

Cognitive Evaluation of Self-Report Questions for Surveillance of Periodontitis

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This paper describes the cognitive testing of eight self-report questions as part of a broader effort to evaluate and validate the use of these questions in estimating the prevalence of periodontitis in the United States population. This study examined how United States respondents understood and processed the proposed questions in English and Spanish, as well as identifying and correcting for possible response errors. The set of eight questions was selected by the Centers for Disease Control and Prevention Periodontal Disease Surveillance Workgroup for further testing after analytical assessments and field testing of an array of potential questions. Evaluation of these eight oral health questions was based on 40 in-depth, semi-structured cognitive interviews in English and Spanish. Results of this cognitive test study are presented. The recommendations from this cognitive testing evaluation served as the basis to improve the original questions in English and Spanish to be more inclusive and consistent and improve the estimation of periodontal disease in the United States population. *J Periodontol* 2007;78:1455-1462.

KEY WORDS

Evaluation; research; survey; testing.

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The simplicity and low cost of administering self-report questions makes the use of self-report measures attractive for health surveillance and for predicting health outcomes in populations. For example, since 1984, the Behavioral Risk Factor Surveillance System, sponsored by the Centers for Disease Control and Prevention (CDC), has used self-report questions to track chronic diseases and risk behaviors in the United States.¹ In particular, self-report surveys can be useful if there are no resources to support clinically assessed health measures. Since 2003, the CDC, in collaboration with the American Academy of Periodontology (AAP), has been examining the possible use of self-report measures for surveillance of periodontal disease in the United States population. Currently, surveillance of periodontal disease requires clinically based periodontal examinations, which are resource intensive and costly; this restricts the capacity to monitor this disease at state and local levels.

The CDC/AAP workgroup identified a set of promising questions for population-based surveillance of periodontal disease based on systematic scientific validation analyses and field testing of these questions in the Australian National Adult Oral Health Survey. In preparation for the use of these questions in the United States population, cognitive testing of these questions is essential. The cognitive testing process evaluates such elements

as the respondent's comprehension of the question and the question–response process, specifically those that could lead to response error.^{2,3}

This paper reports on the cognitive testing of eight survey questions being tested for use in the United States population to estimate the prevalence of periodontal disease. It includes a question-by-question analysis of the respondent interpretation of each question, interview findings, potential problems, and revision recommendations for question improvement. The goal is to reduce response error when using these questions by evaluating the way that United States respondents understand and process these survey questions.

MATERIALS AND METHODS

Unlike survey interviews that adhere strictly to scripted questionnaires, cognitive interviews are structured with survey questions as starting points for a more detailed discussion of the questions themselves: how respondents interpret key concepts, their ability to recall the requested information, and the appropriateness of response categories. The primary focus of the evaluation may center on the ways in which respondents interpreted questions and the types of experiences respondents considered when forming their response. Examining these kinds of interpretive processes uncovers potential sources of response error and assesses how well each question measures the intended analytic concept.⁴ Because cognitive interviews generate narrative responses rather than statistics, results are analyzed using qualitative methodologies.

The set of questions evaluated in this study was proposed by the Division of Oral Health at the National Center for Chronic Disease Prevention and Health Promotion, CDC. The evaluation of eight oral health questions was based on 40 in-depth, semi-structured cognitive interviews that were conducted in the Questionnaire Design Research Laboratory at the National Center for Health Statistics. Three rounds of interviews were conducted. The first round, consisting of 21 interviews, was conducted with the initial set of proposed questions presented in English. Questions were modified based on findings of round one and retested in nine additional English-language interviews and 10 Spanish-language interviews.

The original questions were as follows:

Another common problem with the mouth is gum disease. By gum disease, we mean any kind of problem with the gums around your teeth that lasts for at least 2 weeks, except for problems caused by injury or problems caused by partials or dentures.

1. Do you think you have gum disease? Yes No

2. Has a dental professional ever told you that you have lost bone around your teeth? Yes No

3. Have you ever had scaling, root planing, surgery, or other treatment for gum disease? Yes No

4. Have you ever had any teeth that have become loose by themselves without some injury (not baby teeth)? Yes No

5. How often during the last 7 days did you use mouthwash or any dental rinse product? _____

6. How often during the last 7 days did you use dental floss, tape, or interdental brush to clean between your teeth, other than just to remove food particles stuck between your teeth? _____

7. How would you rate the health of your gums?
 Excellent Very good Good Fair Poor

8. During the past 3 months, have you noticed that you have a tooth that does not look right? Yes No

Sample

Forty in-depth, semi-structured cognitive interviews were conducted and analyzed for this evaluation. Thirty interviews were conducted in English, and 10 interviews were conducted in Spanish. English-speaking respondents were recruited from among people who answered a newspaper advertisement. Spanish-speaking respondents were recruited in a community center. Potential respondents were men and women with a broad range of oral health conditions and gum disease, including some respondents with no known problems. Respondents were given \$40 upon completion of the interview. The final sample consisted of 19 men and 21 women between the ages of 21 and 59 years. Twenty-two of the respondents identified themselves as African American, seven were white, 10 were Hispanic, and one was multiracial. Among the Hispanic respondents, eight were Mexican, one was Peruvian, and one was Guatemalan. Twelve of the 40 respondents reported an annual household income of \geq \$30,000. Twenty-two respondents held at least a high school diploma; five held at least a bachelor's degree.

Interviewing Procedures

Interviews in English were conducted face-to-face in the National Center for Health Statistics Questionnaire Design Research Laboratory in the Washington, DC metropolitan area. Interviews in Spanish were conducted in the Chicago metropolitan area in a community center. The length of the interview ranged from 45 minutes to an hour. For the interview, respondents were asked each question and were probed to explain their answer. Typical follow-up probes included "How so?" and "Why do you say that?" If a respondent's answer seemed vague or unclear, the interviewer asked: "Can you give an example to describe what you are talking about?" The culminating text from the interview relates how respondents understood or interpreted each question and outlines the types

of experiences and behaviors respondents considered in providing an answer.

For Spanish interviews, follow-up probes were asked specifically to make sure that translation choices worked well, i.e., that terms the translation team chose as the best options were being understood by the respondents as intended.

Analysis

We analyzed detailed notes and reviewed video recordings of the interviews. Spanish-language interviews were not video recorded. The text was collated by question so that comparisons could be made systematically across all respondents. We performed two levels of analysis. First, we noted distinct occurrences in which respondents misunderstood terms or expressed difficulty or confusion while answering. Second, we examined the following interpretive patterns: 1) respondents' interpretations of key words; 2) the types of behaviors that participants counted as positive responses to particular questions; and 3) the degree of variation among respondents' interpretations.

To analyze the interpretive aspects of question response, we used the constant comparative method, a standard method for analyzing qualitative data.⁵ By comparing across all cases, we could categorize individual responses according to a respondent's particular interpretation of a question. From these categories, we examined interpretive aspects (e.g., the consistency and degree of variation) of each question. Additionally, when we compared and generated categories, analytic themes emerged for particular questions, which then could be compared across questions.

RESULTS

The results are presented by individual question (in italics). Specifically, we detail an original question along with a discussion of the interview findings. Based on the results of the first round of interviews, we revised and retested questions. The revised version of that question is presented and subsequent interview findings are outlined. We tested the revised version in English and Spanish; therefore, language or cultural differences also are presented in this portion of the discussion. However, very few Spanish-language problems arose, and unless presented in the discussion, it can be assumed that no issues were identified.

Question 1

Another common problem with the mouth is gum disease. By gum disease, we mean any kind of problem with the gums around your teeth that lasts for at least

2 weeks, except for problems caused by injury or problems caused by partials or dentures. Do you think you have gum disease? Yes No

Because of the question's subjective quality, no outright response errors could be identified in the interviews. Nine respondents answered "no," 10 answered "yes," and one, even when pushed by the interviewer to provide an answer, answered "don't know." Differences in the ways in which respondents came up with their answers were identified, and, notably, some respondents experienced difficulty answering the question because they were uncertain about what to include as gum disease.

The differences in the ways respondents came up with an answer depended primarily on whether they had seen a dentist in the recent past. Those who had not been to the dentist in many years experienced the most trouble with responding. To answer, those respondents were required to use the provided description of gum disease while considering their own symptoms and then decide whether they had the condition. A few of them provided particularly tentative answers (answering "possibly" or "don't know") because, despite the introductory clause, they were not entirely sure what symptoms should count as gum disease. One man who had difficulty answering, for example, had not seen a dentist in ≥ 5 years and said that, because he was "not a professional," he needed a dentist's opinion to answer with confidence. In the end, he answered that, because the question specifically asked "Do you think you have gum disease?" and not "Do you have gum disease?", he was able "to make a guess"; he answered "yes" based on the fact that his gums bled when he brushed his teeth. Another respondent said she was not sure what to answer because she recently had experienced some swelling around a particular tooth but that the condition seemed to have improved. It was not clear to her whether she should count this flare-up as gum disease.

Conversely, respondents who were able to answer the question easily were those who had been to the dentist and who had been told directly by a dental professional that they had no problems. For example, as one woman who had seen a dentist within the past month explained, "I really don't know what that (gum disease) is. All I know is I don't have it because my dentist would have told me if I did." For these respondents, it did not matter whether they understood the introductory definition because a dental professional had weighed in on this assessment indirectly.

Respondents who had been diagnosed with an oral health condition did not necessarily have an easy time answering the question. Some respondents had been treated, for example, with scaling or by having teeth

pulled but were unsure if their condition was cured with the treatment. Additionally, unless respondents were told specifically by their dentist that they had gum disease (and not that they had another condition, such as gingivitis, or needed a deep cleaning), they needed to decide what condition or symptoms should be counted specifically as gum disease. For example, one respondent who had had 16 teeth pulled because of decay as recently as 2 months earlier stated that her dentist never told her that she had gum disease (only that her teeth needed to be pulled), and she erroneously answered “no” to the question.

To provide respondents with a clearer definition of what symptoms to include for the second round of interviews, the introductory statement was revised to include tangible descriptions of gum disease. Additionally, to ensure that respondents would relate to the new wording easily, language was taken directly from phrases that previous round one respondents used when describing their own symptoms. The revised question was as follows:

Gum disease is a common problem with the mouth. People with gum disease might have bleeding in the gums around the teeth, swollen gums, receding gums, or sore or infected gums. The condition lasts for ≥ 2 weeks and is not caused by injury or problems with partials or dentures. Do you think you have gum disease? Yes No

In responding to this new question, most respondents answered with little difficulty and referred to the list of descriptions along with a diagnosis from their dentist to support their answer. Despite the additional information, the question continued to elicit some apprehension for a few respondents. For example, one respondent answered “I might” and explained that he recently had a tooth extracted and had noticed that his gums were receding; however, his dentist had never told him explicitly that he had gum disease. Unlike the previous version, respondents were able to consider and cite specific problems with their gums. For example, one respondent explained, “I do have receding gums and from time to time I do have bleeding . . . though none recently.” For this version of the question, much of respondents’ indecision centered on the amount or the degree of bleeding or swelling required for them to count their condition as “gum disease.” To this extent, the question remains subjective, and its answer depends on how respondents interpret the degree of seriousness regarding their symptoms.

Additionally, when probed, most Hispanic respondents did not know the meaning of the term “receding gums.” In hindsight, it is possible that they may know the concept but not the specific terminology. However, no Hispanic respondent described receding gums in the course of the entire interview, and this

did not seem to impact the validity of their answers. This terminology problem did not appear in the English interviews, although it is likely that English-speaking interviewers did not specifically probe respondents on the meaning of this term.

Question 2

Has a dental professional ever told you that you have lost bone around your teeth? Yes No

No problems were identified with this question. Compared to the previous question, question 2 is more objective and, therefore, was more straightforward and easier to answer. Three respondents answered “yes” and upon probing, described the circumstances surrounding the diagnosis of bone loss. One woman stated that her dentist told her in 1999 that she was losing bone and that this was the reason for her tooth loss. She explained that she was having bone density problems and that she now must take calcium supplements and eat a lot of dairy products. Except for two respondents who paused upon hearing the question, all other respondents answered quickly and with certainty.

Because no problems were identified in the first round of interviews, we did not revise this question. In the second round, no problems were identified in Spanish or English interviews.

Question 3

Have you ever had scaling, root planing, surgery, or other treatment for gum disease? Yes No

The primary difficulties with question 3 centered on terminology problems. Specifically, respondents did not know what types of procedures should count as surgery. Consequently, the types of procedures that were included varied across respondents. For example, several respondents included their root canals as surgery, many others included rotten teeth being pulled, and a few others considered the removal of wisdom teeth. Conversely, some respondents considered the term “surgery” to mean a relatively serious procedure that would include the actual cutting and suturing of the gum. Very few respondents were familiar with the terms “scaling” and “root planing.” Therefore, including these terms in the question did little to clarify what procedures should be counted.

Several respondents who had had the procedure and who also knew the terminology answered the question easily. Conversely, others who had had some kind of dental procedure but could not remember the name were unable to answer accurately. For example, one respondent wondered if this included the procedure done at her regular checkup when the dentist scrapes around her teeth and prods up underneath her gums. A few other respondents said they believed that they had undergone the procedure but were not entirely sure what the procedure was called.

For example, one respondent initially answered “no,” but then changed her answer to “yes.” She had had scaling the previous month, although it took her a moment to recall the name. Upon probing, she described the dentist going into the gum, scraping out dead tissue, and rinsing out with peroxide. Additionally, one respondent stated that he was not entirely sure but suspected that he may have had scaling ~4 years previously. Not remembering the term, he understood the procedure as being a “deep cleaning.” Additionally, he was unsure why it was performed but that his dentist said it was necessary and it was very painful.

In the revised version, the question was split into two parts to clarify the concept of surgery and to associate the phrase “deep cleaning” with “scaling” and “root planing.” We hoped that if we placed the surgery question first, respondents would grasp that scaling and root planing were not components of a regular checkup. The resulting questions that were tested in the second round of interviews were:

Have you ever had surgery to clean underneath your gums? Yes No

Have you ever had scaling or root planing, sometimes called deep cleaning? Yes No

Despite this improvement, two types of problems remained with the surgery question. First, two respondents were not certain if the question was asking about procedures performed as part of a typical, regular dental checkup. One respondent answered “yes” to this question, describing the procedure by which the dentist prodded around her gums during a regular checkup. Although most respondents ultimately answered “no,” this evidence suggested the possibility of false-positive reports, especially among poorer, less educated respondents who have had little dental care. Second, a couple of respondents were unsure whether to count root canals. One Hispanic respondent answered “yes,” citing her root canal.

Even more than the revised surgery question, respondents found the revised scaling question difficult to answer. The phrase “deep cleaning” sometimes was confused with cleaning a tooth in preparation for a filling or even part of a routine checkup. A few others indicated that they believed that this question was asking about the same procedure as in the previous item, whereas another respondent believed that this referred to root canals. Consequently, it may be advisable to include the parenthetical statement “(do not include root canals or cleanings done at a regular checkup)” in the revised surgery and scaling questions.

Question 4

Have you ever had any teeth that have become loose by themselves without some injury (not baby teeth)?
 Yes No

Though the question directs respondents not to include injuries, a few respondents reported erroneous answers when they did include these incidents. They either misunderstood the question or did not hear the word “injury.” For example, one woman included the time that her teeth came out when her jaw was broken, and another respondent counted the time that he lost a tooth while playing basketball. A respondent who included the time his three front teeth became loose after being punched in the mouth said that he heard the question as asking whether they became loose because of some injury.

Another problem arose because of the parenthetical statement “not baby teeth,” which, in at least one case, caused a respondent to consider only teeth that had become as loose as baby teeth, i.e., to the point of falling out. In this case, the respondent did have loose teeth, but she believed that the question was asking about only those extreme circumstances and responded “no.” The question also was tested a few times without reading the parenthetical clause; in these few interviews, no respondents thought to include baby teeth.

For the revised question, wording was changed to make the phrase “without injury” more prominent. Additionally, to simplify the question, the parenthetical phrase was removed by integrating the word “permanent” into the question. The resulting question was as follows:

Have you ever had any permanent teeth that became loose on their own, without an injury? Yes No

Despite the word “permanent,” two second-round respondents answered “yes,” thinking of losing their baby teeth. Consequently, it was recommended that the parenthetical clause “(not baby teeth)” be retained for clarification. Additionally, one Spanish-speaking respondent answered “yes,” referring to a tooth that became loose as a result of domestic violence. A dentist had removed the tooth. After this explanation, the interviewer reread the question to the respondent, who then stated that she should have answered “no.” Additionally, one Spanish-speaking respondent who answered “yes” to this question was referring to a tooth that broke without injury, not an entire tooth becoming loose. She was having a drink of water, felt something strange in her mouth, and spit out a piece of a tooth. It is not clear whether this response should be deemed an error.

Question 5

How often during the last 7 days did you use mouthwash or any dental rinse product? _____ [numeric response]

The primary problem with question 5 was that the stem of the question (i.e., how often) was not consistent with the open response category, i.e., respondents

did not understand that the question was asking for a specific number. Consequently, respondents' answers included "every day," "every once in awhile," and "not that often." No problems were identified with terms, and most respondents referred to commercial products. Those respondents who used mouthwash regularly were able to recall the number of times with confidence. Those who used mouthwash intermittently were more inclined to estimate; few respondents attempted to recall with accuracy and counted the exact number of times throughout the past week.

For the second-round interviews, we rewrote the question so that the stem was consistent with the response category, specifically, so that respondents were cued to provide the exact number of times that they used mouthwash. The revised question was:

In the last 7 days, how many times did you use mouthwash or other dental rinse product?

Although most respondents provided a number instead of a rate with the revised version, a few respondents responded "every day." However, with the revision, it was much easier for the interviewer to repeat the question, placing an emphasis on "how many times" or to ask the respondent to clarify what "every day" meant, e.g., by asking if that meant seven times in the past 7 days.

Question 6

How often during the last 7 days did you use dental floss, tape, or interdental brush to clean between your teeth, other than just to remove food particles stuck between your teeth? _____ [numeric response]

As in the previous question, the stem of the question was not consistent with the response category, and respondents were not aware that they were being asked to supply a number. Consequently, respondents were inclined to answer "every day" or "not very often." Additionally, most respondents were unfamiliar with interdental brushes; in several circumstances, this caused respondents to misunderstand the question. One man answered "every day"; however, upon probing it became clear that he never flosses. Because he heard the word "brush" in the question, he had understood the question as asking how often he brushes his teeth.

For a couple of respondents, the clause "other than just to remove food particles stuck between your teeth" was confusing because they believed that their regular flossing routine was, specifically, to remove food particles; it did not occur to them that some people floss only when food is stuck in their teeth. Consequently, these respondents were inclined to answer "no" erroneously.

For the revised question, "interdental tape" was omitted because of the confusion, as was the clause about food particles. Because the question was

placed next to questions about routine cleaning practices, such as brushing and using mouthwash, we surmised that respondents also would see this question as asking about regular hygiene as opposed to removing food particles after a meal. The revised question was as follows:

In the last 7 days, how many times did you use dental floss or dental tape?

The revised question worked well in English and Spanish, i.e., no errors were identified, and respondents could provide an answer with relative ease. Although most respondents had never heard of dental tape, everyone was able to surmise that it was a form of dental floss, and this unknown term did not influence their response.

Question 7

How would you rate the health of your gums?
 Excellent Very good Good Fair Poor Don't know

Like the first question in the series, question 7 is subjective; therefore, no outright errors could be identified. As with the first question, a few respondents did not want to provide an answer because they did not deem themselves knowledgeable of gum health. For example, one respondent who initially refused to answer on the basis that he was "not an expert," ultimately answered "fair" when pushed; he explained that he was answering in the middle to be safe.

Although the question specifically referred to the health of gums, respondents typically considered their teeth and gums, and answers were based on a number of different themes. For example, many respondents seemed to base their answer on an existing condition, including needing to have teeth pulled, having gingivitis, having inflamed gums, or experiencing bleeding when brushing. However, two respondents based their answer on the fact that they had had teeth pulled; other than the missing teeth, their gums were in good shape. Other respondents based their answer on their perception of the quality of upkeep that they give to their teeth and gums. For example, one respondent answered "very good" and not "excellent" because he does not floss every day. Another respondent answered "good" only because she had not been to a dentist in a year and a half; other than that, she said, her teeth and gums were in good shape.

Because we identified no major problems with the question, we made little modification for the second-round interviews. However, all of the respondents seemed unable to consider only their gums, so we modified the question to include teeth:

Overall, how would you rate the health of your teeth and gums? Excellent Very good Good Fair Poor Don't know

Table 1.
Recommended Questions in English and Spanish

1. Gum disease is a common problem with the mouth. People with gum disease might have bleeding in the gums around the teeth, swollen gums, receding gums, or sore or infected gums that lasts for ≥ 2 weeks and is not caused by injury or problems with partials or dentures. Do you think you might have gum disease? Yes No

La enfermedad de las encías es un problema común en la boca. Las personas que sufren de la enfermedad de las encías pueden sangrar en las encías alrededor de los dientes, tener inflamación en las encías, retracción de las encías, encías adoloridas o infectadas por lo menos durante dos semanas y sin que haya una lesión, o pueden tener problemas con dentaduras postizas parciales o completas. ¿Piensa usted que tal vez sufra de la enfermedad de las encías? Sí No

2. Overall, how would you rate the health of your teeth and gums?

Excellent
 Very good
 Good
 Fair
 Poor
 Don't know
 Refused

En general, ¿cómo diría que es el estado de salud de sus dientes y encías?

Excelente
 Muy bueno
 Bueno
 Regular
 Malo
 Don't know
 Refused

3. Have you ever...

...had surgery to clean underneath your gums? (not root canals or cleanings done at regular checkups) Yes No

...had scaling or root planing, sometimes called "deep" cleaning? (not root canals or cleanings done at regular checkups) Yes No

...had any teeth that became loose on their own, without an injury? (not baby teeth) Yes No

...been told by a dental professional that you lost bone around your teeth? Yes No

¿Alguna vez...

...le han hecho cirugía de encías para limpiar por debajo de las mismas? (sin contar tratamiento de conducto de raíces, ni limpiezas que le hayan hecho durante visitas de rutina) Sí No

...le han hecho un raspado o un alisado de las raíces de los dientes que a veces se conoce como limpieza "profunda"? (sin contar tratamiento de conducto de raíces, ni limpiezas que le hayan hecho durante visitas de rutina) Sí No

Table 1. (continued)
Recommended Questions in English and Spanish

...se le ha aflojado algún diente por sí solo sin haber tenido una lesión? (sin contar dientes de leche) Sí No

...le ha dicho un profesional de la salud dental que usted ha perdido hueso alrededor de los dientes? Sí No

4. In the last 7 days, how many times did you...

...brush your teeth with toothpaste?

...use dental floss or dental tape?

...use mouthwash or other dental rinse product?

Durante los últimos siete días, ¿cuántas veces...

...se cepilló los dientes con pasta dental?

...usó hilo dental o cinta dental?

...usó enjuague bucal u otro producto de enjuague dental?

5. During the past 3 months, have you noticed that you have a tooth that doesn't look right? Yes No

En los últimos tres meses, ¿ha notado que alguno de sus dientes no parece verse bien? Sí No

In this version, we found no differences in the English-speaking interviews. Most Spanish-speaking respondents seemed to focus on their teeth without referring to their gums, e.g., explaining their answer by stating that they were missing some teeth or that they had cavities that needed to be filled.

Question 8

During the past 3 months, have you noticed that you have a tooth that does not look right? Yes No

Six of the 21 first-round respondents answered affirmatively to this question. All but one of the six indicated that this was a tooth that they believed needed to be pulled. One woman said that a couple of her teeth were "collapsed," another said her tooth was "blackened and clearly unhealthy," and one that it was cracked and believed that there was a serious problem with the tooth. Another respondent explained that she had a broken molar but did not indicate that it necessarily needed to be pulled.

The primary difficulty with the question was that some respondents did not know what types of characteristics to include (specifically those unrelated to gum disease), and although they eventually answered "no," some wondered if they should report "yes." For example, one woman had a tooth that had grown in crookedly; another respondent wondered if a chipped tooth should count. Additionally, a few respondents stated that they simply do not look at their teeth and answered "don't know."

We did not revise question 8 for second-round interviews. Spanish-speaking respondents understood

the question in much the same way, although they seemed to interpret it as asking more strictly about appearance and cited discoloring as the main potential problem. For example, one Spanish-speaking respondent who answered “yes” explained that one of his teeth had begun to look spotted. The dentist had told him that the enamel may be worn out or that some strong medication he took may have been the cause. Another Hispanic respondent who answered “yes” explained that she had the impression that her teeth are getting narrower as though they were wearing out and losing width.

CONCLUSIONS

For survey data to produce valid and reliable prevalence measures, questions must be understandable to respondents as well as cognitively possible for respondents to answer. Recommendations for English and Spanish oral health questions appear in Table 1. Based on the results of cognitive testing, the recommended questions are designed to reduce overall response burden, particularly for respondents of a large-scale national survey who would have little understanding of the causes or symptoms of gum dis-

ease. Additionally, questions are designed to be interpreted consistently by respondents and to be interpreted as the survey writers intended.

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