Strack 1992; Strack, Schwarz, and Wänke 1991; Tourangeau and Rasinski 1988; Tourangeau et al. 1989).

The context effects of preceding questions are stronger for general than for specific questions (Schuman and Presser 1981). Presumably, the intended referent of general questions is more susceptible to alternative interpretations and, hence, to context effects. For instance, "Do you have *serious* difficulty seeing, even when wearing glasses or contact lenses?" can have different interpretations if preceding questions covered medical conditions related to vision than if they covered conditions unrelated to vision. Respondents may be more likely to infer that serious difficulty seeing involves a medical vision condition in the former than in the latter context.

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This research addresses the effects of preceding questions on reporting serious difficulty seeing and legal blindness<sup>1</sup> in the National Health Interview Survey (NHIS). The NHIS of 1994 and 1995 offers a unique possibility for testing these effects. All respondents were asked about serious difficulty seeing and legal blindness in the second part of the interview but, following the NHIS's standard practice, had been assigned to one of six lists of medical conditions questions in the first part. One of the condition lists covered sensory impairments and included six questions related to vision.

Respondents who were asked the vision condition questions should be more likely to interpret "serious difficulty seeing" as involving not only the functional difficulty they experience but also a diagnosed medical vision condition. Thus, among respondents who do not have or are not aware of a vision condition, those in the vision context should be less likely to report serious difficulty seeing, even if they experience difficulty, than respondents in the nonvision context. This should result in a lower reported rate of serious difficulty seeing in the vision context.

The "serious difficulty seeing" question is a filter question that screens respondents for more specific questions, including legal blindness. Assuming that severe levels of difficulty seeing are more likely to be related to diagnosed vision conditions, this question can screen out people without conditions or less severe levels of difficulty in the vision context. In the case of legal blindness, the "difficulty seeing" question in the vision context would most likely screen out respondents who have less severe difficulties and are not legally blind. As a result, the proportion of legally blind among people who reported difficulty seeing in the vision context will be higher than this proportion in the nonvision context, although the proportions relative to *all* respondents will be the same in both contexts.

However, a cognitive accessibility mechanism may contribute to differences between contexts in subsequent reports of legal blindness. Exposure to relevant concepts makes them more accessible and thus more likely to be used in a subsequent situation to which these concepts apply (Higgins 1996; Skelton and Strohmets 1990; Strack 1992; Strack and Martin 1987). In the vision context, respondents were asked whether they were "blind in one or both eyes," and this question could have made the concept of "blindness" more accessible in the memory of respondents with serious difficulty seeing. Further, respondents in this context should be more likely to interpret "serious difficulty seeing" as linked to a medical condition and "legal blindness" is a category assigned to a person based on clinical testing. Under these conditions of more accessible and relevant knowledge in the vision context, respondents with

1. Legal blindness refers to visual acuity of 20/200 or less in the better eye with the best possible correction or to a field of vision of 20 degrees or less. This definition is derived from the Federal Social Security Act and is also used in the NHIS.

serious difficulty seeing would be more likely to report that they are legally blind than those in the nonvision context.

This accessibility hypothesis is testable. If differences on the questions following the “difficulty seeing” question remain when the responses are adjusted for the screening out of respondents with less severe levels of difficulty seeing in the vision context, then one could conclude that there is an independent contribution of accessibility effects to the higher rate of reported legal blindness in the vision context.

## Method

### DATA SOURCES AND PRELIMINARY ANALYSES

Data for the present analyses come from the 1994 and 1995 National Health Interview Survey (NHIS) core questions and the Disability Supplement (NHIS-D) questions (National Center for Health Statistics 1997, 1998a, 1998b, 1998c).<sup>2</sup> The NHIS is a representative nationwide household survey of the noninstitutionalized population of the United States. Data are collected each week on a probability sample. Face-to-face interviews are conducted by personnel of the U.S. Bureau of the Census.

In 1994 and 1995, after respondents were asked the “core” questions, that is, the questions asked every year, they responded to the Disability Supplement (DS) questions. Sample sizes for the DS were 107,469 (1994) and 95,091 (1995). Following the NHIS’s standard practice, respondents were assigned to one of six medical condition lists in the core section of the interview. The six condition lists correspond to different body systems and are designed to measure the prevalence of specific chronic conditions in the population. Because the list of all conditions is too long, the sample is divided into six representative subsamples, and respondents in each of them are asked one of the condition lists.

For the present study, respondents for whom the assigned condition list was unknown ( $n = 695$  for 1994 and  $n = 895$  for 1995) were excluded from the analyses. For 1994 and 1995, 17,770 and 15,803 respondents, respectively, were assigned to the sensory-impairment condition list referred to as the vision context in this article. The rest of the respondents were assigned to one of the five additional condition lists: bone, muscle, and skin; digestive system; glandular, nervous, and genito-urinary systems; heart and circulatory system; and respiratory system. Respondents assigned to these condition lists were collapsed into one category, referred to as the nonvision context in this article ( $n = 89,004$  for 1994 and  $n = 78,393$  for 1995). No significant differences

2. All analyses, interpretations, and conclusions are the sole responsibility of the author and not of the National Center for Health Statistics.

between respondents in the vision and nonvision contexts were found in comparisons on age, sex, race, education, income, family size, employment, region of the country, and subjective health.

#### SEQUENCE OF QUESTIONS IN THE NHIS

Respondents first answered questions in the core about household composition, limitations of activities, doctor visits, and a health indicator page. Then they responded to the condition lists, followed by a hospital page and a demographic section.

Interviewers started all condition lists as follows: “Now I am going to read a list of medical conditions. Tell me if anyone in the family has had any of these conditions, even if you have mentioned them before.” All questions started: “Does anyone in the family [read names] NOW HAVE \_\_\_\_\_ ?” In the sensory-impairment condition list, that is, the vision context, the first three conditions were related to hearing, followed by the six vision conditions, in this order: blindness in one or both eyes, cataracts, glaucoma, color blindness, a detached retina or any other condition of the retina, any other trouble seeing with one or both eyes *even* when wearing glasses. These conditions were followed by 18 other conditions related to speech, taste, smell, and other impairments.

The DS followed the last core section—demographics—except that respondents who had reported medical conditions were asked a series of questions about these conditions between the demographic section and the DS questions. The DS started with the questions about seeing. The “difficulty seeing” question read as follows: “Does anyone in the family have *serious* difficulty seeing, even when wearing glasses or contact lenses?” Three response categories, “Yes,” “No,” and “Don’t know,” were used, and a fourth category, “Not ascertained,” was used for coding unclear cases.<sup>3</sup> If the respondent answered in the affirmative to the difficulty-seeing question, she or he was asked to identify the person(s) in the family with the difficulty seeing.<sup>4</sup>

Only respondents who reported difficulty seeing ( $n = 2,812$  for 1994 and  $n = 2,305$  for 1995) were asked further questions related to seeing. Of those respondents, 20 from 1994 and 17 from 1995 were excluded from the analyses because their assigned condition list was unknown. After the person with

3. In all analyses, the “Not ascertained” and “Don’t know” categories were treated as “No” responses for the following reasons: these categories contained very few responses; for all practical purposes, such as estimating impairments, these categories are treated as “No” responses; and initial analyses on all response categories yielded the same findings.

4. In the NHIS, as in most household surveys, part of the responses are based on self-reports and part on proxy reports. Given the differences between these reports (Schwarz and Wellens 1997; Sudman, Bradburn, and Schwarz 1996), one may argue that all analyses should be performed separately for self- and proxy responses. However, only one-fifth of the responses of interest were based on proxy reports, and initial analyses showed that the effects of the preceding questions were the same for self- and proxy reports.

difficulty seeing was identified, the respondent was asked, “What is the *main* problem or condition which causes [person’s name] serious difficulty seeing?” and “Is [person’s name] legally blind?” Next, respondents who did not report legal blindness were asked, “Do you expect [Is (person’s name) expected] to have *serious* difficulty seeing for at least the next 12 months?” All respondents who reported legal blindness or expected long-term difficulty seeing were asked about vision-related aids: “Does [person’s name] *now* use telescopic lenses, braille, readers, a guide dog, white cane, or any other equipment for people with visual impairment?” Response categories were provided for each listed aid. These were the “seeing questions” from the DS, and the analyses to be reported were performed on them.

#### ANALYSES

All hypotheses were tested with logistic regression. The independent variables were the question context, the year of the interview, and their interaction. The reason for including the last two variables in the analyses was to show that the context effects were robust and independent of the year of the interview. All analyses were performed on data weighted for the probability of selection in the survey and nonresponse bias with statistical software for analysis of complex survey data, WesVarPC (Brick et al. 1997).

## Results

As expected, respondents who were asked the “serious difficulty seeing” question after the vision condition list were less likely to report difficulty seeing than respondents who were asked this question after the other condition lists, 2.2 percent versus 2.5 percent (table 1). As shown in the top one-third of table 2,<sup>5</sup> the effect of the context was reliable in all models and was not qualified by the effects either of the year of the interview or the interaction of the year and the context.

Respondents who reported serious difficulty seeing were asked whether they were legally blind. As shown in the second part of table 1, respondents in the vision context were more likely to report legal blindness than respondents in the nonvision context, 21.3 percent versus 15.7 percent. The estimated odds across models were 1.46 (table 2). Respondents who reported serious

5. The detailed form of the hypothesis is that among people without a condition, respondents in the vision context are less likely to report difficulty seeing than those in the nonvision context. However, respondents with a condition should be more likely to report difficulty seeing in the former context. In order to test this hypothesis, one has to make the assumption that the proportions of respondents with a condition is the same in both contexts because respondents in the nonvision context were not asked about the vision conditions before the “serious difficulty seeing” question. This analysis yielded a highly reliable interaction of context and condition, likelihood ratio  $\chi^2(1) = 141.48, p < .00001$ . The details of the analysis are available on request from the author.

**Table I.** Rates of Reported Serious Difficulty Seeing, Legal Blindness, and Long-Term Serious Difficulty Seeing as a Function of the Questions Context

	1994		1995		1994 and 1995	
	Vision Context	Nonvision Context	Vision Context	Nonvision Context	Vision Context	Nonvision Context
Serious difficulty seeing (%):	2.2 <sup>a</sup> (2.2)	2.6 (2.7)	2.3 (2.3)	2.4 (2.4)	2.2 (2.3)	2.5 (2.6)
<i>n</i>	398	2,394	370	1,918	768	4,312
Total <i>N</i>	17,770	89,004	15,803	78,393	33,573	167,397
Legal blindness (%):	20.9 (21.1)	16.9 (15.6)	21.8 (21.1)	15.3 (15.0)	21.3 (21.1)	15.7 (15.3)
<i>n</i>	84	374	78	287	162	661
Total <i>N</i>	398	2,394	370	1,918	768	4,312
Long-term difficulty seeing (%):	71.8 (72.0)	67.4 (66.9)	74.1 (72.6)	67.5 (66.5)	72.9 (72.3)	67.4 (66.7)
<i>n</i>	226	1,352	212	1,085	438	2,437
Total <i>N</i>	314	2,020	292	1,631	606	3,651

SOURCES.—National Health Interview Survey on Disability, 1994 and 1995.

<sup>a</sup> These are weighted proportions reflecting the probability of selection of respondents and nonresponse bias. The proportions in parentheses are the sample proportions.

**Table 2.** Parameter Estimates of Context Effects on Reports of Serious Difficulty Seeing, Legal Blindness, and Long-Term Serious Difficulty Seeing

	Model I		Model II		Model III	
	Exp. ( $\beta$ )	(95% CI)	Exp. ( $\beta$ )	(95% CI)	Exp. ( $\beta$ )	(95% CI)
Serious difficulty seeing:						
Context	.90*	(.82, .97)	.90*	(.82, .97)	.90*	(.82, .97)
Year			.96	(.90, 1.03)	.99	(.91, 1.08)
Interaction					.95	(.87, 1.03)
Legal blindness:						
Context	1.46**	(1.16, 1.84)	1.46**	(1.16, 1.84)	1.46**	(1.16, 1.84)
Year			.96	(.80, 1.15)	1.00	(.79, 1.26)
Interaction					.94	(.75, 1.19)
Long-term difficulty seeing:						
Context	1.30*	(1.04, 1.62)	1.30*	(1.04, 1.62)	1.30*	(1.04, 1.62)
Year			1.02	(.88, 1.18)	1.06	(.86, 1.32)
Interaction					.95	(.76, 1.19)

SOURCES.—National Health Interview Survey on Disability, 1994 and 1995.

NOTE.—Exp.  $\beta$  = exponentiated log odds; CI = confidence interval.

\*  $p < .02$ .

\*\*  $p < .002$ .

difficulty seeing but not legal blindness ( $n = 4,287$ ) were asked whether they expected the difficulty seeing to last at least 12 months. Similar to the legal blindness reports, respondents in the vision context were reliably more likely to report long-term difficulty seeing than respondents in the nonvision context, 72.9 percent versus 67.4 percent (tables 1 and 2). Respondents who reported either legal blindness or long-term difficulty seeing ( $n = 3,698$ ) were asked about their use of vision-related devices. Only 234 respondents reported use of any such device, and the analysis did not reveal reliable differences by context on these questions.

#### EFFECTS ON NATIONAL ESTIMATES OF SERIOUS DIFFICULTY SEEING AND LEGAL BLINDNESS

Because respondents in the NHIS were assigned to the different condition lists so that six representative subsamples were created, one can use the probability of selection weights in each subsample to calculate the national estimates of serious difficulty seeing and legal blindness. As shown in table 3,

**Table 3.** National Estimates of Number (Rates) of People with Serious Difficulty Seeing and Legal Blindness as a Function of the Questions Context

	Vision Context	Nonvision Context	Estimates Ignoring the Context
Serious difficulty seeing	5,824,000 (2.25)	6,483,000 (2.50)	6,373,000 (2.44)
Legal blindness	1,243,000 (.48)	1,020,000 (.39)	1,057,000 (.40)

SOURCES.—National Health Interview Survey on Disability, 1994 and 1995.

NOTE.—Numbers in parentheses are percentages. The estimates are based on the combined samples for 1994 and 1995 and are adjusted for the number of respondents in each context. The estimates are also adjusted for respondents with unknown condition lists ( $n = 37$ ). All estimates are rounded.

the national estimate of serious difficulty seeing derived from the vision context was 1.11 times lower than the estimate derived from the nonvision context (more than 600,000 people difference), whereas the national estimate of legal blindness derived from the vision context was 1.22 times higher (more than 200,000 people difference).

#### TESTING THE UNDERLYING MECHANISMS OF THE CONTEXT EFFECTS

Presumably, respondents in the vision context were more likely to interpret “serious difficulty seeing” as linked to a medical vision condition. If this is the case, these respondents should be more likely to report such a condition as causing their difficulty than respondents in the nonvision context. In fact, 68.4 percent ( $n = 525$ ) reported one of the six vision conditions in the vision context, whereas 58.1 percent ( $n = 2,506$ ) reported those in the nonvision context. This difference was highly reliable, Exp.  $\beta = 1.45$ , 95 percent CI = (1.20, 1.74), and was not qualified either by the year or the interaction of the year and the context. This was the case even when the reported vision conditions were classified in more than 100 detailed categories according to the International Classification of Diseases as modified by the National Center for Health Statistics (1995). Respondents in the vision context were more likely to report a vision condition (79.3 percent,  $n = 609$ ) than those in the nonvision context (73.7 percent,  $n = 3,176$ ), Exp.  $\beta = 1.28$ , 95 percent CI = (1.06, 1.56).

In the vision context, the “difficulty seeing” question may have screened



out respondents with less severe levels of difficulty who are not legally blind. If this is the case, the proportions of legally blind people would be the same in both contexts relative to all respondents, although these proportions differed for respondents who reported difficulty seeing. However, an accessibility mechanism may contribute to the reported higher rate of legal blindness in the vision context among respondents who reported difficulty seeing. The test of this hypothesis amounts to comparing the proportions of respondents who reported legal blindness in both contexts relative to all other respondents. In that way, the analysis controls for the presumed bias in the vision context of screening out respondents who have less severe levels of difficulty seeing and are not legally blind. If the accessibility hypothesis is correct, then respondents in the vision context should be more likely to report legal blindness than those in the nonvision context independent of the report of serious difficulty seeing.<sup>6</sup> This effect was reliable and unqualified by the year of the interview or the interaction, Exp.  $\beta = 1.22$ , 95 percent CI = (1.00, 1.50).

Additional support for the accessibility hypothesis comes from the reports of “blindness in both eyes” as the main condition causing serious difficulty seeing. “Blindness in both eyes” is a more narrow category than “legal blindness.” For both years, only 204 respondents reported it as the main condition causing their difficulty seeing ( $n = 47$ , 6.1 percent, in the vision context and  $n = 157$ , 3.6 percent, in the nonvision context). Although “legal blindness” and “blindness in both eyes” are different categories, according to the accessibility logic the context should affect their reports in the same way because they share the concept of blindness, which was primed before the relevant questions were asked. In fact, respondents in the vision context were 1.52 times more likely to report blindness in both eyes as causing their difficulties seeing than respondents in the nonvision context even when controlling for the initial effect on the “difficulty seeing” question, 95 percent CI = (1.07, 2.17).

## Discussion

In a series of analyses on data from the NHIS, it was shown that preceding questions about medical vision conditions influenced the reports of serious difficulty seeing and legal blindness. The reported rate of serious difficulty seeing was lower for respondents who were asked questions about vision conditions than the rate for respondents who were asked questions about conditions unrelated to vision. At the same time, the rate of reported legal blindness was higher for the former respondents.

Two mechanisms underlying these differences were identified. Presumably, respondents who were asked the serious-difficulty question after the vision

6. The same logic applies to the reports of long-term difficulty seeing, and the same analysis was performed. The effect of the context was not reliable, 95 percent CI = 0.80, 1.03.

conditions questions were more likely to interpret this question as asking not only for experienced difficulty seeing but also for a medical condition linked with this difficulty. In fact, respondents in the vision context were more likely to report medical vision conditions as causing their difficulty seeing than those in the nonvision context. This context effect may have contributed to screening out of respondents with less severe levels of difficulty seeing in the vision context. Consistent with this interpretation, the reported rate of long-term difficulty seeing was higher among respondents in this context.

The process of screening out respondents with less severe levels of difficulty seeing in the vision context partially explained the higher rate of reported legal blindness in this context. However, after adjustment for this effect, the rates of legal blindness in the vision and nonvision contexts were still reliably different. Presumably, an independent accessibility mechanism contributed to this difference. Respondents with difficulty seeing in the vision context were exposed to the concept of blindness in the preceding questions. As a result of this exposure, the concept was more cognitively accessible for these respondents, and they were more likely to use it than respondents who were asked condition questions unrelated to vision. The finding that respondents in the vision context were more likely to report blindness in both eyes as causing their difficulties seeing than respondents in the nonvision context is consistent with this hypothesis.

Finally, the differences in the reports of serious difficulty seeing and legal blindness in the vision and the nonvision contexts resulted in substantively different national estimates of serious difficulty seeing and legal blindness. For the former pair of estimates, the difference was more than 600,000 people. Similarly, the estimates of legal blindness differed by more than 200,000 people. This finding is especially important because the NHIS on Disability is the first representative national survey in the United States that attempts to measure legal blindness in the population. The national estimates of legal blindness available in the literature have been projected from local epidemiological studies (e.g., Tielsch et al. 1990).

The present findings extend the existing cognitive models of question understanding (Schwarz and Bless 1992; Schwarz, Strack, and Mai 1991; Strack 1992; Strack and Martin 1987; Tourangeau and Rasinski 1988) to the health domain and demonstrate how minor effects on a filter question (Knäuper 1998) can lead to large differences on subsequent questions, which in turn can bias national estimates for both specific populations (e.g., the proportion of legally blind among people with difficulty seeing) and the general population (e.g., the prevalence of legal blindness in United States).

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