Cognitive Interview Evaluation of Questions on Walking and Lung Cancer Screening on behalf of the National Health Interview Survey

Amanda Wilmot, J. Brent Vickers and Paul Scanlon

Collaborating Center for Questionnaire Design and Evaluation Research
National Center for Health Statistics
Centers for Disease Control

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1. Introduction

This report summarizes findings from an evaluation of survey questions on the topics of walking and lung cancer screening, intended for inclusion in the 2020 National Health Interview Survey (NHIS)[1]. NHIS is an interviewer-administered[2] nationally representative household survey, providing information on the health of the civilian non-institutionalized population of the United States. NHIS is one of the major data collection programs of the National Center for Health Statistics (NCHS), which is part of the Centers for Disease Control and Prevention (CDC).

When survey questions are modified or new questions added to the NHIS it is standard practice for these questions to be evaluated to ensure that the questions accurately collect data consistently across respondent groups, in accordance with the objectives of the research. In 2019, an evaluation of the walking and lung cancer screening question modules was conducted by staff working in the Collaborating Center for Questionnaire Design and Evaluation Research (CCQDER) at NCHS, using cognitive interviewing methods.

Twenty English-speaking adult respondents took part in face-to-face, one-on-one cognitive interviews over two rounds. This report summarizes findings from the two rounds and includes a summary of the main findings for each module, as well as those related to the performance of each question.

2. Method

2.1 Question evaluation method

Cognitive interviewing is a qualitative method routinely used in survey question evaluations (Willis, 2005; Miller, 2011; Geisen & Murphy, 2019). Cognitive interviewing, involves conducting one-on-one interviews with a small-scale purposive sample of respondents, selected to reflect the population under investigation. With a purposive non-random sample the number of people interviewed is less important than the criteria used to select them. A phenomenon only need appear once to be of value (Wilmot, 2005). Those selected who fulfill the sample criteria are interviewed.

During the interview the survey questions under investigation are administered and cognitive interviewing techniques applied in order to make an assessment of the mental processes that respondents go through when answering the survey questions, within the context of their individual life circumstances (Miller, 2011). Using this approach researchers are able to explore construct validity and identify the variety of difficulties respondents encounter in understanding and answering survey questions (learning whether respondents interpret the questions as asking about the construct of interest, and if not, why not) (Miller, 2014). Ultimately the findings from the cognitive interviews help in

[1] https://www.cdc.gov/nchs/nhis/index.htm

[2] Face-to-face interviewing is the primary mode of administration for the NHIS, but follow-up interviews may be completed by telephone.

determining whether questions may be prone to measurement error when administered in a quantitative survey. Best practice advocates an iterative approach (OMB, 2016; Willis, 2016; Collins, 2015). Any changes adopted as a result of the initial evaluation are re-evaluated to ensure that they have made an improvement to respondents' ability to answer the questions and have not introduced additional problems that were not there originally.

Analysis of cognitive interview data follows a systematic process of synthesis and reduction from interview to report (Miller et al., 2014). The first step is one of data management. Summary notes of each interview are made from interview recordings. These notes are organized according to themes, while retaining the ability of the analyst to conduct within case as well as theme-based analysis. The original response to the survey question being evaluated is reported along with an accurate description of the interview discussion. Examples and illustrative quotes ground the summary in the data (Collins, 2015). A systematic analysis of the summary notes, examining cognitive processing difficulties or inconsistencies, patterns across interviews and comparisons of sub-group responses, also ensures that no particular case is overemphasized and that findings represent the full range of responses (Ryan & Culbertson, 2012; OMB, 2016). Respondent confidentiality is maintained throughout this process.

2.2 Study sample and respondent recruitment

For this evaluation study, CCQDER's operations staff recruited and screened respondents for interview. Respondents were recruited from advertisements placed in local newspapers and Craigslist, and a small number through word-of-mouth. Staff reached out to those who expressed an interest in taking part, administered a set of screening questions, and scheduled appointments with those who fulfilled the screening criteria.

Screening criteria included basic demographics such as age, gender, race and ethnicity as well as questions about walking behavior and whether or not potential respondents had had an X-ray or computerized tomography (CT) scan of the chest area in the past 12 months. An attempt was made to achieve interviews with people representing a range of demographic characteristics as well as a mix of behaviors related to the topics under investigation.

Twenty face-to-face one-on-one cognitive interviews were conducted in total, over two rounds, each round comprising a separate sample of respondents. Following Round 1, amendments were made to some of the questions that were not performing well, for further testing in Round 2. Round 1 was conducted in June 2019; Round 2 in July 2019. Thirteen interviews were conducted during Round 1 and seven during Round 2. All respondents were non-Hispanic English-speaking adults aged 18 or over, living in urban or suburban settings. Table 1 shows the demographic breakdown achieved for this study across both rounds of interviewing.

Table 1: Respondent Demographics

Demographics	Number of respondents (N=20)
Age in years	
18-29	0
30-49	4
50-64	9
65 or over	7
Gender	
Female	10
Male	10
Education	
HS Diploma/GED or less	16
2- or 4-year college degree	4
Graduate degree	0
Race/Ethnicity	
American Indian or Alaska Native	1
Asian	0
Black or African-American	13
Native Hawaiian or Other Pacific Islander	0
White	2
Two or more races	4
Hispanic or Latino	0

An even mix of female to male respondents was achieved. However, the sample skewed towards those self-classifying as Black or African-American and those with lower educational attainment (high school diploma/GED or less). All respondents interviewed self-classified as non-Hispanic or Latino. Respondents from rural settings were not included in the sample for this evaluation study.

2.3 Data collection

Cognitive interviews were conducted at CCQDER's cognitive testing laboratory in Hyattsville, MD. Each respondent took part in an interview lasting no more than 1 hour and received $40 for participating. All interviews were conducted on a voluntary basis and informed written consent was obtained prior to the start of the interview.

To achieve a balanced assessment of how a particular respondent went about answering the survey questions, cognitive interviewers asked non-leading questions (or probes) retrospectively, after first administering each module of questions. The approach to cognitive interviewing used by CCQDER staff is interpretivist. That is, it focuses on how a respondent's own life experiences inform their answers to survey questions. As such, staff rely on non-scripted verbal probing to illuminate the respondent's circumstances and inform how and why they answered the questions the way they did (Cibelli Hibben & de Jong, 2020).

With respect to question administration, 'Don't know' and 'Refusal' codes were available for interviewers to use if respondents answered spontaneously in this way. However, these response choices were not read to the respondent as part of the question administration. For the purposes of this study, any interviewer 'read-if-necessary' instructions were not administered.

2.4 Analysis and reporting

All interviews were video and audio recorded to afford the interviewer the freedom to concentrate on the interview and allow a more thorough and impartial analysis than could be achieved by simply taking notes during the interview. Interviewers made summary notes about the way in which respondents interpreted and responded to the survey questions from the recordings, evidenced by verbatim statements made by respondents during the interview. Where this report makes reference to verbatim statements, the respondent's accounts are italicized. The evaluated questions provided the framework for the interview summaries which, along with respondent's answers to the questions as they were administered, were entered into CCQDER's Q-Notes software[3]. Q-Notes is a matrix-based approach for managing qualitative data that allows for both case and theme-based analysis of the data set. All notes were anonymized. That is, they did not contain any personal information that could identify those respondents who took part in the interviews.

3. Findings

Findings from the evaluation of the walking and lung cancer screening modules are reported below. Within each module main findings along with item-specific findings are presented.

3.1 Walking module of questions

A set of twelve questions, designed to measure walking behavior and the influence of the environment on walking behavior, was evaluated across both rounds of cognitive interviewing. The main objectives of the evaluation were to determine:

i) Whether respondents could distinguish between the concepts of walking for transportation purposes and walking for leisure or exercise purposes.
ii) Whether respondents could accurately report the number of times they had walked for each purpose over the past seven days.
iii) Whether respondents could accurately report the average length of their walking journeys in hours or minutes.

[3] https://www.cdc.gov/nchs/ccqder/products/qnotes.htm

3.1.1 Walking module: main findings

Concept of walking for transportation versus walking for leisure or exercise

Interpretations of the phrase "walking for transportation" and definitions of walking for leisure or exercise (described in the question stem as walking for fun, relaxation, exercise, or to walk the dog) differed according to the primary purpose of the walk.

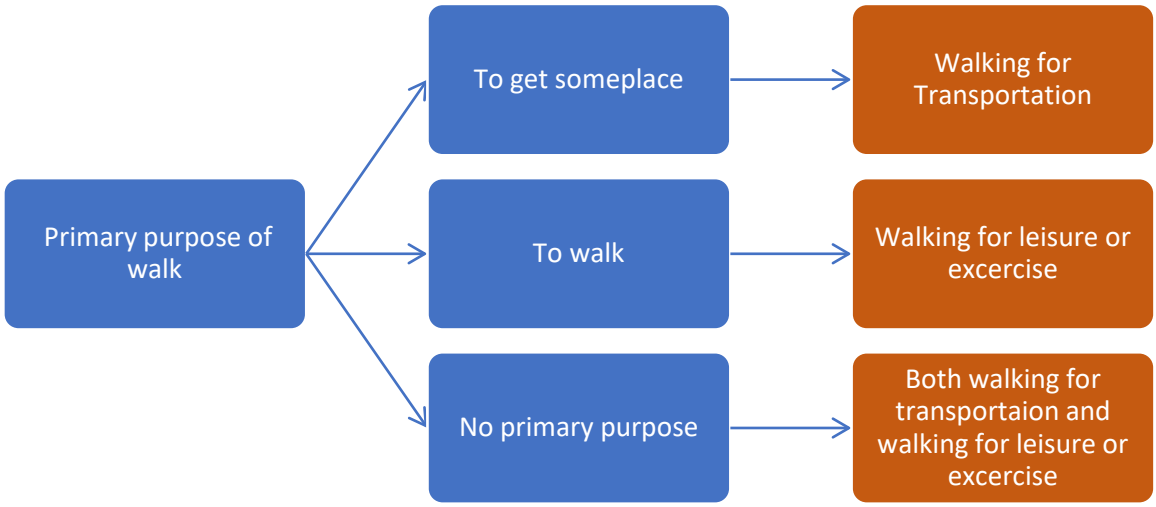
Primary purpose to get someplace. Some respondents considered the phrase "walking for transportation" to mean any walks made in order to get someplace, including a place of work, a store, or a transit point such as a bus stop or train station. These respondents only counted walks as being for leisure or exercise when walking was the only purpose of the activity, such as walking the dog or walking on a path or trail. For example, one respondent included her walk to the store as walking for transportation and her morning walk around the neighborhood as walking for leisure or exercise.

Primary purpose to walk. A few respondents had a narrower interpretation, only including walks to a transit point in their definition of walking for transportation. These respondents included walking to other destinations, such as the grocery store, in their definition of walking for leisure or exercise. This was because their primary intent in walking to the grocery store was to walk for exercise: *"Ya I walk for exercise. I walk to the Walmart and even the Safeway."*

No primary purpose. While some respondents made a distinction between walking for transportation purposes and walking for leisure or exercise - even if their definitions differed - others did not consider the two mutually exclusive and could not prioritize one purpose over the other. Some began their walking journeys with the intention of combining both purposes; others made the decision spontaneously during their walks: *"It's a mix. … I might go out to run an errand and then spontaneously decide to do some extra walking around."* As a result, there was evidence of double counting across the two categories. Where respondents answered affirmatively to both Question 1 (walking for transportation) and Question 4 (walking for leisure or exercise), these differing interpretations, and the difficulty respondents had distinguishing between the two categories of walking for transportation and walking for leisure or exercise, impacted responses to Question 2 (frequency of walks for transportation), Question 3 (length of walks for transportation), Question 4, Question 5 (frequency of walks for leisure or exercise), and Question 6 (length of walks for leisure or exercise).

Figure 1 illustrates the decision-making process that respondents went through when determining how to classify walks according to those made for transportation purposes and those made for the purpose of leisure or exercise. First, they considered the primary purpose of their walk. The primary purpose determined how they classified their walk according to the definitions of walking for transportation or walking for leisure or exercise. When they were unable to determine the primary purpose, they classified their walks into both categories and reported them twice.

Figure 1. Decision making process involved in the classification of walks



Concept of walking "one time"

The way in which respondents determined the number of walks they made also differed. Some counted a journey comprising any number of walking stages as one walk, or one time; others counted all walking stages of a journey separately. For example, a journey to the grocery store requiring a walk to the bus stop and a walk from the bus stop to the store was counted as one walk by some and two by others.

Cognitive burden

When respondents walked more frequently or had irregular walking patterns of behavior, the process of answering questions either about the number of times they had walked or the average length of time their walks had taken over a 7-day period required greater use of memory recall and more effort on the part of the respondent. Interviewers described some respondents as pausing to think and taking a few deep breaths before answering, or looking at them wide eyed and shaking their heads as they thought about their walking behavior: *"Because that's all I do is walk back and forth. That's all I do. I walk instead of taking public transportation. It all depends on how far I've got to go."*

With regard to the questions about walk length, some tried to minimize the cognitive effort involved by answering in such a way as to have the interviewer make the calculation for them, or they provided ranges rather than an actual amount. In a few cases, respondents did not deduct the time they spent waiting for public transportation to arrive, or avoided the calculation altogether by providing the total time of their journey from start to finish, including any time spent at their destination. Bearing in mind that the NHIS is interviewer administered in-person and by phone, it is important to note that this kind of respondent behavior, known as satisficing, can be even more exaggerated when quantitative survey interviews are administered over the phone, rather than in-person (Singleton & Straits, 2012).

Social desirability

As is common with survey questions related to physical activity, or any behavior that might be perceived as socially desirable, there was evidence that a few respondents reported answers in line with something that they perceived was more typical, or socially acceptable than what they actually did in the past seven days. In doing this they tended to inflate the amount they walked and therefore provided an overestimate to the questions. For example, one respondent described the number of times he used to walk each week, rather than the number of times he currently walks for leisure or exercise.

Accounting for disability

One respondent used a wheelchair. This respondent did not consider journeys made using his wheelchair when reporting walks. He only thought about walking when using his cane.

3.1.2 Walking module: question by question review

Each question evaluated is reported on below. Some questions were amended before Round 2 based on initial findings from Round 1. Where changes in question wording impacted on the response task or respondents' interpretation of the question, each round is reported separately.

Question 1

Walk1
The next questions are about walking for transportation. This is walking you might have done to travel to and from work, to do errands, or to go from place to place. I will ask you separately about walking for other reasons like relaxation, exercise, or walking the dog. IN THE PAST 7 DAYS, did you walk for transportation?

Read-if-necessary: Include walking to or from a bus, train, or rail stop.
Read-if-necessary: Do not include walking for relaxation or exercise.

1. Yes
2. No

7. Don't know
9. Refused

Skip Instructions: *If Yes: go to WALK2*
If No, DK, or Refused: go to WALK4

All twenty cognitive interview respondents, across both rounds of testing, were asked this question about walking for transportation in the past seven days. Seventeen answered "Yes" and described some walking journeys that could be classified as walking for transportation, either as an alternative mode of transportation to get to a destination, or to get to or from a transit point *en route*. Three respondents answered "No" to this question. All three described using a private vehicle as their preferred method of transportation.

The way in which respondents defined "walking for transportation" differed, depending on what they considered to be the primary purpose of the walking journey. Most considered walking for transportation to mean any walks made in order to get someplace, including a place of work, a store, bank, to visit relatives or friends, or to get to a transit point such as a bus stop or train station, irrespective of whether the walk was also carried out for leisure or exercise purposes. Indeed, a few of these respondents included walks to a destination where the purpose was to take part in a leisure or exercise activity, for example walking to a park. A few respondents only considered walking to or from a transit point as "walking for transportation." These respondents made their assessment based on necessity versus choice. There was no choice other than to walk to the initial transit point: "*How else would I get to the bus stop?"* and therefore these walks were counted as walks for the purpose of transportation. On the other hand, if respondents were going someplace, for example to the grocery store, and an alternative mode of transportation was available to them, then the choice to walk was primarily a choice to walk for leisure or exercise, and these walks were not considered as walking for transportation.

Only one respondent included walking while at work when thinking about her answer. She included the walk from the parking lot to the main office and from the main office to her place of work. This was the only walking for transportation that she engaged in.

Question 2

During Round 1, respondents were asked to count the total number of times they had walked for transportation in the past seven days. During Round 2, respondents were first asked for the number of days on which they had walked for transportation in the past seven and were then asked to calculate the average number of times per day that they walked for transportation on the days they had walked. The reasons for this change are discussed below. Ten respondents were routed to Question 2 in Round 1; seven in Round 2.

Round 1 question

WALK2

IN THE PAST 7 DAYS, how many times did you do that**?**

_____ Number of times

The question as worded in Round 1 was cognitively burdensome for respondents and slowed down the pace of the interview. To answer the question, respondents first needed to consider the days on which they had walked for transportation in the past seven days, and then to add up the number of times they had walked for transportation on each of those days, while excluding any walks they had made for leisure or exercise purposes: *"It all depends. I had a doctor's appointment…and I exercise too. I walk up and down the halls. Every day I'm walking. "*

Some respondents only made the first part of the calculation and answered about the number of days on which they had walked for transportation in the past seven days. Most who answered in this way walked every day, answering *"every day"* or *"seven days a week."*

For those who understood that the question was asking about the number of times they had walked for transportation, they had to decide what was meant by "a time." Indeed, respondents asked the interviewer for clarification:

> *"Do we mean every time that I started to a destination A to B, then another time A to B?"*
>
> *"Is it each way counts as one instance? There and back."*

Definitions of "a time" varied in both rounds of testing. A few respondents counted each journey to and from someplace as one time, although these journeys only involved one walking mode of transportation. For example, a walk to the grocery store and back was counted as "one time." A few counted each trip to or from someplace as one time even if it comprised more than one walking stage. However, most settled on counting all walking stages of a journey separately, although they were not consistent in whether they included very short walks e.g., from a bus stop to a metro station. Some did; others did not. Therefore, a journey comprising a walk to a bus stop, a walk from a bus stop to a metro station, and then a walk from the metro station to a destination, might be counted as one, two or three times.

Respondents then had to make the calculation over a 7-day period. Unsurprisingly, those who made the same walking journey on a regular basis or walked less frequently found the calculation easier to manage than those whose walking journeys varied or who walked more frequently. Indeed, those who walked frequently sometimes struggled to provide an answer at all. For example, one respondent talked through the various walking stages of his typical journeys and after prompting by the interviewer guessed *"about 70 times."* An added complication in making the calculation over a 7-day period was for those whose daily routines varied. These respondents had difficulty remembering all of their walking journeys over the past week. The quote below illustrates the complexity of this question for some Round 1 respondents. While talking through her answer of 3 times, one respondent said:

> *"Well, Thursday I had a medical appointment so I had to walk to the bus to get me to the medical center and the walk to get home once I got back from the bus stop. I included today. So the same thing, walking to the bus stop and walking back. Ummm, my days are very different from one day to the next. So I know I didn't go any…well, I walked on the weekend. No, Monday I walked all the way to the grocery store. So, that's three days right there. I don't think I walked to any store on the weekend. And Friday I got a ride, so I didn't walk on that day. And I don't remember what I did on Wednesday."*

<u>Round 2 questions</u>

To help reduce the complexity of the questioning, with the aim of improving accuracy of reporting, in Round 2, respondents were asked first to report the number of days on which they had walked for transportation during the past seven days and then were asked second, to report the average number of times per day they had done so.

WALK2

IN THE PAST 7 DAYS, how many days did you do that**?**

_____ Number of days

As evidenced from the question response times observed during the interview, first asking for the number of days on which respondents had walked for transportation over the past week was less burdensome than asking for the number of times. Respondents who walked every day for transportation easily answered "*seven.*" Nevertheless, response error was apparent. One respondent initially answered using the heuristic of 'everyday' to mean seven days a week, but during probing changed her answer to 'five' because she realized that she only walked for transportation on the days she worked, which were Monday to Friday.

WALK2A

On average, how many times per day did you walk for transportation?

_____ Number of times

Respondents often estimated their answers rather than calculating an average. Sometimes they estimated their answer by using their perception of a typical day: *"Today, I'll use this as an average."*

One respondent did not include journeys made using his wheelchair when reporting walks. He only included walking when using his cane for assistance.

Two respondents interpreted the question to be asking about the average length of time their walking journeys had taken. The terms "average" and "time" possibly heard as "average time" spent walking. One respondent answered 12 minutes; the other answered 3 hours.

Question 3

Round 1 question

WALK3

How long did that walk take? / On average, how long did those walks take?

_____ Number

1. Minutes
2. Hours

Round 2 question

WALK3

On average, how long did those walks take?/**[Only if one day and one time]**How long did that walk take?

_____ Number

1. Minutes
2. Hours

This question was also cognitively burdensome for some respondents who were asked to estimate the average length of time, of all walks for transportation purposes, made during the 7-day reference period. As a result, a "guesstimate" or a range was provided. One respondent was unable to provide a response.

Those who made regular walking journeys to the same destination found it easier to provide an estimate and were confident in their answers, for example, 20 minutes to the grocery store, or 10 minutes to the bus stop. In one case a respondent did not need to estimate the average length of time her walks took because she said she knew precisely how long the walk was to the bus stop because she used an app that gave her that information.

It was more difficult for respondents whose walks varied to provide an answer: *"Um…to be honest with you that's kind of hard."* Some took longer to calculate their response, in particular those who added up the time taken to complete each separate walking stage of a journey. For example, one respondent thought out loud as he made his calculation: "*…from my house to the bus, to the next* [subway] *station, to the nursing home."*

To avoid the cognitive effort involved in making the calculation, as a short-cut some respondents provided a range e.g. 25-30 minutes, only selecting an actual amount when prompted by the interviewer. A few relied on the interviewer to make the calculation for them. For example, one respondent answered *"15-20 minutes, 5 times a day."* One respondent was unable to provide an answer at all because his walk times were so variable. He answered, *"On average each walk was 2 to 20 minutes. And multiply that by 2 or 3 times a day."* A few respondents included their wait time at the bus stop in their estimate, or the time they spent at their destination, for example, walking around the store while shopping.

Question 4

Question 4, which asked about walking for the purpose of leisure or exercise, was amended before Round 2. The Round 1 interviewer instruction not to include walks for transportation was included as part of the question stem in Round 2. This change was made to ensure that all respondents were provided with the same information about how to answer the question, encouraging them not to double count walks for transportation previously reported. However, some double counting was still apparent in Round 2, as discussed below.

Round 1 question

WALK4

Sometimes you may walk for fun, relaxation, exercise, or to walk the dog. IN THE PAST 7 DAYS, did you walk for any of these reasons?

Read if necessary: Do not include walking for transportation.

1. Yes
2. No

7. Don't know
9. Refused

Skip Instructions: *If Yes: go to WALK5*
If No, DK, or Refused: go to WALK8

Round 2 question

WALK4

Sometimes you may walk for fun, relaxation, exercise, or to walk the dog. [fill if said at least one walk for transportation] **Not including the walks you just told me about,** IN THE PAST 7 DAYS, did you walk for any of these reasons?

1. Yes
2. No

7. Don't know
9. Refused

Skip Instructions: *If Yes: go to WALK5*
If No, DK, or Refused: go to WALK8

Across both rounds of interviews, four respondents answered "No" to this question, explaining that they did not walk for leisure or exercise, either because of health reasons or it was just not one of their "*pastimes*."

Those who answered "Yes" did not always separate walking for transportation and walking for leisure or exercise because they had combined both purposes, as mentioned earlier during the discussion at Question 1. As a result, a few considered the same walks previously considered when answering Question 1. In Round 2, despite being instructed not to include previously reported walks, some respondents continued to do so, for example, walking to the mall or to the grocery store where the purpose was also for exercise.

The types of walking described by respondents when answering this question about walking for leisure or exercise included walking the dog, walking or jogging in a park or along a trail, walking to do errands, and, playing with children or doing yard work.

> *"For exercise. He gets his* [referring to dog], *and I get mine."*
>
> *"I have a* [child], *so we're outside a lot. We go for walks. I may be walking while she is riding her bike. Or going to the playground, or sightseeing, playing games. It involves a lot of walking."*

One respondent said that the only walking she did that was not for transportation was when she was mad or upset: *"I walk for leisure when I'm mad or upset, but that's about it."*

Question 5

During Round 1, respondents were asked for the number of times in the past seven days they had walked for the purpose of leisure or exercise. During Round 2, as was the case for Question 2, this question was spilt in order to try and make the response process simpler for respondents to complete accurately. In Round 2, respondents were first asked for the number of days on which they had walked for leisure or exercise, and then to calculate the average number of times per day they had done so.

Across both rounds, the definitional issues associated with walking for transportation versus walking for leisure or exercise impacted on the answers provided. As mentioned previously, respondents sometimes counted walking while running errands where they had chosen to walk for the purpose of exercise.

Round 1 question

WALK5

IN THE PAST 7 DAYS, how many times did you do that?

_____ Number of times

As with Question 2, some respondents answered this question in terms of number of days rather than number of times - although in a few cases those who had answered in days to Question 2, now answered in terms of number of times.

There was some indication of possible overcounting. A few respondents answered about their usual or past behavior rather than their behavior during the past seven days, where that past behavior suggested they were more active. For example, a respondent who answered fourteen times, stated: *"I used to do it twice a day, but I have gotten lazy."*

Round 2 questions

WALK5

IN THE PAST 7 DAYS, how many days did you do that?

_____ Number of days

There were no issues apparent with this question during Round 2.

WALK5A

One average, how many times per day did you walk for leisure or exercise?

_____ Number of times

One respondent initially answered this question in terms of the number of days, providing the same answer she had given to the prior Question 5. Only on probing did she realize that the question was asking about the average number of times per day that she had walked for leisure or exercise: *"Oh wait, oh PER day. Oh I got ya. Okay. Just…on average how many times…just once."*

The definition of "one time" appeared less problematic for this type of walking. Walks for leisure or exercise which began and ended at home were counted as a one-time round trip. Nevertheless, there was variation in the same way as reported previously at Question 2. For example, one respondent initially answered *"five"* but changed his answer to *"six"* during probing because he stated *"the number should be an even number to go someplace and to come back"* indicating that he was counting each way as one time.

Question 6

Round 1 question

WALK6. How long did that walk take? On average, how long did those walks take?

_____ Number

1. Minutes
2. Hours

Round 2 question

WALK6. On average, how long did those walks take? **[Only if one day and one time]**How long did that walk take?

_____ Number

1. Minutes
2. Hours

In general, respondents were able to provide an average time, although qualifying that their walks for leisure or exercise varied in length: *"It depends on what my schedule is like."* As reported at question 3, a few continued to provide a range, before being asked to provide an exact amount by the interviewer.

Question 7

WALK7

These next questions are about where you live. How often does this walking take place near your home? Would you say almost always, most of the time, some of the time, a little of the time, or never?

1. Almost always
2. Most of the time
3. Some of the time
4. A little of the time
5. Never

7. Don't know
9. Refused

Respondents were routed to Question 7 if they answered "Yes" to Question 4 about walking for leisure or exercise. Across both rounds, 16 of the 20 respondents interviewed were routed to Question 7 and asked how often walking took place near their home. Ten answered "almost always," four answered "most of the time" and two answered "some of the time."

The majority not only walked for the purpose of leisure or exercise but also for transportation. In these cases, some thought only about their walks for leisure or exercise when answering, whereas others thought about both types of walking, particularly when they rarely walked for leisure or exercise. Two respondents answered that they only walked for leisure or exercise, and that they did not walk for transportation, and as such, answered Question 7 only on the basis of their walks for leisure or exercise.

Respondents' definitions of "near your home" was not probed in detail. Respondents described walking that occurred "close" to their home or "by" their house. A few were more specific, describing walks near their home in terms of time, which varied somewhat. One respondent described walks near her home as being within 3 or 4 minutes; another used a reference period of 40 minutes.

Respondents considered walks that started and ended at their home. One respondent described the fact that he very rarely left the area "close" to his home because he lived in an urban area and the library, grocery store, etc. were close by within walking distance. Respondents did not always distinguish between the response categories of "almost always" and "most of the time": *"They're about the same thing."* Those who did not distinguish selected "almost always" as their response. One respondent answered *"most of the time"* because some of the time he was away on vacation.

Question 8

WALK8

Where you live, are there roads, sidewalks, paths or trails where you can walk?

1. Yes
2. No

7. Don't know
9. Refused

As the respondents in this study all lived in urban or suburban areas all answered "Yes" to this question. During probing, most reported sidewalks in their area: *"Sidewalks, I'm in the suburbs."* Some also reported paths or trails, or roads.

Question 9

WALK9

Read if Necessary: Where you live... Are there shops, stores, or markets that you can walk to?

1 Yes
2. No

7. Don't know
9. Refused

In general, respondents considered stores that were closest to them and then determined if they walk there, or if not, whether other people could walk there. Stores that were considered within walking distance tended to include smaller convenience stores. A few respondents mentioned larger grocery stores within walking distance.

Two respondents answered "No" because the closest shop was too far for the respondent to walk (35-40 minutes) or because the it was inaccessible on foot: *"the closest shop is across the highway about a quarter or a mile away."*

One respondent did not provide an answer because he was unsure if the question was asking about his closest convenience store or, because the question asked about more than one shop or store, if he was being asked about whether he was able to walk to a shopping center:

> *"I'm far away from a commercial area… but there's one little convenience store…I use that, but not for major grocery shopping and things like that…See the question is asking plural. Like when you said shops plural, there is a shop… That's why I had to give it some thought because there's one store that's incredibly convenient and then the others are further away…I have walked to them before, but it is some distance. I mean it would be a real exercise assignment to walk to them. I mean I could, I have, but I don't because it's a distance."*

Question 10

WALK10

Read if Necessary: Where you live... Are there bus or transit stops that you can walk to?

1 Yes
2. No

7. Don't know
9. Refused

The majority of respondents answered "Yes" to this question and were confident in their answers because they themselves used public transportation: *"The public transportation is excellent where I live. I have the option of four or five buses that I can take to get to the metro. And the stop is right in front of my apartment building."*

Two respondents, who did not use public transportation, were uncertain whether there were transit stops they could walk to: *"I haven't seen no buses around there."* Nevertheless, they answered "No" to this question rather than "Don't know."

Question 11

WALK11

Read if Necessary: Where you live... Are there places like movies, libraries, or churches that you can walk to?

1 Yes
2. No

7. Don't know
9. Refused

Similar to findings reported by Willson (2014), when answering this question almost all respondents focused only on the examples provided in the question stem. Only two mentioned other places in addition to those provided as examples: one a community center; the other restaurants. Those who answered "Yes," answered hypothetically on the basis of whether they could walk to at least one of the example places, even if they did not: *"Churches I could, Yes, but not the other two*." Those who answered "No" or "Don't know" answered on the basis of what they actually did. For example, one respondent explained that there was a church *"right across the street"* but although she had been there a couple of times, the church she went to was *"… not in walking distance."* Another explained: *"There are churches, but I don't participate in those."*

Question 12

WALK12

Read if Necessary: Where you live... Are there places that you walk to that help you relax, clear your mind, and reduce stress?

1 Yes
2. No

7. Don't know
9. Refused

What was considered to be a place of relaxation for those answering "Yes" to this question included playgrounds, parks and recreational areas, jogging paths and walking trails, a pond area within a housing development, a local swimming pool, church, gym, and library. Pastimes which were relaxing for some respondents were also considered. These included walking the dog, even when this was not done in a recreational area but on sidewalks in an urban area. One respondent included walking to visit his girlfriend. A few respondents thought about places they went to for relaxation that involved taking public transportation, such as the zoo or a bookstore, albeit involving walking to a public transit point. One respondent thought about a club that she went to listen to music and socialize, which helped her to relax.

Again, similar to findings reported by Willson (2014), respondents answered this question based on their own behaviors. Those who answered "Yes" considered places within walking distance and which they themselves walked to, to relax, clear the mind and reduce stress. Those who answered "No" did so even if there were places they could walk to, but didn't. For example, one respondent explained that her place of relaxation, although nearby and walkable for some people, was not within walking distance for her as she had limited mobility. Another said that although there was a walking trail near to her home it was too dangerous and her bag might be snatched. One other respondent answered "No" because she preferred to drive to the place where she walked for relaxation: "W*ell, if you were into walking you could walk, but we just drive."*

3.2 Lung cancer screening module of questions

A set of four questions to measure when respondents had last received a CT scan screening for lung cancer was evaluated. The question set was designed to take a stepwise approach to helping respondents think though the conceptual elements required to answer a question about when they might have had a CT scan screening for lung cancer. The question set asked respondents to consider:

i) whether they had ever had a CT scan;
ii) if the CT scan was of the chest area;
iii) whether the purpose of the scan had primarily been to screen or check for lung cancer, and,
iv) when the CT scan to check or screen for lung cancer had most recently taken place.

This stepwise approach was designed so that respondents did not have to retain in working memory all of the information required to formulate an answer, thus theoretically reducing cognitive burden with the aim of improving response accuracy.

The main objectives of the evaluation were to: i) test the comprehension of the concept of the CT scan itself, to ensure that respondents could distinguish between a CT scan, and other similar procedures such as a regular x-ray or magnetic resonance imaging (MRI) scan; ii) understand if respondents could report accurately on whether the CT scan had been carried out to check or screen for lung cancer, and if so, iii) whether respondents could remember when their latest CT scan to check or screen for lung cancer had been carried out.

Questions were asked over both rounds of interviews reported previously. Question 1 was amended after the first round and text added to the introduction to help respondents differentiate between a CT Scan and an MRI.

3.2.1 Lung cancer screening module: main findings

The evaluation identified potential response error across the question set. This was due to knowledge issues. Respondents did not always know if they had undergone a CT scan or another test such as an MRI, and did not always know why their test had been carried out. These issues aside, respondents were able to report on when they thought they had undergone a CT scan to check or screen for lung cancer, particularly if the scan had occurred within the past 12 months, since they were able to remember the event that had caused them to have undergone a CT scan. These findings are consistent with those reported from previous evaluations conducted by CCQDER staff of questions on this topic (Willson, 2012; Willson, 2014).

3.2.2 Lung cancer screening module: question by question review

Question 13

Round 1 question

LUNG1

The following questions are about CT scans. During this test, you lie down on your back and are moved through a donut shaped x-ray machine while holding your breath. Have you EVER HAD a CT scan?

1. Yes
2. No

7. Don't know
9. Refused

Skip Instructions: *If Yes: go to LUNG2*
If No, DK, or Refused: go to next section

Round 2 question

LUNG1

The following questions are about CT scans. During this test, you lie down on your back and are moved through a donut shaped x-ray machine while holding your breath. **It is not the same as a MRI where you lay inside of a tunnel.** Have you EVER HAD a CT scan?

1. Yes
2. No

7. Don't know
9. Refused

Skip Instructions: *If Yes: go to LUNG2*
If No, DK, or Refused: go to next section

All twenty cognitive interview respondents were asked this question. Thirteen in Round 1; seven in Round 2. The question wording was amended between rounds.

While some respondents were confident that they had undergone a CT scan, others did not always understand exactly what a CT scan was: *"What is a CT scan? Is it a chest X-ray?"* During Round 1, a few respondents were unclear on the difference between a CT scan and an MRI, using the terms interchangeably to describe their procedure, but never-the-less answering "Yes" to this question. For example, one respondent described how she had felt panicked and trapped when undergoing testing in *"the machine …the one that covers your whole body."* Two others who also answered "Yes" to this question, during probing, specifically referred to having undergone an MRI: *"The MRI…I'm kind of claustrophobic…but somehow I made it through."* The addition of the MRI description at Round 2

appeared to be helpful for respondents in making the distinction, as one Round 2 respondent explained, *"because you said a donut versus a long tube."* Although their description indicated that they may have had a CT scan, a few respondents admitted that they had not always been told the name of the test they had undergone, but nevertheless still answered "Yes" to this question.

Those taking part in the cognitive interview could clearly recall the event that had led them to have a CT scan done, or what they perceived could have been a CT scan. These more memorable life events included being injured, feeling pain, or because they had been worried about possible lung cancer. Three respondents had taken part in medical research studies which involved having a CT scan.

Only one respondent (Round 2) answered "No" to this question, explaining that he had never had any tests for cancer, nor had he experienced any injuries or surgeries.

Question 14

LUNG2

Were any of the CT scans done of your chest area?

1. Yes
2. No

7. Don't know
9. Refused

Skip Instructions: *If Yes: go to LUNG3*
If No, DK, or Refused: go to next section

Of the 19 respondents routed to this Question, 16 answered "Yes" to having had a CT scan of the chest area. The majority had a CT scan of the chest area because of reported breathing or lung issues, or as part of lung cancer screening. As mentioned above, three had undergone CT scans of their chest area as part of a medical research study.

However, one respondent said the CT scan of his chest area was done because of a heart condition. Another had had a CT scan done because of arthritis in his back. He answered "Yes" to this question rationalizing that the machine *"…goes around your whole chest and back."* Another respondent, who may have been talking about an MRI, answered "Yes" to this question because: *"They did the whole body. Chest would be included."*

Question 15

LUNG3

The next question is about CT scans to check or screen for lung cancer, sometimes called low-dose CT scans. Were any of the CT scans of your chest area done mainly to check or screen for lung cancer?

1. Yes
2. No

7. Don't know
9. Refused

Skip Instructions: *If Yes: go to LUNG4*
If No, DK, or Refused: go to next section

Seventeen respondents were routed to this question. Seven answered "Yes" and 10 answered "No."

Most of those who might be considered to be in a higher risk group for lung cancer due to their past smoking behavior, described at least one of their past CT scans as having been carried out to check or screen for lung cancer.

However, some respondents were unsure as to why they had had a CT scan of their chest area, but nevertheless made a guess and answered on that basis. For example, one respondent answered "Yes" to this question, but during probing said, *"I don't remember them telling me why they took it…"* She had assumed it was done because she was a smoker. Another answered "No" but during probing said that he wasn't sure why his doctors had asked him to have a CT Scan but had assumed it wasn't to check for lung cancer. One of the respondents who had taken part in a medical research study which had led to a CT scan of the chest area also answered "No" because the doctors had not actually told him the scan was to check or screen for lung cancer: *"I would have to say no because they didn't actually say that."*

Question 16

LUNG4

When did you have your MOST RECENT CT scan of your chest area done mainly to check or screen for lung cancer?

Read only if necessary

1. Within the past year (anytime less than 12 months ago)
2. Within the past 2 years (1 year but less than 2 years ago)
3. Within the past 3 years (2 years but less than 3 years ago)
4. Within the past 5 years (3 years but less than 5 years ago)
5. Within the past 10 years (5 years but less than 10 years ago)
6. 10 years ago or more

7. Don't know
9. Refused

Seven respondents were routed to this question. All but two stated that they had their most recent CT scan of their chest area mainly to check or screen for lung cancer was within the past year, one within the past 2 years, and one within the past 5 years.

Perhaps unsurprisingly, those who had had the scan within the past year found it easier than those who had had it longer ago to remember when the scan had taken place. As mentioned earlier, the specific life events that had led to the scan being ordered by their doctor were more memorable: *"I felt like there was a lump in ther*e." The respondent who answered within the past 2 years thought that her CT scan for lung cancer may have been about a year ago, but selected within the past 2 years so as not to provide an underestimate. The respondent who answered within the past 5 years did so on the basis of her most recent test for COPD, but was unsure if that test had been a CT Scan. She had however had a CT scan previously which had initially identified a problem with her lungs.

4. References

Cibelli Hibben, K.L., & de Jong, J. (2020). Cognitive Interviewing. *Guidelines for Best Practice in Cross-Cultural Surveys.* Ann Arbor, MI: Survey Research Center, Institute for Social Research, University of Michigan. Retrieved from https://ccsg.isr.umich.edu/chapters/pretesting/cognitive-interviewing/

Collins, D. (2015). *Cognitive interviewing practice*. London: SAGE Publications Ltd.

Geisen, E. M., & Murphy, J. (2019). A compendium of web and mobile survey pretesting methods. In P. Beatty, D. Collins, L. Kaye, J.L. Padilla, G. Willis, & A. Wilmot (Eds.), *Advances in questionnaire design, development, evaluation and testing* (1st ed.). Hoboken, NJ: Wiley.

Miller, K. (2011). Cognitive interviewing. In J. Madans, K. Miller, A. Maitland, & G. Willis (Eds.), *Question evaluation methods*. (1st ed.) Hoboken, NJ: Wiley.

Miller, K. (2014). Introduction. In K. Miller, S.Willson, V. Chepp, & J.L.Padilla (Eds), *Cognitive interviewing methodology*. Hoboken, NJ: Wiley.

Miller, K. Willson, S. Cheppe, V. & Ryan, J.M. (2014). Analysis. In K. Miller, S.Willson, V. Chepp, & J.L.Padilla (Eds), *Cognitive interviewing methodology*. Hoboken, NJ: Wiley.

Ryan, K., Gannon-Slater, N., & Culbertson, M. J. (2012). Improving Survey Methods With Cognitive Interviews in Small- and Medium-Scale Evaluations. *American Journal of Evaluation*, *33*(3), 414–430.

Singleton Jr., R. & Straits, B. (2012). Survey interviewing. In J.F. Gubrium, J. A. Holstein, A.B. Marvasti, & K.D. McKinney (Eds), *The SAGE handbook of interview research: The complexity of the craft.* Thousand Oaks, CA: SAGE Publications.

U.S. Office of Management and Budget (OMB). (2016) Statistical policy directive no,. 2 addendum: Standards and guidance for cognitive interviews. Washington DC. Retrieved from: https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/directive2/final_addendum_to_stat_policy_dir_2.pdf

Willis, G.B. (2005) *Cognitive Interviewing: A Tool for Improving Questionnaire Design*. Thousand Oaks, CA: SAGE Publications.

Willis, G.B. (2016). Questionnaire pretesting. In C. Wolf, D. Joye, Smith, T. W. & Fu, Y (Eds) *The SAGE Handbook of Survey Methodology*. SAGE Publications.

Willson, S (2012). Cognitive Interview Evaluation of the 2010 National Health Interview Survey Supplement on Cancer Screenings & Survivorship: Results of interviews conducted October – December, 2008. Retrieved from: https://wwwn.cdc.gov/qbank/Reports.aspx#/Reports

Willson, S (2014). Cognitive Interview Evaluation of the 2015 National Health Interview Survey Cancer Control Supplement. Retrieved from: https://wwwn.cdc.gov/qbank/Reports.aspx#/Reports

Wilmot, A. (2005). Designing sampling strategies for qualitative social research: With particular reference to the Office for National Statistics Qualitative Respondent Register. *ONS Survey Methodology Bulletin No. 56*, pp. 53-65. Retrieved from:

https://webarchive.nationalarchives.gov.uk/20160108193821/http://www.ons.gov.uk/ons/guide-method/method-quality/survey-methodology-bulletin/smb-56/index.html