Survmeth 621 Project 2
Cognitive Interview Findings Report

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Report Outline

Abstract

        This findings report is a collective analysis of interviews conducted by the 5 personnel in our team across the 15 one-round, semi-self-administered cognitive interviews for testing the given Household Energy Consumption Survey. The interviewees possess a diverse background in terms of demographic characteristics in age, gender, race/ethnicity, and level of education regardless of the fairly small amount of it. Issues found are listed respectively with individual survey questions. Questions with difficulties understanding or answering raised by more than 5 respondents are identified as major issues and are analyzed in section IV. The remaining are deemed as minor ones and are outlined in section V. In the last section of this report, we made recommendations based on issues reported and words quoted from our interviewees, willing to improve the ease and convenience of respondents to understand and respond to this questionnaire, and to collect data with higher validity in regards with our research question. Depending on the types of the survey questions, different suggestions such as visual instructions, option expansion, and detailed definitions are given. Three limitations that restrict our analysis being reliable for future relative studies are described in the last section of this report, which are 1) sample size limitation; 2) respondent characteristic representativeness limitation; and 3) consistency of interviewing process limitation.

Keywords: Survey Design, Cognitive Interview, Household Energy Consumption, Data Collection

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I.   Introduction

This report summarizes the cognitive interviews to test questions in the Household Energy Consumption Survey. A cognitive interview aims to identify and evaluate potential measurement error problems related to surveying questions.

Household Energy Consumption Survey measures households' residential energy use and asks about household characteristics, physical characteristics, appliances, space heating, and air conditioning. The survey also seeks detailed household electronic equipment, including the frequency of use and age of machines.

The report provides summaries of findings and a deep analysis of the cognitive results related to particular demographic criteria. The study interviewed 15 (fifteen) respondents from October 1st, 2022, to October 31st, 2022. The evaluation using cognitive interviews refers to Beatty and Willis (2007)[2] and Massey and Virkar (2002)[3]. Detailed information about the questionnaire tested, and probes is presented in the appendix.

II.   Methods

Cognitive Interviewing: Cognitive Interviewing is a technique to evaluate and analyze sources of response error in the survey. This technique measures a respondent's ability to understand survey questions and collect their responses during the interview. The results of this method are used to improve the questionnaire, provide questions validity, and understand data using qualitative methods.

Cognitive interviewing provides two methods: think-aloud and verbal probing. Think-aloud procedures refer to the activity in which respondents were asked to think as they answered the survey questions. In the verbal probing technique, interviewers administered questions to ask about the respondent's thoughts or opinions about the question. Two general approaches to probing are concurrent probing and retrospective probing. In the concurrent probing, interviewers asked a probe question during the interview process. In the retrospective probing, interviewers asked a probe question after finishing the entire questionnaire. The samples of cognitive interviewing usually include a small number of respondents (12-15 respondents for each round). The sample can represent some of the population, but selecting diverse characteristics is more important.

Sample: It is composed by 15 respondents for one round of interviews. This includes differences such as six respondents aged 45 or older and four respondents with less than a college degree. In addition, respondents were representative of other demographic characteristics of gender and race/ethnicity.

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[2] Beatty C.P. and Willis G.B. (2007). Research Synthesis: The Practice of Cognitive Interviewing. Public Opinion Quarterly, Vol. 71, No. 2, Summer 2007, pp. 287–311.

[3] Massey, Meredith and Virkar, Saarika. (2002). Results of Cognitive Testing of Questions on Adverse Childhood Experiences for the Youth Risk Behavior Surveillance System. Retrieved on Oct 30, 2022 from https://wwwn.cdc.gov/QBANK/Search/Reports.aspx#/Reports/1232

Interviewing Procedures: The interviewer read the respondents each item in the questionnaire and posed probing questions about the respondent's opinions of specific questions. We prepared the probing questions before the interviews, so all interviewers posed the standard probe questions to all respondents. The probes only provided specific questions for several reasons. First, time limit consideration may be related to respondent fatigue/burden. Second, we proposed probes for questions that were assumed harder to answer and showed potential uncertainty from respondents. Third, when we work with a more significant number of respondents, those minor probes can presumably be ignored.

Interviewers asked all questions to respondents except for section B, where respondents read the questions themselves to simulate a self-administered survey. All interviews were conducted online and recorded based on the mutual agreement between interviewers and respondents. The interviews were conducted for an estimated time of 45 minutes and the actual average time of interviews is 31 minutes.

Data Analysis: The analysis was based on the recording and notes from all interviewers. We summarized all probe results and categorized them based on the respondent's demographic characteristics. Then, we captured patterns and noted any possible measurement issues. We provided an overview for major issues that happened for more than five respondents and we also have a detailed analysis of issues that we discover.

III.   Overview: Patterns associated with demographics

Table 1. Demographic profile of respondents	
Characteristics	**Respondents (n=15)**
Age	
18-24	3
25-34	5
35-44	1
45-54	1
55-64	2
65 or above	3

Gender	
F	8
M	7
Race / Ethnicity	
White	13
Latin	1
Asian	1
Education	
High school diploma or GED	4
Some college or Associate's degree	7
Master's, professional degree, or doctorate	4

Table 1 resumes the demographic characteristics of the respondents in the sample. The following paragraphs describe some of the patterns presented by Race/Ethnicity, Gender, Age, and Education.

Race/Ethnicity: The survey's target population is the group of people who live in the US and are fluent speakers of English; for that, 13 of the 15 respondents are white, and the other two are other (Latin and Asian). For questions about the type of TV that is most used in the household, minorities do not use the TV in their home. The rest of the questions do not have significant differences in the answers among the three racial groups.

Gender: The group of respondents has seven female and eight male respondents. Female respondents reported more issues while answering the questionnaire, especially in sections A and B, which are related to the housing units' characteristics and the appliances. For example, one female respondent said she asked her husband the year the building was constructed, declaring that she did not know the construction date, while his husband answered. In the next section, generally said, gender identifications do not affect how respondents understood or answered the questions. Respondents showed similar issues in the knowledge of space heating and air conditioning as the same as the household characteristics section.

Age: Some patterns between ages are described as the following:

- Older respondents were more conscious of questions that involved dates and heating equipment for the house; this pattern shows that this group has more accurate knowledge about household information.

- In the appliances and household characteristics sections, age did not affect how respondents answered because the issues in their answers were quite similar between all the groups in the sample.

Education: In the sample, more than two-thirds of the respondents have completed at least some college or associate degree. One clear pattern shown across the interviews is that people who made more inquiries have higher degrees than a high school diploma. This pattern could show that people with more education express more issues to understand the questions better.

IV.   Overview: Major issues in the questionnaire

15 interviews were conducted, and several major issues associated with the questionnaire design were identified. In order to identify the major issues within the questionnaire provided to us, all interviews conducted were reviewed according to each individual questionnaire item, and items in which respondents indicated to be difficult to understand and/or respond to were noted. If five or more respondents expressed difficulty with a particular item in the questionnaire, it was classified as a "major issue" in the design of the questionnaire. Five or more respondents having a challenge with a specific questionnaire item was deemed as the indicator of a major issue in the design, as this accounts for at least one-third of the overall sample. Therefore, this parameter aids in distinguishing flaws in the questionnaire design, and helps to identify factors that could cause measurement error, such as the respondent not understanding or knowing the answer to the question being posed. Through implementing the aforementioned distinction process, the following questionnaire items were identified as major issues. The items are as follows: (1) A4, (2) A21, (3) B1-B7, (4) B10, and (5) D9 (a full description of survey items can be found in the appendix).

Item A4 required respondents to share when their home was built, which was deemed to be challenging primarily due to retrieval failure as a result of memory decay since several respondents had lived in their homes for many years, and have consequently forgotten when their homes were built. This item also introduced measurement error, as several respondents were renters, which caused them to not have information on when their homes were built.

Item A21 asked respondents to state how many rooms they have within their homes, besides bedrooms and bathrooms. Several respondents expressed that they were unsure of what was considered to be a "room", and mentioned that they did not know whether or not to include spaces such as the kitchen, or an open loft. This lack of clarity introduced a measurement error, as well as the potential for a processing error, as the interviewer may have recorded an inaccurate number of rooms based on the way in which an individual respondent described their home.

Items B1-B7 asked respondents to state whether or not their household appliances were equipped with an "Energy Star" sticker, and the majority of respondents did not have knowledge of the location of the sticker, or whether or not their appliances had the sticker at all. This made it difficult for respondents to answer the question, which subsequently introduced a nonresponse error.

Item B10 asked respondents to identify the type of display (LCD, Plasma, etc.) that is utilized on their television. Many respondents expressed that they were not aware of the type of display on their televisions. Respondents stated that a primary reason for this was due to a lack of technological prowess, especially amongst older respondents, which made it more difficult to identify the display type. This further introduced a potential for nonresponse errors due to the respondents not being able to respond to the question.

Item D9 asked about the income of the respondents, and several expressed that they were uncomfortable with divulging this information to the interviewer leading to refusal. Other respondents also stated that they were unsure if the question was alluding to household or individual income, which further made the question difficult to answer and increased the likelihood of item nonresponse.

In an effort to improve upon the major issues, it can be recommended to provide respondents with cues to aid in retrieval and recall of specific dates, particularly for item A4. It may also be useful to provide respondents with date ranges to select from in reference to when their home was built (for example, between 2000-2005), so that they are not limited to identifying a specific year, and can utilize additional memories from a specific time frame to aid in the recall of the year the home was built. In addition to providing cues to assist with retrieval, adding a concrete definition of what is to be classified as a "room" in a household in item A21 would help respondents to provide a more accurate response to the question, as well as to improve respondent's understanding of the question which can work to reduce measurement errors and encourage responses to the question. It may also be useful to utilize an additional survey mode, such as the web, in an effort to improve response rates on sensitive topics such as income (item D9), as web surveys have been shown to increase response propensity among respondents for sensitive items (Kreuter, Presser & Tourangeau, 2003).

V.   Detailed analysis of the questionnaire

The overview section summarized the patterns associated with demographics and major issues encountered by more than ⅓ of respondents. This section presented a detailed analysis of issues with individual survey questions. Questions with no issues detected are skipped; this doesn't mean they're flawless, but rather may result from limitations on our samples (see "VI. Conclusions & Limitations" section).

Please see the tables below for issues associated with each part of the questionnaire. Column "Question" is the question code and topic. Column "Issue" describes what issue was detected with the question. Column "Prevalence" records how many times the issues happened across a total of 15 interviewees. Column "Recommendation" is our recommendation to the issue. If the issue is more prevalent or detected to be more "severe" e.g. strongly affected respondents' ability to provide correct answers, we recommend revision of the question. For issues with lower prevalence (e.g. fewer than 2 respondents), we still recommend some solutions, but it could be beneficial to do further interviews to detect if the issue is prevalent or has a significant impact.

Questionnaire Section A

Question	Issue	Prevalence	Recommendation
A3: House ownership	Option 1 "Owned or being bought by someone in your household" was slightly confusing; the R wasn't sure if the question meant to separate self-owned or family-member owned and paused to think	1 R	Although this issue is not prevalent, we recommend splitting the option to be self-own and family-own. This could avoid potential confusion and also further distinguish whether R is a direct homeowner, the answer of which may relate to how they answer A4 (see below).
A4: House age	Rs didn't know for sure or remember when the house was built. Specifically: Rs who are not the homeowner (e.g. a renter, a child who lives with parents) may not know the information or have less interest in knowing it; Rs who are homeowners may know the information but cannot remember it precisely.	8 Rs	Provide "Don't know" option to allow Rs who really don't know the answer to provide their "true" answer to increase accuracy. If this question is important that we hope to collect some kinds of data instead of "don't know", urge Rs to look up their house information before attending the survey through recruiting message or survey introduction.
A8-10: Basement	Rs are not familiar with their basement status due to not frequent visits, or have different concept of what counting as basement (e.g. whether "crawl-space" counts)	4 Rs	Explicit mention if "crawl-space" counts as a part of the basement; for Rs who are unsure, provide the "Don't know" option.
A11-13: Attic	Rs were unsure what "attic" includes and whether the question "finished" implies that only the usable/livable attic space counts as the attic in this question. (quote: "we have an attic space. But they blow the insulation in it, so it's not usable, not supposed to be lived or used. I don't know which option to fit in")	2 Rs	Explicitly mentioned in the question if "not livable space" counts as a part of the attic to avoid confusion.
A18: Number of bedrooms	R was unsure if the bedroom was used for a different purpose (e.g. using a bedroom as a home office), should the space be counted as a "bedroom"	1 R	Explicitly mentioned in the question if bedrooms that are not used for "bedroom" purposes still count as bedrooms.
A21: Number of	For linked spaces (e.g. open kitchen, living room, loft area),	8 Rs	There are 3 ways to reduce confusion: 1) provides a criteria about how to count

other rooms	it's harder to say if they're separate rooms. (quote: "They are linked. It's one big space.")		linked space, 2) include examples about what counts and what doesn't count as "other rooms", 3) for rooms that are more specific and common (e.g. kitchen), consider breaking them down and asking them in separate questions to avoid confusion around counting.

Questionnaire Section B

Question	Issue	Prevalence	Recommendation
B1: fridge size	Harder to estimate fridge size especially if it feels "medium to large-ish". The unit "cubic ft" doesn't make a lot of sense.	5 Rs	Rs are not familiar with the unit "cubic ft" for measuring the fridge size. It can be beneficial to provide a more common measurement unit.
B1-B7: Energy Star	Rs didn't know what Energy Star is, how it looked, or where it's located on the appliance, and tended to give answers based on assumption that most new appliances nowaday are energy-saving and therefore are probably "starred".	11 Rs	For Rs who may not recall what Energy Star is, give it a definition or a visual cue of what the sticker looks like to aid their memory. For Rs who don't know if their appliances have Energy Star, provide the "Don't Know" option to allow them to select such an option.
B1-B7: appliance age	For Rs who rent the place, they don't really know the age of the existing appliance. For Rs who do know the age of appliances, they are bad at remembering them and their estimation of how many years had passed since the appliance was bought could be inaccurate. (For example, 1 R changed the original answer after remembering the appliance was bought in 2016, and it has been 6 years since 2016 instead of 3-4 years)	7 Rs	For Rs who don't know the age of their appliances, provide the "Don't Know" option to allow them to select such an option. For Rs who are bad at estimating how long they had bought the appliance, but remembered which year it was bought, provide the purchase year information in the options, e.g. "5~6 years (purchased in 2016-2017)".
B3: freezer size	R didn't know the actual size of the freezer and guessed it by feeling	1 R	See recommendations for the B1: fridge size question.

B4: Dishwasher frequency	Rs thought "At least once each day" implies sometimes the appliance is used more than once a day, but "we never do twice a day" (quoted from 1 of the Rs).	2 Rs	Add an option "More than once a day" and change the original option "At least once a day" to just "Once a day" to distinguish their difference.
B4-B7: Frequency	R didn't not know the frequencies of use of the appliances as he does not spend much time at home.	1 R	Provide a "Don't Know" option to allow Rs who truly don't know to select the option.
B4-B7: Frequency	Rs usage of appliances is sometimes irregular and it could be hard to answer how often the appliances are used.	2 Rs	Adding "On average" into the question could make it clearer that we meant to ask about average frequency of usage.
B5-B6: Clothes washing machine Frequency	Think the frequency options are too high. Quoted from a R: "15 loads a week as an upper bound seems a lot!"	2 Rs	Consider adjusting the range of frequency based on prior statistics and taking all kinds of households into consideration. For a household of 1 or 2, it's very unlikely to do 15 loads a week.
B7: Energy start on water heater	Compared with other appliances, Rs were especially unsure about if the water heater had Energy star, but most still guessed "yes" based on the belief that most appliances nowadays "are energy-saving and should have it" (Quoted from 1 R).	4 Rs	See recommendations for "B1-B7: Energy Star" question.
B8: TV number	Rs were unsure if the wording of the question "How many TVs do you USE at home" meant to differ from "How many TVs do you HAVE at home".	2 Rs	Clarify if the question wants to ask about "use" or "have". If it's the former, include explicit descriptions to remind Rs that the focus is "use". If it's the latter, change the wording from "use" to "have" to avoid confusion.
B10: TV display's type	Rs were unsure of the TV display's type because the TV was either bought by someone else (e.g. their child) or long ago, and they no longer remembered what they were told about the type, and couldn't really tell it now due to unfamiliarity with hardware/technology.	5 Rs	Consider providing visuals or more description about each type of display to help Rs identify it.

Consider providing a "Don't Know" option for Rs who really cannot tell the type of display. |
| B11: TV watching | R wanted a "Rarely watch" option. "Less than 1 hour" | 1 R | Consider adding a frequency option that's less than "Less than 1 hour". |

frequency	implies they still watch TV, which they don't. (Quote: "We almost never watch TV. A couple times only in a year.")		
B12-B13:	Rs didn't know the difference between a box with or without DVR.	2 Rs	Consider providing visuals to help Rs identify the difference, or provide a "Don't Know" option. If the priority of distinguishing between these 2 types is not high, even consider combining them to be 1 question.
B19: Number of laptop	R was unsure if laptops with monitors count as desktop computers.	1 R	Explicitly define if laptops with monitors are included or excluded in "laptops" to avoid confusion.
B23: Electric toothbrush	Electric toothbrushes seem to belong to a different category from other devices. Seeing it in this list confused Rs.	4 Rs	Re-consider the purpose of the survey and whether it's necessary to include electric toothbrushes in the survey.

Questionnaire Section C

Question	Issue	Prevalence	Recommendation
C1: Heating equipment	Rs were not familiar with the heating equipment in the house and how they operated, and therefore had challenges answering the question.	3 Rs	For Rs who are unfamiliar with the equipment, consider adding visual aids to improve their recognition of the option. For Rs who don't know the answer, provide the "Don't Know" option to allow them to select the true answer.
C1: Heating equipment	Rs moved to a new place this year and therefore were confused about being asked "Last year winter".	2 Rs	If the question meant to ask about the current house Rs are living in, consider using terms like "In your current house". If not, keep the original term.
C2 & C3: Fuel for heating/ cooling	Rs didn't know What was the main fuel used for the heating or cooling system at home.	2 Rs	Provide a "Don't Know" option for Rs who truly don't know the answer.
C5: AC Frequency	Frequency options seem to be slightly vague, especially the difference between "a few days" and "quite a bit".	3 Rs	Consider using frequency options such as "almost daily", "a few times a week", "once a week" to help Rs better estimate the frequency.

Questionnaire Section D

Question	Issue	Prevalence	Recommendation
D1: Gender	Rs thought it'd be better if the options to the gender question were more inclusive.	3 Rs	Make the options more inclusive by adding options such as "non-binary", "others", "prefer not to say".
D3-D4: Race	For Rs who are Latino, D3 ("Are you a Hispanic or Latino?") is included in D4 (Race) so it's unclear why D3-D4 are separate questions.	1 R	D3 is not really needed as the answer of which can be calculated from D4.
D7: Home-based service	R wasn't sure if "work from home" is considered as "operating a home-based business or service".	1 R	Explicitly define in the question whether "work from home" is included or excluded in the answer.
D9: Income	Rs didn't wish to answer the income question considering the answer to be sensitive and private.	2 Rs	Consider providing "Prefer not to answer" to allow Rs who don't wish to answer a correct option to select. Also, consider adding description in the question to reassure Rs that their answer would be kept confidential and only analyzed on the aggregated level as well as and no personal identifiable data would be linked with their answers to reduce Rs suspicion.
D9: Income	R appreciated the question mentioning "before taxes and deductions" as it clarified the range. On the other hand, there was confusion around whether this question meant to ask about individual income or household income.	2 Rs	Use visual formatting (e.g. bold, underline) to emphasize the type of income being asked in the question.
Additional	It may be helpful to cross-analyze the relationship between location and income.	1 R	Add a location question in the survey.

VI.   Conclusion & Limitations

Conclusion

Across the 15 interviews we had conducted, we would like to conclude our findings regarding factors that decrease the ability to answer a question in this survey in the two categories listed below.

A. Demographic patterns

Race/Ethnicity is not considered a factor causing significant differences in difficulties answering the questions among our respondents. Female respondents reported more difficulties answering questions related to the housing units' characteristics and their household electrical appliances than male. Older respondents were more conscious of time-related questions and their heating operations than the younger. Other than the aforementioned patterns, there seems to be no significant differences in reporting issues encountered when answering the questions associated with demographic characteristics.

B. Question types
- Time-related questions or questions that require memory retrieval asking about the year of house being constructed and years of use of the electrical appliances can be difficult for our respondents to answer because they either rent the house or cannot recall relative memories.
  - Question A4, and questions about duration of use (B1, B2, B3)
  - We suggest adding a sequence of questions that are relative to the critical questions we would like to know for respondents to retrieve sequence memory, or adding "don't know" options.
- Tech-related questions asking respondents to categorize their household electrical appliances are often reported as hard to respond to because of the lack of relative knowledge.
  - Questions about Energy Star (B1, B2, B3, B4, B5, B6, B7), amounts of different technological items (B12, B13, B14, B15, B16, B17, B18, B19, B20, B21, B22, B23), and types of specified appliances (B10, C1)
  - We recommend providing more information or basic background knowledge for the respondents to retrieve relative answers to these questions. For example, pointing out where the Energy Star stickers typically are on the appliances,or what features differentiate the several categories asked in questions. Additionally, we would like to add "Don't know"

- Questions that include information that can be defined in multiple ways are raised frequently during the interviews. Descriptions in parentheses are usually noted to be helpful by our respondents.
    - Questions A3, A11, A12, A13, A18, A21, B8, B18
    - We recommend adding detailed information, images, or visual cues to questions as instructions or examples with caution of the possibility to lead respondents to respond to certain options.
- Questions that ask about sizes can be confusing to the respondents due to the unfamiliarity of the measurement units mentioned.
    - Questions B1, B2, B3, B9
    - We recommend using units that are more seen in dialogues or providing the formulas of the conversion of units for respondents' convenience in answering the questions.
- Inadequate options for respondents to answer the questions may be due to differences in life experiences or unawareness of survey developers.
    - This issue can be seen across the whole questionnaire.
    - Generally speaking, we think adding "don't know" and "prefer not to say" to respond options when appropriate, even though not in sensitive ones, can be a way to avoid respondents feeling uncomfortable answering specific questions. We also suggest researchers doing more literature review and research before and when developing questions in order to include as many possible answers for the respondents to find one they fit comfortably. In addition, we recommend conducting pre-tests with a small group of people within our target population prior to publishing our surveys, so that we have chances to improve them.
- The sensitive question asking about respondents' income is reluctant to be answered.
    - Question D9
    - According to our respondents, the wording in this question is basically clear as it explicitly states "before taxes and deductions." However, they reported that full-time employees were more unwilling to answer this question honestly than students because they felt uncomfortable revealing their own private information.

Limitations

There are three limitations identified in our report listed below in bullet points.

- Sample size limitation

    Sample sizes are typically smaller in social science qualitative research because it can be hard to reach out to everyone in the groups of the target populations. To ensure the representativeness of the sample, it is suggested that we reach out to a minimum

ratio of 30 percent for populations under 1000 and of 10 percent for larger populations.[4] However, due to the time constraints and based on the requirement for this assignment specifically, we take a sample size of only 15 respondents to complete analysis and make recommendations. The fairly small size of sample we use for this report can affect the validity of our analysis and the reliability of similar studies.

- Respondent characteristic representativeness limitation

    When looking for interviewees, it is best to consider and include as much of the characteristics of our target population in our samples. Nonetheless, due to time, the process we recruit our interviewees, and the diverse characteristics our target population possess, we lack interviewees who have children or are with a larger family size. Weaknesses in the representation of our respondents' characteristics can render our recommendations to be inappropriate for those individuals.

- Consistency of interviewing process limitation

    Usually in formal social science research, the interview process should be consistent and stable among each other. and are expected to be conducted by well-trained interviewers. Two interviewers with one hosting and one taking notes or assisting in an interview are often seen and believed to guarantee a quality interview. While our team decided to complete the requested amount of interviews, which is 3 for each member, alone without training prior to the interviews after complete discussions, we do not promise the process to be consistent among every interview. This can affect the reported issues in this paper raised by our interviewees. Notwithstanding, as our team is composed of students who are about to become experts in survey methodologies, we believe that this issue can be minor and does not bother our analysis a lot.

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[4] USC Libraries. Research Guides. Retrieved on Oct 30, 2022 from https://wp.stolaf.edu/iea/sample-size/#:~:text=For%20populations%20under%201%2C000%2C%20a,ensure%20representativeness%20of%20the%20sample.

Appendix

*Questionnaire provided to our team with probes developed by team members. Probes are listed in parentheses and highlighted after the specified questions.

Introductory text for cognitive interviews

Hello, my name is _____ and I am a graduate student at the University of Maryland/Michigan. As part of one of my classes, I have been given the assignment of developing recommended improvements to a draft survey questionnaire. The questionnaire is designed to collect information about households' residential energy use. I would like to ask for your help in coming up with my recommendations for making this questionnaire easier to understand and to complete.

Your role will be to read the survey questions, respond to the questions however you see fit, and then from time to time, simply tell me about your reaction to certain parts of the questionnaire that I'll point out.

Before we begin, I would like to remind you that your participation is voluntary and that you may stop your participation at any time. I also want to assure you that any responses you provide will be kept strictly confidential and nobody will be able to identify you from the information that you give.

I would like to video record today's session, or if you prefer simply audio recording it, to help me to write up the results of this interview. Would that be ok with you? [if only okay to audio record, then ask participants to turn off the camera.]

For the next 30 minutes or so, you will read and respond to questions from the draft survey questionnaire I have been given and, in several places, I will ask you questions about your responses. Do you have any questions for me before we begin?

Section A: Housing Unit Characteristics

A1.   What is your housing unit type?
- One-family house detached from any other house
- One-family house attached to one or more other houses (for example: duplex, row house, or townhouse)
- Apartment building with 2-4 units
- Apartment building 5 or more units
- Mobile home

A2.   Is this your primary residence? (Your primary residence is the place you live the largest part of the year.)
- Yes
- No

A3.   Do you own or rent this residence?
- Owned or being bought by someone in your household
- Rented
- Occupied without payment of rent

A4.   In what year was this structure built?
- Before 1950
- 1950 to 1959

- 1960 to 1969
- 1970 to 1979
- 1980 to 1989
- 1990 to 1999
- 2000 to 2009
- 2010 to 2014

(Probe for A4: What do you think about this question? (Is it clear/unclear? Do you have the knowledge to answer it?))

A5.   What is the major outside wall material for this housing unit?
- Brick
- Wood
- Siding (aluminum, vinyl, or steel)
- Stucco
- Composition (Shingle)
- Stone
- Concrete or concrete block
- Other

A6.   Which best describes the type of glass in most of the windows in your home? Do not consider storm windows.
- Single-pane glass
- Double-pane glass
- Triple-pane glass

A7.   Not including basements or attics, how many stories does your home have?
- 1
- 2
- 3 or more
- Split-level

A8.   Is any part of your basement finished? (Finishing materials on the floor, walls, or ceilings)
- Yes
- No
- Do not have a basement (2) [GO TO A11]

(Probe for A8: Is this question clear/easy to answer?)

A9.   What portion of your basement is **heated**?
- None
- Some
- All

(Probe for A9: How do you select an answer from the 3 answers provided? How do you feel about the answers?)

A10.   What portion of your basement is **cooled**?
- None
- Some
- All

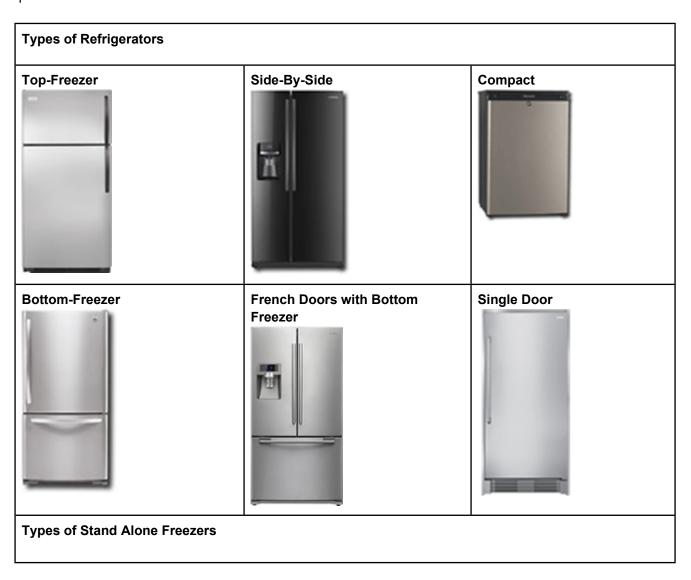==(Probe for A10: What does "cooled" in the question mean?)==

A11.   Is any part of your attic finished? (Finishing materials on the floor, walls, or ceiling)
- Yes
- No
- Do not have an attic [GO TO A14]

A12.   What portion of your attic is **heated**?
- None
- Some
- All

A13.   What portion of your attic is **cooled**?
- None
- Some
- All

A14.   Not including your basement or attic, what portion of your house is **heated**?
- None
- Some
- All

A15.   Not including your basement or attic, what portion of your house is **cooled**?
- None
- Some
- All

A16.   What is the size of your **attached** garage?
- 1-car
- 2-car
- 3-or-more-car
- Do not have an attached garage [GO TO A18]

A17.   Is your **attached** garage heated or cooled during the year?
- Both heated and cooled
- Heated only
- Cooled only
- Neither heated nor cooled

Including finished basements and finished attics:

A18:   How many **bedrooms** do you have in your home?.........   _____

A19.   How many **full bathrooms** do you have in your home? (A full
         bathroom includes a sink with running water, a toilet, and a bath or shower.)   _____

A20.   How many **half bathrooms** do you have in your home? (A half
         bathroom includes a sink with running water and either a toilet, a bath, or a shower.)   _____

A21.   How many **other rooms** do you have in your home? (Include, for
         example, living or family rooms, kitchens and home offices. Do not
         include hallways or closets.)   _____

17

Section B: Appliances

The next set of questions is about the large appliances that you have in your home. Please fill in the grid for each appliance.

There are several different types of refrigerators and freezers. Please take a look at the pictures and answer the questions below.

Types of Refrigerators		
Top-Freezer 	**Side-By-Side** 	**Compact**
Bottom-Freezer 	**French Doors with Bottom Freezer** 	**Single Door**
Types of Stand Alone Freezers		

Chest Freezers	**Upright Freezers**	

	Which of the appliances looks the most like the one in your home?	**How old is this appliance?**	**How would you describe its size?**	**Some appliances contain an ENERGY STAR label to indicate that they are more efficient than similar products. Is this appliance an ENERGY STAR appliance?**
B1. Primary refrigerator	○ Top-Freezer ○ Bottom-Freezer ○ Side-By-Side ○ French doors with Bottom Freezer ○ Single door ○ Compact ○ Do not have refrigerator	○ Less than 2 years old ○ 2 to 4 years old ○ 5 to 9 years old ○ 10 to 14 years old ○ 15 to 19 years old ○ 20 years or older	○ Half size or compact ○ Small (17 cubic ft. or less) ○ Medium (18-22 cubic ft.) ○ Large (23-29 cubic ft.) ○ Very large (bigger than 30 cubic ft.)	○ Yes ○ No
B2. Second refrigerator (If more than one refrigerator in addition to the primary refrigerator, report for the largest.)	○ Top-Freezer ○ Bottom-Freezer ○ Side-By-Side ○ French doors with Bottom Freezer ○ Single door ○ Compact ○ Do not have second refrigerator	○ Less than 2 years old ○ 2 to 4 years old ○ 5 to 9 years old ○ 10 to 14 years old ○ 15 to 19 years old ○ 20 years or older	○ Half size or compact ○ Small (17 cubic ft. or less) ○ Medium (18-22 cubic ft.) ○ Large (23-29 cubic ft.) ○ Very large (bigger than 30 cubic ft.)	○ Yes ○ No

B3. Stand-alone freezer (If more than one, report for the largest.)	○ Chest freezer ○ Upright freezer ○ Do not have stand-alone freezer	○ Less than 2 years old ○ 2 to 4 years old ○ 5 to 9 years old ○ 10 to 14 years old ○ 15 to 19 years old ○ 20 years or older	○ Half size or compact ○ Small (17 cubic ft. or less) ○ Medium (18-22 cubic ft.) ○ Large (23-29 cubic ft.) ○ Very large (bigger than 30 cubic ft.)	○ Yes ○ No

==(Probe for B1-B3: Does the unit look good for you or do you wish to change it? Which one are you thinking about?)==

	What type of appliance do you have?	How often is it used?	How old is your appliance?	Is this appliance an ENERGY STAR appliance?
B4. Dishwasher	○ Have dishwasher(s) ○ Do not have dishwasher(s)	○ At least once each day ○ 4-6 times each week ○ 2-3 times each week ○ Once each week ○ Less than once each week ○ Never	○ Less than 2 years old ○ 2 to 4 years old ○ 5 to 9 years old ○ 10 to 14 years old ○ 15 to 19 years old ○ 20 years or older	○ Yes ○ No
B5. Clothes washing machine	○ Top loading ○ Front loading ○ Do not have clothes washer	○ More than 15 loads each week ○ 10-15 loads each week ○ 5-9 loads each week ○ 2-4 loads each week ○ 1 load or less each week ○ Never	○ Less than 2 years old ○ 2 to 4 years old ○ 5 to 9 years old ○ 10 to 14 years old ○ 15 to 19 years old ○ 20 years or older	○ Yes ○ No

B6. Clothes dryer	o Electric o Natural gas from underground pipes o Propane (bottled gas) o Do not have clothes dryer	o More than 15 loads each week o 10-15 loads each week o 5-9 loads each week o 2-4 loads each week o 1 load or less each week o Never	o Less than 2 years old o 2 to 4 years old o 5 to 9 years old o 10 to 14 years old o 15 to 19 years old o 20 years or older	o Yes o No
B7. Water heater	o Electric o Natural gas from underground pipes o Propane (bottled gas) o Other o Do not have water heater		o Less than 2 years old o 2 to 4 years old o 5 to 9 years old o 10 to 14 years old o 15 to 19 years old o 20 years or older	o Yes o No

(Probe for B4-B7:
Frequencies: What is the process of you answering this question? (e.g. if your frequencies of using the appliances change each week, how do you decide which to choose from)
Energy Star: Do you think the options are enough for people to answer this question? Why or why not?
Water heater: Do you think the blank here is expected or unexpected? Why?)

B8.   Next we have some questions about the electronic devices in your home. First, how many televisions do you use in your home?
_____   [IF 0, GO TO B18]
(Probe for B8: When you answer this question, what definition do you have about "use"?)

B9.   Which size category best describes your most used television?
    o 20 inches or less
    o 21-30 inches
    o 31-42 inches
    o 43 inches or more

(Probe for B9: Are you comfortable with answering this question? Why or why not?)

B10.   What type of display does your most used television have?
    o Black/standard tube
    o LCD
    o Plasma
    o Projection
    o LED
    o Other

B11.   Thinking about your most used television, on the weekdays, about how many hours per day is this television turned on? (Include the time it is on even if no one is actually watching it.)

21

- Less than 1 hour
- 1 to 3 hours
- 3 to 6 hours
- 6 to 10 hours
- More than 10 hours

Looking at the list below, how many of each item are used in your home?

B12.   Cable or satellite box **without** DVR   _____

B13.   Cable or satellite box **with** DVR   _____

B14.   Internet streaming box (for example: Roku or AppleTV)   _____

B15.   DVD or BluRay player   _____

B16.   Stereo system   _____

B17.   Video game console   _____

B18.   Desktop computer   _____

B19.   Laptop computer or netbook   _____

B20.   Tablet computer   _____

B21.   Internet modem or router   _____

B22.   Printer, scanner, or copier   _____

B23.   Electric toothbrush or shaver   _____

(Probe for B12-B23: Does any of the items in this list confuse you? What were you thinking about when answering? How can questions in this section be improved? Which of those do you think are the most unwilling to answer or report the actual amount? Why? If none of them are, why not?)

(Probe for Section A and B: After completing this section, what do you think the study is about? Does the blueprint that gradually appears in your mind affect your answers (reporting more or less than the actual amounts)?)

Section C: SPACE HEATING AND AIR CONDITIONING

Now we have some questions about heating and cooling your home.

C1.   Last winter, what was the main type of heating equipment used to provide heat for your home?
- Heat pump
- Central furnace with ducts to individual rooms
- Steam or hot water system with radiators or pipes in each room
- Built-in electric units in each room installed in walls, ceilings, baseboards, or floors
- Built-in floor or wall pipeless furnace
- Built-in room heater burning gas, oil, or kerosene
- Heating stove burning wood, coal, or coke
- Portable electric heaters
- Portable kerosene heaters

- Fireplace
- Some other equipment
- Did not heat home   [GO TO C5]

(Probe for C1: Are you familiar with heating equipment? Do you need any definition of the items?)

C2.   What was the main fuel used by this equipment for heating your home?
- Electricity
- Natural gas from underground pipes
- Propane (bottled gas)
- Fuel oil
- Kerosene
- Wood
- Solar
- Other

C3.   Now, we have some questions about cooling in your home last summer. What type of air conditioning equipment does your home have?
- A central system   [GO TO C7]
- Individual units in the windows or wall
- Both a central system and individual units
- Do not have air conditioning equipment   [GO TO D1]

C4.   How many window or wall air conditioning units do you use in your home?

     _____

C5.   Which of these statements best describes the way you used your air conditioning last summer?
- Not used at all
- Turned on only a few days or nights when really needed
- Turned on quite a bit
- Turned on all summer

(Probe for C5: Is this question clear for you to answer it?)

Section D: HOUSEHOLD CHARACTERISTICS

D1.   Are you…
- Male
- Female

(Probe for D1: How do you feel about this question? Do you have suggestion to improve it?)

D2.   What is your age?
- 18 – 24
- 25 – 34
- 35 – 44
- 45 – 54
- 55 – 64
- 65 or above

D3.   Are you Hispanic or Latino?
  o Yes
  o No

  D4.   What is your race? Mark all that apply.
    o White
    o Black or African-American
    o American Indian or Alaska Native
    o Asian
    o Native Hawaiian or Other Pacific Islander
    o Other

  D5.   What is the highest degree or level of school you have completed?
    o Less than a high school diploma or GED
    o High school diploma or GED
    o Some college or Associate's degree
    o Bachelor's degree (for example: BA, BS)
    o Masters, professional degree, or doctorate (for example: MA, MS, MBA, MD, JD, PhD)

  D6.   Including yourself, how many adults and children normally live in this household? (Do not include
  anyone who is just visiting, those away in the military, or children who are away at college.)
        Adults (18 years of age or older)   _____
        Children (17 years of age or younger)   _____

  D7.   Does anyone in this household operate a home-based business or service?
    o Yes
    o No

  D8.   In a typical week, on how many weekdays is there someone at home most or all of the day?
    o None
    o 1
    o 2
    o 3
    o 4
    o 5

  D9.   Including all income sources, which category best describes the 2020 total combined income of all
  members of your household before taxes and deductions?
    o Less than $20,000
    o $20,000 - $34,999
    o $35,000 - $49,999
    o $50,000 - $64,999
    o $65,000 - $79,999

- $80,000 - $99,999
- $100,000 - $139,999
- $140,000 or more