United States
Consumer Product Safety Commission

September 6, 2024

Consumer Product Safety Commission (CPSC) Staff's Statement[1] on EurekaFacts Report on "Survey on Use and Functionality of Smoke and Carbon Monoxide Alarms (SCOA) in Households" Final Report, September 3, 2024

The attached contractor report presents the results of a national in-home quantitative assessment of the functionality of residential smoke and carbon monoxide (CO) alarms, as well as resident use and knowledge of smoke and CO alarm systems. In 2016, the U.S. Consumer Product Safety Commission (CPSC) and other fire safety advocacy organizations contracted with EurekaFacts to conduct the Survey on Usage and Functionality of Smoke and Carbon Monoxide Alarms in Households (SCOA survey). The SCOA survey, completed in 2024, was administered to 1,060 U.S. households across 24 metropolitan areas (MSAs) as well as non-MSAs. In total, 1,314 alarms (71% smoke alarms, 22% smoke/CO alarms, 7% CO alarms) were tested across 985 households for the study. Households (75) without smoke alarms or having alarms connected to a security system participated in the survey portion only.

Based on the sample households, the study estimates 16% of U.S. households have no functional alarms, mostly due to having no working alarms in the household (15%) as opposed to missing smoke and CO alarms entirely (1%). The study estimates 84% of households have at least one fully functional alarm (smoke or CO). The overall alarm testing results at the household level, assessments of household-given perceptions and knowledge, and estimates of alarm presence within homes are presented in the study as weighted data. Refer to the report's source notes on all figures for n sizes, whether data is weighted or unweighted, and other information.

The SCOA survey results provide current national estimate of operability of smoke and CO alarms and key questions about use, such installing, maintaining, testing, and replacing alarms. The SCOA survey also creates a demographic profile of households that do not have operable alarms. Staff insight into such occupancies will help CPSC focus future efforts to decrease the number of households without operable alarms.

The study was conducted under CPSC contract Number: GS-00F-211CA and OMB Control Number: 3041-0180.

[1] This statement was prepared by the CPSC staff, and the attached report was prepared by EurekaFacts for CPSC staff. The statement and report have not been reviewed or approved by, and may not represent the views of, the Commission.

Consumer Product Safety Commission (CPSC)

Survey on Use and Functionality of Smoke and Carbon Monoxide Alarms (SCOA) in Households

Final Report

September 3, 2024

Contract Number: GS-00F-211CA (order numbers CPSC-F16-0091, CPSC-F-17-088, and 61320622F0083); NIST Awards 60NANB17D284, 60NANB21D171, and 60NANB23D221; Fire Protection Research Foundation Agreements for Research w/ Eureka Facts dated 6/1/2018, 1/6/22, and 11/1/2023 aligned with CPSC contract GS-00F-211CA

OMB Control Number: 3041-0180

Contents

Prepared in compliance with ISO 20252 International Quality Standard for Market, Public Opinion and Social Research

For questions about this study, please contact Jorge Restrepo, CEO of EurekaFacts, LLC at (email) RestrepoJ@eurekafacts.com

EurekaFacts staff contributors to this report and research throughout its phases include:

Robert Suls, M.A., Neva Gakavian, Cindy Mendez Hernandez, Pablo Saldarriaga, M.Sc., Anh-Thu “Andrea” Ton, M.A., Monica Schell, Ally Holden, Djass Mbangdadji, M.Sc., MBA, Jonathan Steinberg M.A., Bohdana Sherehiy, Ph.D., Ismail Nooraddini, Ph.D., Jorge Restrepo MGA, and Margie Eulner Ott

Acknowledgements

EurekaFacts is proud to present the following report and is appreciative of all the field teams who collaborated on this project to complete data collection.

Thank you to the following subcontractors, main contacts, and field interviewer teams throughout the country who contributed to the data collection:

- Milepost 12 Consulting: Scott Koenig, Tim Carter, Beckem Koenig, and team
- RedDog Strategies: David Wilson, Bryan McPartlan, Scott Borges, and team
- Evident Research & Consulting (TakeASurvey.com): David Kaiser, Matthew Hoenig, and team
- Accurate Focus, LLC: Dan Connor and team
- Dunlap Marketing: Mike Dunlap and team
- Facts 'n Figures Inc.: Bob Johnson, and team
- Building Enterprises, Inc.: Buddy Rhodes, David Schnepp, and team
- Door To Door I-4, Inc.: David Washington, Victoria Rampersad, Rafiq Rao Ruiz, and team
- Charlotte (NC) Fire Department Fire & Life Safety Education Team: Amy Rea, Christie Russell, and Greg Francus
- New Bern (NC) Fire-Rescue Department: Jeremy Blalock and team

Additionally, we want to thank Carmen Ortiz Larsen and team of AQUAS, Inc. who assisted the EurekaFacts team during the DC pilot fielding.

We also want to acknowledge the contributions of the 57 fire safety subject matter experts from the 2017 CPSC and Fire Protection Research Foundation *Workshop for Survey on Usage and Functionality of Smoke Alarms and CO Alarms in Households*[1] and David Mallay and Patricia Gunderson of Home Innovation Research Labs, Inc. who provided feedback for revising and updating the questionnaire.

Part of this work was performed under the following financial assistance awards:

[1] Kimball, A. (2017, February 17). *Workshop for Survey on Usage and Functionality of Smoke Alarms and CO Alarms in Households* [Workshop Proceeding Summary]. Held in Bethesda, MD. Download proceedings at https://www.nfpa.org/education-and-research/research/fire-protection-research-foundation/projects-and-reports/proceedings/workshop-for-survey-on-usage-and-functionality-of-smoke-alarms-and-co-alarms-in-households

60NANB16D284, 60NANB21D171, and 60NANB23D221 from U.S. Department of Commerce, National Institute of Standards and Technology.

Finally, we recognize the financial contributions from the National Fire Protection Association (NFPA), the NEMA Fire, Life Safety, Security & Communications Section, and the National Association of Home Builders (NAHB).

1. Introduction

1.1 Background

The U.S. Consumer Product Safety Commission (CPSC) has contracted with EurekaFacts to conduct the *Survey on Usage and Functionality of Smoke and Carbon Monoxide Alarms in Households* (SCOA survey). The survey is an in-home quantitative assessment of the functionality of residential smoke and carbon monoxide (CO) alarms, as well as resident use and knowledge of smoke and CO alarm systems.

This is an updated replication of the 1992 CPSC-sponsored study *Smoke Detector Operability Survey Report Findings*, published in 1994[2]. The 1992 study was conducted to fill the gap in knowledge regarding smoke detector operability rates, as previous studies only had estimated about how many homes had these devices installed[3]. With the growing installation and requirement of CO alarms, and updated codes and requirements for smoke alarms, CPSC sought to provide an updated report on the operability rates of these lifesaving household devices. The combined sponsorship of CPSC staff and other fire safety advocates allowed for the completion of this robust study.

For the purposes of this report, smoke/CO detectors, alarms, and similar devices are referred to as “alarms.” This is the common terminology used by fire services, technicians, and standards organizations, among other stakeholders in this research. For the survey instrument administered to the general public, these devices were referred to as “detectors” (see section 3.1 for more information).

1.2 Project Scope and Research Objectives

The purpose of the SCOA survey is to inform CPSC about the usage and functionality of smoke alarms and CO alarms in U.S. households. Alarm testing data alongside household responses about perceptions, knowledge, and behaviors will assist in the development of standards and guidelines that will help protect property and human life and will improve household safety across the U.S. Additionally, findings from this survey will be helpful for establishing a baseline for measuring future progress, and for providing key information for

[2] Smith C. L. (1994). *Smoke Detector Operability Survey Report on Findings (Revised).* Consumer Product Safety Commission (CPSC).

[3] Hall J. (1992). *U.S. Experience with Smoke Detectors.* National Fire Protection Association (NFPA).

public safety education, code enforcement, and the improvement of smoke and CO alarm technology. Research questions include:

- What proportion and number of households have smoke and/or CO alarms installed in their homes? Of these households with alarms, what proportion and number have operational alarms?
- What proportion and number of respondents perceive their homes as safe? For what reasons do respondents not have alarms installed?
- Do the characteristics of a respondent's residence affect the availability or operability of smoke or CO alarms? Do the characteristics of residency affect fire and CO risks?
- What proportion and number of respondents are aware of how to maintain and test their fire and/or CO alarms?
- Are there behaviors or activities, if any, that impact respondents either having alarms in their homes and/or having functioning alarms in their homes?
- What proportion of respondents seek out information about fire and CO safety? Of these respondents, what resources do they use to seek out information about fire and CO safety?

The project consisted of the following two phases:

- Phase I: Questionnaire review and update. This consisted of two parts. Part 1 included a general review of the 1992 instrument and a workshop to collect additional input for changes to the instrument. This included a literature review and gathering of insights from subject matter experts. Part 2 included pre-testing of the questionnaire. This was accomplished through in-depth, semi-structured interviews with diverse segments of the public to ensure all aspects of the questionnaire and communications were properly understood.
- Phase II: Survey Execution. This consisted of fielding, analysis, and reporting of the final instrument. This phase included fielding attempts with the initial methodology and the revised methodology. Ultimately, a door-to-door recruitment methodology was used for the pilot and national fielding of the survey.

2. Executive Summary

The following executive summary details the overall takeaways and answers to core research questions from the SCOA survey. This in-home door-to-door study was administered to 1,060 U.S. households across 24 metropolitan statistical areas (MSAs) and residents living in non-MSAs. Screening questions ensured respondents were a head of the household who could answer questions about the house, appliances, and alarms. Residents with alarms not connected to a security system that notified emergency services participated in the full survey and alarm testing portion of the study (n=985). Residents without smoke alarms or who had alarms connected to a security system participated in the survey portion only (n=75).

Data collection was conducted from January 1, 2019, to May 30, 2019; then continued from March 23, 2021, to February 16, 2024.[4] The survey aimed to collect in-home quantitative data regarding the functionality of residential smoke and CO alarms, as well as resident perceptions, knowledge, and behaviors regarding smoke and CO alarm devices.

This study was designed to be a replication of the methodology described in the 1994 CPSC report *Smoke Detector Operability Survey Report Findings* with findings that would be representative of general U.S. households. While high-risk areas and populations are important to study, these results provide point estimates applicable across the U.S.

The margin of error for the full survey sample (N=1,060) using a 95% confidence interval is +/- 3.0% points. The margin of error for questions asked only of those with smoke and/or CO alarms (N=985) using a 95% confidence interval is +/- 3.1% points. Please see the source notes on all figures for n sizes, whether data is weighted or unweighted, and other information.

This report focuses almost exclusively on univariate measures. Key findings from the report include the following:

[4] The gap in data collection dates is due to the COVID-19 pandemic. Research was paused due to the in-person nature of the data collection and resumed once the restriction was lifted by CPSC.

1. **Nearly all U.S. households have smoke alarms but almost half are missing CO alarms.**

About 99% of households have smoke alarms installed in their home. This is a significant increase in alarm presence compared to the 1994 report estimate (88%). Moreover, 55% have CO alarms installed, and only 1% of households are missing both alarm types. This is based on what the head of household reported, but a slightly higher rate of CO alarms was found during testing since some households have combination smoke/CO alarms and may have been unaware they had CO alarms in the household. This was true for only a small percentage of households but indicates that slightly more households may have CO alarms if an inspection is conducted vs. asking a head of household.

Figure 2-1: Presence of alarm types in U.S. households

Nearly all had a smoke alarm, but almost half missing CO alarm

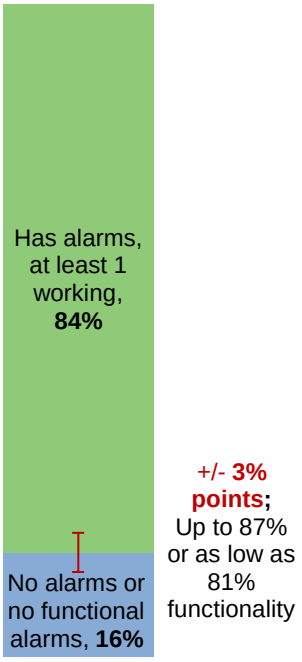
% of households with …	
Smoke alarms only	**44.2**
CO alarms only	**0.5**
Smoke and CO alarms	**54.4**
Total with smoke alarms	*98.6*
Total with CO alarms	*54.9*
No alarms	**0.9**
	100%

Source: S15, S19. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,060. Note: Data is weighted. Percentages read down with decimals shown for precision and add to 100%.

2. **Most (84%) of households do have at least one fully functional alarm to alert them of a fire or CO event. The 16% of households at risk are mostly due to having no functional alarms rather than no alarms at all.**

Households may have alarms of varying functionalities. As summarized in Figure 2-2, most (84%) households do have at least one functional smoke or CO alarm. This point estimate has a margin of error of plus or minus 3% points, which means that household functionality may be as high as 87% or as low as 81%. Accordingly, this may indicate that 1-in-5 households (19%) are at risk of not having at least one functional alarm.

Figure 2-2: Estimated household alarm functionality, including margin of error



Source: S15-17, S19-21, Q41, Q50, Q52, Q75. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,060. Note: Data is weighted and shown with margin of error bar.

3. **There are mismatches between households' perceptions about their alarms age and functionality, and the reality.**

While households knew the types of alarms they had and where they were located, they were less accurate about aspects related to their function and age, which impacts replacing them on the correct timeline. Slightly less than 1-in-5 households (16%) that believed all alarms would be working had at least one functionality issue with the alarms tested. This includes alarms that had a battery issue where function was able to be restored and devices which were completely non-functional. Additionally, only half (51%) of households were accurate about the age of all their tested alarms.

4. **Based on the alarms tested, many households might be missing recommended alarm technologies.**

In addition to almost half of households missing CO alarms, many might lack improvements to powering these devices or having a variety of smoke detection technologies in their homes. Most (80%) alarms were a single standalone device compared to 20% being part of an interconnected system. Among alarms tested, fewer used AC power (27%) or sealed batteries (16%), compared to a majority of alarms having a replaceable battery (54%). While both types of smoke alarm technologies were tested, ionization technology was more prevalent. About one-quarter (23%) of smoke alarms could not be identified with one of the technologies, potentially indicating that some of these older alarms are not clearly marked (but are likely ionization).

Figure 2-3: Composition highlights of all alarms tested with newer technologies

Smoke Alarm Technology	%
Ionization (incl. CO combo)	**42**
Photoelectric (incl. CO combo)	**29**
Don't know	**23**
Ionization and photoelectric	**6**
Power Type	
Replaceable battery	**54**
AC power	**27**
Sealed battery	**16**
Connection Type	
Standalone/wire free	**80**
Interconnected[1]	**20**

Source: Q58, 60, 63. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,314 alarms.
Note: Data is unweighted. Percentages read down per section and may only show partial results that do not add to 100%.
[1] Likely interconnected as there was a short period in the code where smoke alarms may have been only AC powered and not interconnected. Exact wires were not checked to confirm.

5. Nearly all households strongly believed smoke alarms are necessary in homes compared to only two-thirds of households who said the same of CO alarms.

Ninety percent of households felt it is "extremely necessary" to have smoke alarms installed in their home, compared to 66% of households who feel the same about CO alarms. While few rank the necessity of either to be low or "not at all necessary," households are more likely to believe smoke alarms are "extremely" necessary, compared to CO alarms.

Figure 2-4: Household views on the necessity of smoke and CO alarms in homes

It is important to have a __ installed in your home?

% of households who say …	**Smoke alarm**	**CO alarm**
5 - Extremely Necessary	**90**	**66**
4	**6**	**11**
3	**2**	**11**
2	**1**	**3**
1 - Not at all necessary	**0.4**	**3**
Don't Know	**1**	**7**
	100%	100%

Source: Q14 and Q27. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,060. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

6. Households who have a smoke alarm and CO alarm, respectively, felt safe with their alarms, but nearly half did not feel "very safe" with what they currently have.

Most households with smoke alarms and those who have CO alarms felt "very" or "mostly" safe with their current devices (79% and 84%, respectively). Notably, nearly half of households who do have each of these devices did not feel their current alarms were enough to make them feel "very safe": 49% feel less than "very safe" with current smoke alarms and 45% said the same about their current CO alarms. This indicates there are likely other factors than ownership of one of these alarms that fosters a feeling of safety.

Figure 2-5: Household perception of safety with current alarms

How safe do you believe your home is with your current ___?

% of households who say …	**Smoke alarms**	**CO alarms**
Net: Very/mostly safe	**79**	**84**
Very safe	*51*	*55*
Mostly safe	*28*	*29*
Moderately safe	**14**	**7**
Net: Slightly/not at all safe	**6**	**4**
Don't know	**1**	**5**
	100%	100%

Source: Q9 and Q20. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,047 (smoke) and 583 (CO). Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

7. Households typically lacked either smoke and/or CO alarms due to them not being part of the residence upon moving in and then further lack of action or thought.

For respondents that did not have CO alarms installed, 33% cited the reason to be because it did not come with the residence. Other reasons included thinking they did not need one (19%), and they never got around to replacing previous alarms (11%), with other residents citing similar reasons for general forgetfulness. Among renters, 20% cited it was the landlord's

responsibility to provide those alarms – which accounts for 10% of the reasons given.

Very few households (n=11) did not have any smoke alarms installed. Qualitatively, there were a variety of reasons given for missing a smoke alarm. Several noted there were none when they moved in or had issues with the device/batteries and have not gotten new ones. Additionally, a couple noted they consider installation to be the landlord's responsibility.

8. **Three-quarters of households are confident in their ability to install and maintain either type of device; however, residents are not testing alarms at the recommended frequency of at least once a month.**

Over seven-in-ten households claimed they know how to install or maintain a smoke alarm or a CO alarm. However, one-third of households with smoke alarms never test them (33%), and a quarter with CO alarms never test them (24%). While most households do test their alarms, they do so less frequently than recommended, usually testing once a year or every six months.

9. **Many households lack knowledge about CO alarms and how to detect high levels of CO in their home.**

The majority (61%) of households believe they have little to no knowledge about CO alarms, including one quarter (26%) who have no knowledge at all. Households without a CO alarm were more likely to know "nothing" or "a little" compared to households with a CO alarm (69% vs. 56%, respectively), but this does demonstrate an overall lack of knowledge about these devices.

Figure 2-6: Household behaviors for installing, maintaining, and testing installed alarms

% of households who…	Smoke alarms	CO alarms
Know how to install	**71**	**73**
Know how to maintain	**77**	**73**
Testing Frequency		
Recommended (at least once a month)	**7**	**6**
Less than recommended	**61**	**68**
Never	**33**	**24**
	100%	100%

Source: Q10a, 12, 23, 31. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,047 (smoke) and 583 (CO). Note: Data is weighted. Percentages are separate per section. For testing frequency, percentages read down and may not total to 100% due to rounding.

Figure 4.3.2-1: Household knowledge on CO alarms and detecting high level of CO

How much do you believe you know about carbon monoxide alarms?	
Nothing at all	**26**
A little	**35**
Some	**23**
A lot	**9**
Don't Know	**8**
	100%
How would you know high levels of CO are in your home?	
CO alarm only	**42**
CO alarm & incorrect method	**7**
Only incorrect method or no way to know	**32**
Don't know or refused	**19**
	100%

Source: Q21 and Q22. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,060. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

When describing how to detect high levels of CO in their homes, only half of households (49%) stated CO alarms as a method of detecting CO. Otherwise, households usually did not know of a method or often thought there was no way to detect CO (15%). As with knowledge, there is a disparity between households with and without these devices, but households with CO alarms were far more knowledgeable regarding this question. Three-quarters (77%) of households with CO alarms articulated that a CO alarm was needed to detect high levels of CO compared to only 13% of households without CO alarms that said the same, demonstrating a 64%-point gap.

10. **About 1-in-5 households actively sought information about either fire or CO safety in the prior 12-month period. Priority to spread more information about smoke and CO alarms and fire and CO safety in general is especially important considering lack of testing at recommended frequency and gaps in perception and knowledge about these devices, particularly among CO alarms.**

Only 18% of households looked for information about either fire or CO safety in the prior 12 months. Almost half (46%) of these households used an internet resource from a search engine to find fire safety information and 40% also used this source to find information about CO safety. Other sources were much less common, which included local fire departments, community or religious organizations, and even their workplaces. The lack of looking for this information may be contributing to the knowledge and behavior disparity, especially regarding CO alarms. CO safety may need more emphasis considering 45% do not have CO alarms, 61% of households feel they know “nothing at all” or only “a little” about CO alarms, most households don’t test either type of alarms as often as recommended, and not all households feel it is necessary to have each type of alarm installed, particularly CO alarms.

3. Methodology and Data Collection

This section discusses the methods and procedures for all stages of the study that directly contributed to the instrument's finalization. An overview of the sampling, weighting, and fielding procedures are provided, with more detail provided in the appendices.

3.1 Questionnaire Development and Pre-Testing

The first phase of the study consisted of the following two tasks:

- Task 1: Workshop and update of questionnaire. EurekaFacts hosted a workshop with subject matter experts to review the 1992 instrument and discuss other research ideas to incorporate. The instrument was revised before and after the workshop using input from experts and additional literature to ensure the new version was appropriate and would meet anticipated analytical needs.
- Task 2: Pre-testing and finalization of questionnaire. In-depth, semi-structured interviews with a diverse selection of the general public were critical to ensuring all aspects of the questionnaire and communications were properly understood. This led to additional edits to create the final version of the questionnaire.

Workshop and Update of Questionnaire

EurekaFacts engaged with the CPSC project team before the workshop to make initial edits to the questionnaire and identify topics to discuss during the workshop. The workshop consisted of EurekaFacts staff and 57 fire safety subject matter experts and other stakeholders, including the CPSC project team, to identify existing questions for revision and new topic areas for development and potential questions in those topic areas based on emerging research needs. These main themes/topics arose:

1. Occupant experiences and perceptions about alarms, cooking habits, and sources of fire/CO information;
2. Knowledge and maintenance of alarms, including motivation to have or reason not to have;
3. Household characteristics such as type of structure and age;
4. Alarm characteristics such as type, model, manufacturer date, location in the home, and operability status and;

5. CO hazards in the home (including presence of garage and equipment or appliances that can emit CO).

These topic areas and accompanying suggested questions were incorporated into the new version of the questionnaire. Additionally, subject matter experts from Home Innovation Research Labs, Inc. ensured that the alarm testing questions were appropriate and complete. These SMEs included a building science engineer and a survey research and analytics manager. Finally, a literature review was used to identify optimal wording of certain concepts and questions successfully asked of homeowners in similar studies. All these edits were incorporated into a complete questionnaire draft that would be pre-tested.

Pre-Testing and Finalization of Questionnaire

The CPSC and EurekaFacts team identified questions, scales, and wording in the revised instrument and communication materials that could potentially be misunderstood and should be cognitively tested with the general public. Cognitive testing was performed by conducting in-depth, semi-structured interviews with two groups of participants, consisting of eighteen (18) respondents (as recommended by OMB). One group, consisting of 9 respondents, included individuals who reported having a smoke alarm not connected to a central alarm which may notify the police or fire department. The second group, also consisting of 9 participants, included individuals who reported not having any smoke alarms installed, or, if they did, were connected to a central alarm. This represented both types of groups who would take a version of the survey. The 18 participants represented a mix of housing types, races/ethnicities, and genders.

Results allowed for both confirmation that new wording and scales were appropriate to administer as is and that some phrases, wording, and response options needed further revision. In cognitive interview testing of the survey instrument, the respondents best understood the devices that were the subject of the survey when referred to as “detectors” and identified this term as most common in their vernacular. Other changes focused on clarifying phrases, expanding response option lists, and defining unusual terms, such as “fuel-burning appliances.”

These edits were incorporated into a new questionnaire draft. EurekaFacts and CPSC conducted a final round of review to ensure all survey language, interviewer instructions, and alarm testing steps were clear. This was the final questionnaire approved and submitted to OMB and used for fielding.

3.2 Sampling and Data Collection Procedures

Sampling Method Overview

This study used a probabilistic multi-stage sampling approach where the allocation of expected completes was proportionally divided in three stages:

1. Metropolitan ("metro") areas as primary sampling units (accounting for U.S. region and metro areas of 1 million or more residents or less than 1 million residents),
2. Residential census tracts within metro areas as secondary sampling units (proportionally allotted based on size/number of completes allocated), and
3. Housing units within those residential census tracts as the final sample units.

Additionally, a non-metro tract was selected during the second sampling stage to be close in proximity to each metro area selected in the first stage. This was to ensure representation of both urban and rural U.S. households.

The primary unit of analysis for this sampling approach is the U.S. household; therefore, the goal was for the sample of housing units per region to be proportionate to the total number of housing units in the region based on the size of the metro area. Additional information about the sampling method can be found in Appendix A.

Recruitment Methodology Change

The original recruitment effort was a multi-mode design that included mailing pre-notification letters to randomly selected households followed by phone calls to determine eligibility. The heads-of-household were recruited by phone to complete the in-home interviews. EurekaFacts had significant difficulty contacting potential respondents and recruiting them for the in-home portion of the survey through this multi-mode approach. Due in part to low response and cooperation rates, scheduling difficulties and budgetary challenges presented by the original sampling method, EurekaFacts worked with CPSC to redesign the survey to become an in-person door-to-door study.

The new methodology replaced the pre-notification letters with door hangers, so potential participants would be alerted field teams would be in the area and they would be recruited at their front doors to immediately complete the survey. This process removed the multiple touchpoints to contact a household, schedule a visit, confirm the interviewer and

respondent availability, and finally have both parties be present at the household for the interview. It also eliminated the potential for drop-off due to the multiple stages required for scheduling an in-person visit. This door-to-door methodology was piloted in the Washington, DC metro area ("DC") with great success compared to the prior fielding attempt with the original methodology (see Appendix B for details).

Out of the 1,185 completes funded by the project, 130 completes were used to do the pilot study and write a preliminary report. This report was published by CPSC in 2020[5].

The pilot ended right before the start of the COVID-19 pandemic. After pausing due to the pandemic, EurekaFacts implemented the new survey sampling and administration process following the OMB-approved approach.

Recruitment and Survey Administration Procedures

The redesigned national survey was fully launched as an in-person door-to-door study on March 23, 2021, and ended on February 16, 2024. These cases were combined with the 9 cases EurekaFacts collected from January 1, 2019, to May 30, 2019, before the DC pilot, as they are still part of the metro areas selected. In total, this report analyzes the final 1,060 valid cases collected from the original list of 24 metro areas selected for this study (DC pilot data is not included).

The integrity of the original design was kept intact but modified for the new approach. The pre-notification letter was exchanged for a door hanger notification hung in the randomly selected neighborhoods and households in the selected Census tracts before the field interviewers arrived (See door hanger in Appendix A, Figure 7A-3).

As part of the original research design, CPSC staff estimated that 10% of U.S. housing units do not have smoke alarms. The true incidence is not known; however, a 2007 national cross-sectional telephone survey of 9,684 U.S households found that 95% of households report having at least one installed smoke alarm[6]. The true proportion was to be assessed and revised based on data collection efforts for this project. In the original design, these non-alarm

[5] EurekaFacts, LLC. (2023). *SCOA Survey Findings from the Washington DC Metro Area Door-to-Door Pilot.* U.S. Consumer Product Safety Commission (CPSC). CPSC-Survey-Revised-DiagnosticReport_11_18_20206b6.pdf

[6] Ballesteros, M. F., & Kresnow, M. (2007, March-April). Prevalence of Residential Smoke Alarms and Fire Escape Plans in the U.S.: Results from the Second Injury Control and Risk Survey (ICARIS-2). *Public Health Reports 122*, 224–231.

households, once screened for presence or absence of alarms, were not eligible to participate in the in-home interview because they had no alarms for testing. Instead, to gather data on the fire/CO safety behaviors and attitudes among non-alarm households, the participants in the current survey were eligible for a 10-minute phone interview to measure the characteristics of these households, excluding the metrics on alarm testing.

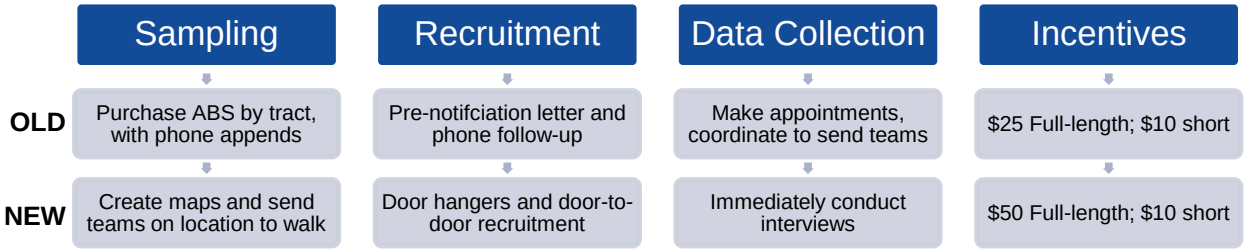
Another change compared to the original design includes receiving OMB approval to increase the incentive. The original incentive for the 60-minute interview was the same as the 1994 study, $25, which the research team considered an impediment to gaining cooperation. OMB approved an increase to $50, which was highlighted on the door hangers. The incentive for the 20-minute interview remained $10.

All potential participants, independent of alarm status in the household, were recruited and screened for eligibility to participate in the study at their door. Screened participants whose households did not have alarms or had alarms connected to a security dispatch, were eligible for a 20-minute face-to-face survey in their home to measure fire/CO safety characteristics and attitudes of the households, excluding the metrics on alarm testing.

The 20-minute survey and the full one-hour survey that included alarm testing were both incorporated into the field data collection tools under the revised design. These revised methods allowed qualified households, once screened for eligibility, to participate in either version of the study immediately.

A summary of adjustments from the original to modified design can be seen in Figure 3.2-1. For a more detailed description of the methodology, approach, recruitment, and data collection strategies and technology, see Appendix A. For more information about the changes in methodology, see Appendix B.

Figure 3.2-1 Summary of changes from original to modified methodologies



3.3 Final Sample, Weighting, and Analysis

Sample Description

Using the sampling method described, the 24 metro areas included in the study represent the U.S. by region and size of the metro area. Additionally, the non-metro tracts provide representation to the 15% of households outside of metro area boundaries. During fielding, the final sample collected closely matched the proportionate sample planned. The summary of completes by Census region and non-metro areas is in Figure 3.3-1.

See Figure 3.3-2 for the breakdown of all metropolitan statistical areas (MSAs) by region and size, the number of tracts fielded by MSA and non-metro tracts for that region, total completes collected in each MSA, and total completes for non-metro areas of that region. In some instances, a tract (metro or non-metro) was dropped during fielding and not replaced due to status of quotas or practical fielding considerations.

Figure 3.3-1 Summary distribution of sample by region, MSA, and non-metro areas

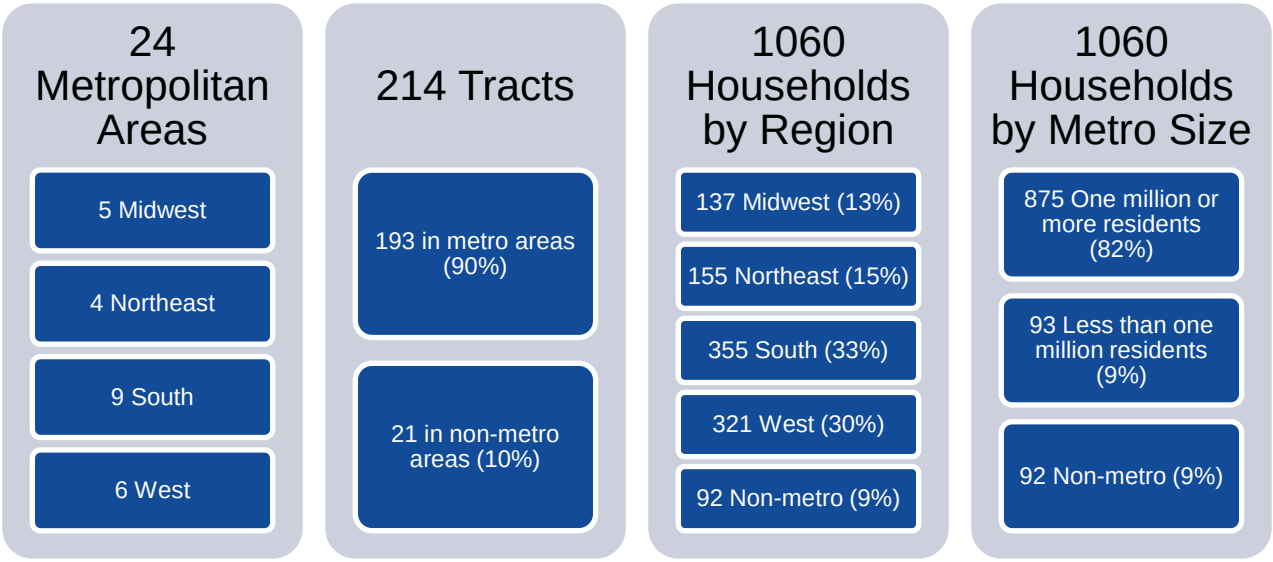


Figure 3.3-2: Distribution of tracts and completes by U.S. region, MSA, and MSA size

Region	MSA Population	MSA Name	Tracts Sampled	Total Completes
Midwest	*1 million or more*	Cleveland-Elyria, OH Metro Area	7	27
		Columbus, OH Metro Area	7	32
		St. Louis, MO-IL Metro Area	10	54
		Sub-Total	**24**	**113**
	Less than 1 million	Columbia, MO Metro Area	2	18
		Terre Haute, IN Metro Area	1	6
		Sub-Total	**3**	**24**
		Non-metro areas	**4**	**12**
		TOTAL	**31**	**127**
Northeast	*1 million or more*	Boston-Cambridge-Newton, MA-NH Metro Area	16	80
		Pittsburgh, PA Metro Area	9	39
		Providence-Warwick, RI-MA Metro Area	5	30
		Sub-Total	**30**	**149**
	Less than 1 million	Syracuse, NY Metro Area	**2**	**6**
		Non-metro areas	**4**	**18**
		TOTAL	**36**	**173**
South	*1 million or more*	Atlanta-Sandy Springs-Roswell, GA Metro Area	19	110
		Charlotte-Concord-Gastonia, NC-SC Metro Area	8	33
		Houston-The Woodlands-Sugar Land, TX Metro Area	20	109
		New Orleans-Metairie, LA Metro Area	4	12
		Orlando-Kissimmee-Sanford, FL Metro Area	8	47
		Sub-Total	**59**	**311**
	Less than 1 million	Athens-Clarke County, GA Metro Area	2	14
		Auburn-Opelika, AL Metro Area	2	13
		Beaumont-Port Arthur, TX Metro Area	2	10
		New Bern, NC Metro Area	2	7
		Sub-Total	**8**	**44**
		Non-metro areas	**9**	**41**
		TOTAL	**76**	**396**
West	*1 million or more*	Los Angeles-Long Beach-Anaheim, CA Metro Area	40	183
		Portland-Vancouver-Hillsboro, OR-WA Metro Area	8	47
		Riverside-San Bernardino-Ontario, CA Metro Area	11	57
		Salt Lake City, UT Metro Area	3	15
		Sub-Total	**62**	**302**
	Less than 1 million	Farmington, NM Metro Area	3	7
		Pocatello, ID Metro Area	2	12
		Sub-Total	**5**	**19**
		Non-metro areas	**4**	**21**
		TOTAL	**71**	**342**
		FULL SAMPLE TOTAL	**214**	**1060**

Source: CPSC SCOA Survey, Jan 1 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,060. Note: Data is unweighted.
Source: The 2013-2017 American Community Survey 5-Year Estimates provide classification for each metro area.

Sampling Timeline, Response, and Cooperation

While the survey officially launched at the start of 2019 and ended at the beginning of 2024, there were interim periods used for planning, redesigning the survey, finding and contracting with subcontractors, coordinating and training subcontractors, the year-long pause amidst the COVID-19 pandemic, and other pauses from awaiting approvals. Once a field team started in an area, they were able to quickly obtain completes, even in larger MSAs, using the revised method. Only 250 unique fielding days were used for data collection.

Figure 3.3-3: Summary of fielding timeline and response rates

Total	**N=1060**
Response rate	**6.9%**
Cooperation rate	**18.2%**
Completes by Quarter	
Q1 (Jan – Mar)	**155**
Q2 (Apr – June)	**241**
Q3 (July – Sept)	**549**
Q4 (Oct – Dec)	**115**
	1060
Completes by Year	
2019	**9**
2020	**0**
2021	**362**
2022	**356**
2023	**293**
2024	**40**
	1060
Unique fielding days	**250**

Source: CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. Note: Unweighted counts read down per section and add to 1060.

Data collection activity was almost evenly distributed between 2021 and 2022, completing about one-third of the planned completes each year. Larger metro areas were completed first, so while 2023 still had 293 completes, a higher proportion of the smaller metro areas were being completed. Data collection spilled over slightly and finished in February of 2024.

Figure 3.3-4 Completes collected by yearly quarters, 2019-2024

Completes by Year/Quarter	Q1 (Jan – Mar)	Q2 (Apr – June)	Q3 (July – Sept)	Q4 (Oct – Dec)	
2019	0	**9**	0	0	= 9
2020	0	0	0	0	= 0
2021	**3**	**13**	**263**	**83**	= 362
2022	**27**	**73**	**238**	**18**	= 356
2023	**85**	**146**	**48**	**14**	= 293
2024	**40**	--	--	--	= 40
	155	241	549	115	**= 1060**

Source: CPSC SCOA Survey, Jan 1,2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. Note: Unweighted counts read down per section and add to 1060 total.

Quarter 3, followed by Quarter 2, were most productive for data collection, as the weather was usually more cooperative, there were longer daylight hours for fielding, and there were fewer major holidays to plan around. There was data collection activity in the other two quarters, but those times of year often coincided with contract and IRB renewals that sometimes required pauses. Still, this often aligned well with the timelines of subcontractors.

Using the screen-out collection form completed by field interviewers, the response rate

(completes / all contact attempts made) and cooperation rate (completes / number of households directly spoken to) can be calculated. The response rate was 6.9% (1,060/15,449) with an ultimate cooperation rate of 18.2% (1,060/5,833), which is slightly higher than the DC pilot (see Appendix B). It is worth noting that some data may not have been entered; however, the amount of data received has been considered sufficient to provide these estimations.

Statistical Weighting and Data Sources

To ensure that the survey results accurately represent the socio-demographics and households of the U.S. considered in the study design, we employed a multi-step weighting procedure. This process was designed to correct for biases that may have arisen from any or all of survey methodology, regional representation, and demographic variables.

The steps were as follows:

- ***Step 1: Correction by Survey Type***
    - The initial step corrected for any bias introduced by the two types of surveys conducted (longer vs. shorter). To address this, we calculated the weight for each respondent based on the potential coverage of respondents who qualified for the short version of the survey versus the actual coverage achieved (which was restricted due to quotas).
- ***Step 2: Regional and MSA Size Adjustments***
    - Next, we refined our weights to account to rebalance proportions of the Census regions and MSA sizes. Using the initial weight, we calculated a second weight that corrected for disparities in representation across the four Census regions and sizes of MSAs (1 million or more vs. less than 1 million residents) considered in the study.
- ***Step 3: Socio-Demographic and Household Characteristics Adjustments***
    - The final step involved adjusting for key socio-demographic variables to ensure that our sample accurately represented the U.S. population. Using the second weight, we calculated a third weight to correct for the proportions of respondents based on the intersection of race/ethnicity of household (based on Census categories), household ownership (own vs. rent), and the unit structure of the household (single-family detached, single-family attached, etc.). This was

achieved by using proportions from the 2017 American Housing Survey, which provided reliable estimates of these socio-demographic characteristics in the U.S. population. The weight for each respondent was calculated as the ratio of the U.S. proportion to the proportion observed in our survey sample.

Complementing the weighting process, we implemented imputation methods to address missing information in certain variables, ensuring a more comprehensive use of our respondent data. Notably, the race/ethnicity of the household was imputed using an approximation based on the respondent's reported ZIP code. This imputation leveraged data from the 2017 American Community Survey, specifically matching ZIP codes to the majority race/ethnicity category in the corresponding ZCTA (ZIP Code Tabulation Area). It is important to note that while this imputed data was used in the weighting calculations to enhance representativeness, it was not included in the descriptive analysis presented in the report.

The demographic proportions used for the final weighting step were derived from the 2017 American Housing Survey, which best aligned with the 2013-2017 Census estimates that informed the design of our study. This ensured that our weighting reflects the most accurate and relevant demographic information available for the U.S. population.

Data Analysis

This report focuses on univariate analysis (frequency results from each question), with only a couple of instances of cross-tabular analysis to demonstrate the intersecting influence of perception and behavior/knowledge. A few questions were only asked to a small sub-set of participants to further understand less common behaviors, so these questions are reported qualitatively.

The margin of error for the full survey sample (N=1,060) using a 95% confidence interval is +/- 3.0% points. The margin of error for questions asked only of those with smoke and/or CO alarms (N=985) using a 95% confidence interval is +/- 3.1% points.

It is possible to further analyze the data with cross-tabular analysis by demographic and household characteristics; however, this report concentrates on reported frequencies and created variables based on alarm testing to answer core research questions.

4. Door-to-Door Quantitative Survey: Detailed Findings

The CPSC nation-wide SCOA survey report consists of 1,060 survey responses captured through structured survey questions. The respondents were heads of household, but the overall unit of analysis was the household itself (referred to as “households”). These data were analyzed using descriptive statistics, including frequencies to distill findings from survey participant responses. Response options are often combined or collapsed for concise reporting.

Additionally, some results are reported based on counts due to small sample sizes for certain conditional questions. Certain questions are only asked to a subset of households, so these responses and other findings with a limited number of responses are best reported without percentages, so as not to be mistaken or confused to be results evaluated based on the full sample. Furthermore, open-ended questions are reported using qualitative evaluation, such as the householder’s specific follow-up when they answered “other” in response to a question.

The results of this analysis are presented in this section and structured thematically: a summary of the outcome of device testing; respondent attitudes and knowledge of smoke alarms and behaviors regarding these devices; respondent attitudes and knowledge of CO alarms and behaviors regarding these devices; and overall characteristics of the physical household and residents which can affect fire and CO risk.

Within section 4.1, overall alarm testing results at the household level, household-given perceptions and knowledge, and alarm presence within homes are presented as weighted data (sections 4.1.1, 4.1.2, 4.1.4, and 4.1.6). Discussion of the tested alarms themselves, including compositional information about the types of alarms, room/floor location of testing etc. is provided as unweighted data (sections 4.1.3 and 4.1.5). Similarly, in section 4.4, some compositional information about the house type is reported using unweighted data since these were variables used in weighting. Other data is presented unweighted to describe the sample, but corresponding data is described or shown as weighted to describe behaviors and appliances that pose fire and CO risk. Please see the source notes on all figures for n sizes, whether data is weighted or unweighted, and other information.

The margin of error for the full survey sample (N=1,060) using a 95% confidence interval is +/- 3.0% points. The margin of error for questions just asked of those with smoke and/or CO alarms (N=985) using a 95% confidence interval is +/- 3.1% points.

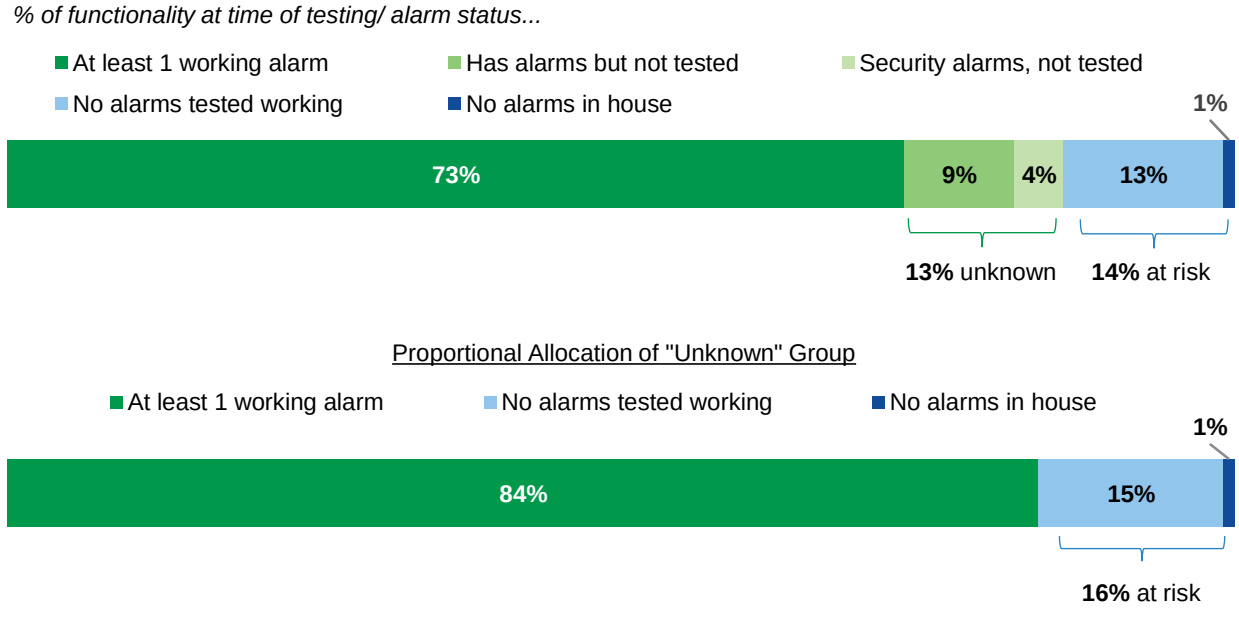
4.1 Smoke and CO Alarm Testing Summary

Ultimately, 16% of U.S. households have no alarms at all or only had non-functional alarms when initially tested. Specifically, regarding CO alarms, half (51%) of households are at risk. Heads of households are mostly knowledgeable about the types of alarms they have and locations in their home, but they are less accurate regarding their age and functionality status. In total, 1,314 devices were tested in various room locations and levels of homes. Ultimately, 9% of the alarms tested were non-functional even after corrective action was attempted, and 13% of alarms required corrective action to the battery to restore function.

4.1.1 Alarm Testing Results: Household Summary

Since a household often had multiple alarms tested, they could have had a mix of functional and non-functional alarms. For households that could/did not have any alarms tested but had alarms present, those “unknown” alarms were proportionally allocated into the working or not working group based on results of testing. Ultimately, 84% of households have at least one fully functional alarm that would alert them of a fire or CO event. This leaves 16% of households at risk, mostly due to having no working alarms in the household (15%) as opposed to missing smoke and CO alarms entirely (1%).

Figure 4.1.1-1: Overall household alarm functionality at time of testing



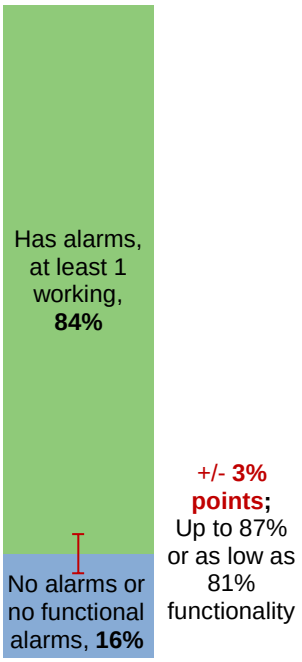
Source: S15-17, S19-21, Q41, Q50, Q52, Q75. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,060. Note: Data is weighted. Percentages may not sum to 100% due to rounding.

As summarized in Figure 4.1.1-2, most (84%) households do have at least one functional smoke or CO alarm. This point estimate has a margin of error of plus or minus 3% points, which means that household functionality may be as high as 87% or as low as 81%. This means that as many as 19% of households are at risk of not having at least one functional alarm.

CO Alarm Test Results

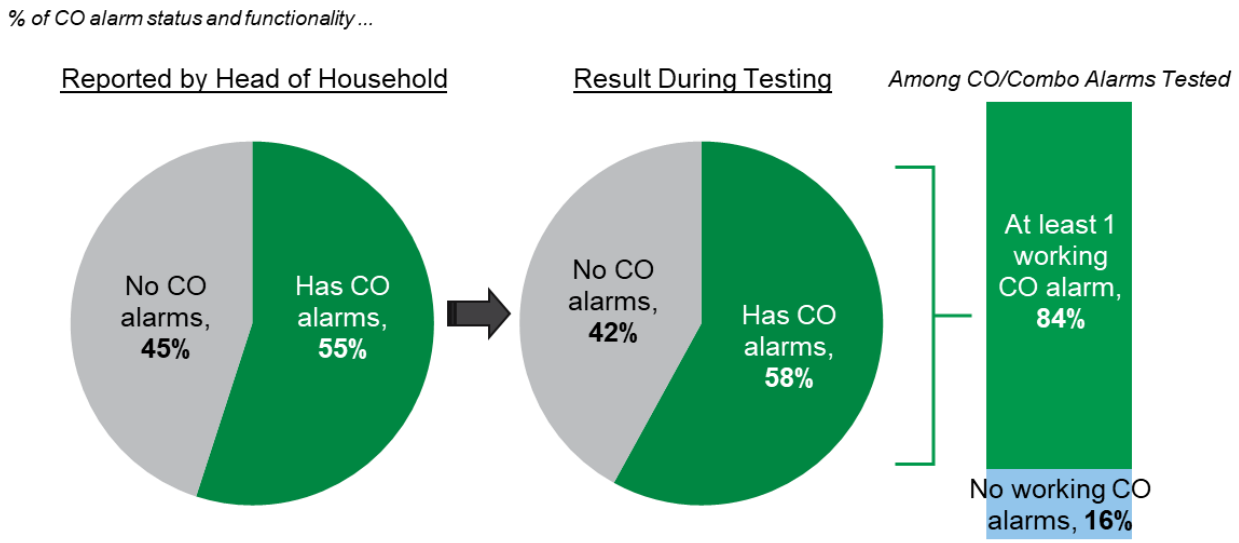
CO alarms are less common in households, with only 55% of heads of households reporting that they have them installed in the home. As shown in Figure 4.1.1-3, this was found to be slightly higher during testing, as some alarms tested were combination smoke/CO alarms. This means that 58% of households have CO alarms installed. While not all households with CO alarms had a CO or combo alarm tested, among households that were tested, 84% had at least one working alarm.

Figure 4.1.1-2: Estimated household alarm functionality, including margin of error



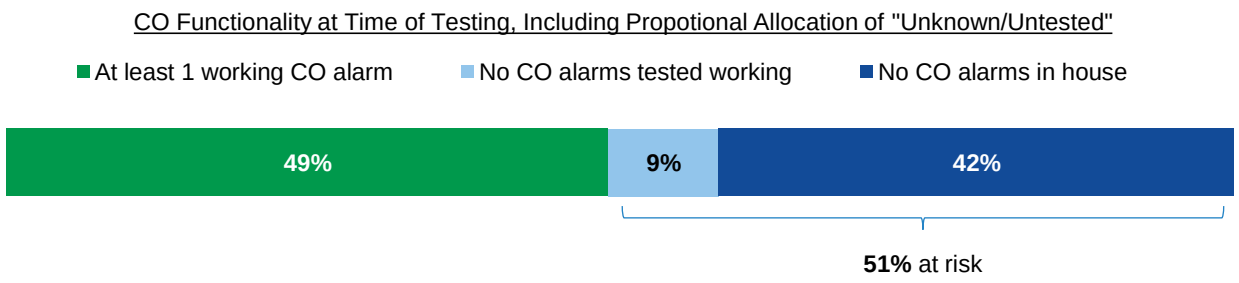
Source: S15-17, S19-21, Q41, Q50, Q52, Q75. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,060. Note: Data is weighted and shown with margin of error bar.

Figure 4.1.1-3: Overall household alarm functionality at time of testing



Source: S15-17, S19-21, Q41, Q44, Q50, Q52, Q75. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,060 for CO alarm pie charts and N=134 for tested CO/combo alarms. Note: Data is weighted. Percentages may not sum to 100% due to rounding.

Figure 4.1.1-4: Overall household CO alarm functionality at time of testing

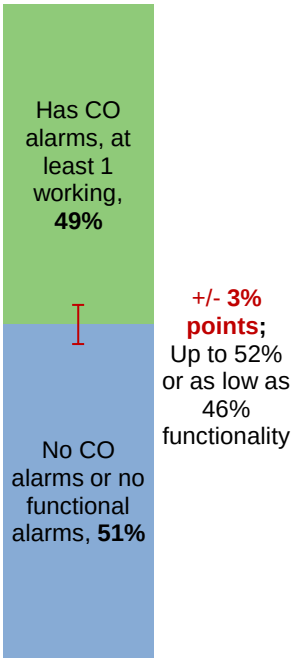


Source: S15-17, S19-21, Q41, Q44, Q50, Q52, Q75. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,060.
Note: Data is weighted. Percentages may not sum to 100% due to rounding.

Just as shown in Figure 4.1.1-1, households with CO alarms often had multiple alarms tested, including CO standalone devices and smoke/CO combination devices, but they could have had a mix of functional and non-functional alarms. For households that could/did not have any CO alarms tested but had CO alarms present, those "unknown" alarms were proportionally allocated into the working or not working group based on results of testing. Ultimately, 49% of households have at least one fully functional CO alarm that would alert them of a CO event. This leaves the remaining half (51%) of households at risk, mostly due to not having any CO alarms in the house (42%). About 1-in-10 households have a CO alarm present, but none are working (9%).

As summarized in Figure 4.1.1-5, half (49%) of households do have at least one functional CO standalone or combination alarm. This point estimate has a margin of error of plus or minus 3% points, which means that household CO alarm functionality may be as high as 52% or as low as 46%. This means that the remaining half of households (51%, up to 54%) are at risk of not being alerted to a CO event due.

Figure 4.1.1-5: Estimated household CO alarm functionality, including margin of error



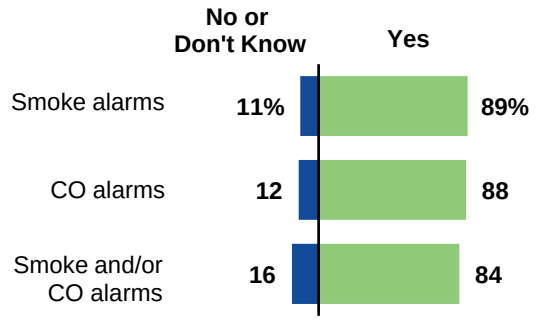
Source: S15-17, S19-21, Q41, Q50, Q52, Q75. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,060. Note: Data is weighted and shown with margin of error bar.

4.1.2 Household Perceptions About Tested Alarms

Nine-in-ten of all households with each type of alarm believed "most or all" of their smoke alarms (89%) and CO alarms (88%) were working. Overall, when considering all the alarm types in a household, 84% believed that all their alarms (smoke and CO, if applicable) are working.

Figure 4.1.2-1: Household perception if households alarms are working

Do you think most or all of your __ are working?



Source: Q11a and Q24. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=988 (smoke), 543 (CO), 990 (both). Note: Data is weighted.

As shown in Figure 4.1.2-2, respondents largely made accurate assessments of the functionality rate of their alarms. The vast majority (84%) of those who believed all their devices (smoke and CO, if applicable) were working were correct as demonstrated through empirical testing. Notably, among those who believed all alarms were functional, 16% owned an alarm that was not fully operational during the initial testing. This includes any issue that caused the alarm not to function upon initial testing, including a battery issue (missing or not working) and if the device was completely non-functional.

Outcomes of alarm testing for households that did not think "most or all" of their alarms were operational ended up more divided. The majority (60%) were correct in noting that they likely had an issue, as demonstrated by testing results. The remaining 40% of households did not encounter an issue during testing.

Figure 4.1.2-2: Perception about alarms vs. testing results

Nearly 1-in-5 households who said they have all working alarms have functional issues during testing

% of households who say…	**All alarms work**	**Not all alarms work**	**Total**
Testing results			
At least one problem w/ alarms	**16**	**60**	19
No problems with alarms	**84**	**40**	81
	100%	100%	100%

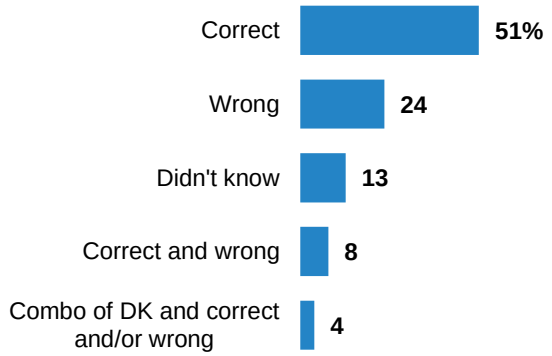
Source: Q11a/Q24 by Q75. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=985 households. Note: Data is weighted. Percentages read down and may not add to 100% due to rounding.

Tested alarms with manufacturers' years that could be identified ranged from 1988 to 2023, and heads of households struggled with correctly identifying the age range of their alarms. As shown in Figure 4.1.2-3, only half (51%) were always able to correctly identify the alarm age. One-quarter (24%) was never correct in their estimation and 13% did not even have

a guess as to the approximate age range. The remaining 12% had a combination of outcomes; for example, their appraisal could be correct for some alarms, but they did not know the age for others.

Figure 4.1.2-3: Household perception of alarm age vs. reality

% of households whose perception about alarm age was ...



Source: Q47 by Q61. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=588. Note: Data is weighted. Percentages may not sum to 100% due to rounding.

Households with brand new alarms accurately stated that these alarms were “less than 1 year old,” and likewise, those with older alarms were mostly accurate with stating those alarms were “more than 10 years old.” Alarms that were a few years old presented the most problems for people to know if they were “1-5 years old” or “6-10 years old.”

Among those who did not know the age of their alarms, those alarms ranged from being just a few years old to being more than 10 years old. This indicates that the appearance of the alarms is not enough information for householders to assess or even guess their age.

While households struggled with identifying the age of alarms, they were almost completely accurate in knowing the types of alarms (smoke, CO, or combination) in their home (99%). Only 1% of households did not know the type of alarm that was going to be tested. These alarms mostly turned out to be smoke alarms, with a few instances of combination or CO alarms.

Overall, households were aware of the locations of the alarms in their homes. As shown in Figure 4.1.2-4, most (88%) heads of households knew all the locations of all alarms that were tested and 11% knew at least one location but not all. Only 2% of heads of households did not know any locations in their homes where the alarms were installed.

Figure 4.1.2-4: Knowledge of alarm locations

Households are knowledgeable about where alarms are installed in their home

% of households who __ tested alarm locations …	
Knew all	**88**
Knew at least one, but not all	**11**
Knew none	**2**
	100%

Source: Q82. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,060. Note: Data is weighted. Percentages read down and may not sum to 100% due to rounding

4.1.3 Alarm Testing Results: Device Summary

Figure 4.1.3-1 summarizes the unweighted distribution of the functionality of all alarms tested. Overall, 79% of all alarms were fully functional during initial testing; 9% were completely non-functioning, even when power was restored, and they were either collected or advised to be replaced. The remaining 13% were not initially working due to a battery issue (missing or old) but were made functional again.

Figure 4.1.3-1: Results of alarm testing

About 2-in-10 alarms were non-functioning or needed corrective action to function

% of alarms that …	
Function (no action required)	**79**
Function after correction	**13**
Battery needed to be replaced	*9*
Battery was missing	*4*
Do not function	**9**
	100%

Source: Q70 and Q75. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,314 alarms.
Note: Data is unweighted. Percentages read down and may not total to 100% due to rounding.

Since the alarms that functioned after correction were caused due to the battery, a deeper dive into the (unweighted) composition of the completely non-functioning alarms is shown in Figure 4.1.3-2 to understand more about those devices.

The completely non-functioning alarms (9%) ranged in manufacture years from 1990 to 2022, demonstrating that some non-functional alarms were relatively new and stopped working before their expected replacement date. Almost all (90%) of these completely non-functional devices happened to be standalone smoke alarms. Standalone alarms were significantly more likely to be non-functioning vs. functioning by 12% points (90% vs. 78%). It is notable that standalone station alarms were more common for older devices. The smoke alarms were a mix of either photoelectric (34%) or ionization (34%) technology, with a fair number not clearly identifiable (25%). A mix of technologies is also present in the combination alarms. Older devices were not able to definitively be categorized by technology, though being older they are likely ionization. Notably, photoelectric smoke alarms were significantly more likely to be non-functioning (34%) vs. functioning (28%).

Figure 4.1.3-2: Composition highlights of non-functioning alarms vs. functional alarms (including functional after correction)

% of __ that are…	**Non-functional alarms**	**Functional alarms**
Type of alarm		
Smoke	**82**	**70**
Combo smoke/CO	**15**	**23**
CO	**3**	**8**
	100%	100%
Smoke alarm technology		
Photoelectric (incl. CO combo)	**34**	**28**
Ionization (incl. CO combo)	**34**	**43**
Both	**4**	**7**
Don't know	**25**	**22**
	100%	100%
Standalone/wire free	**90%**	**78%**

Source: Q44, Q58, Q63. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=125 (non-functional), 1,189 (functional).
Note: All data is unweighted. Percentages read down per section.

4.1.4 Presence of Alarm Types and Technologies

As summarized in Figure 4.1.4-1, among U.S. households, nearly all (98.6%) have some type of smoke alarms installed in their homes; however, only a slim majority (54.9%) reported having CO alarms. As found during testing, some households have combination smoke/CO alarms, so they were unaware they had CO alarms in the household. This was true for only a small percentage of households but indicates that slightly more households may have CO alarms if an inspection is conducted vs. asking a head of household (see section 4.1.1 and figure 4.1.1-3 for more details). Only 1% of households do not have any type of alarm. In total, about 46% of residents reported missing one or both types of alarms to alert them of a fire or CO incident.

A total of 985 households qualified for the full-length interview, which included testing of their alarms. The remaining 75 households either had no alarms (24%) or had security devices that call emergency services when the alarm is set off (76%). This group of households completed a short interview querying behaviors, attitudes, and experiences related to smoke/CO alarms, without testing any alarms.

Among the households with alarms we could test, weighted results of the composition of alarms provides some insights into the common types and technologies found in U.S. households.

As shown in Figure 4.1.4-2, the most common alarms were standalone alarms (84%) and only detected smoke (73%). Alarms were usually

Figure 4.1.4-1: Presence of alarm types in U.S. households

Nearly all had a smoke alarm, but almost half missing CO alarm

% of households with …	
Smoke alarms only	**44.2**
CO alarms only	**0.5**
Smoke and CO alarms	**54.4**
Total with smoke alarms	*98.6*
Total with CO alarms	*54.9*
No alarms	**0.9**
	100%

Source: S15, S19. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,060. Note: Data is weighted. Percentages read down with decimals shown for precision and add to 100%.

Figure 4.1.4-2: Composition highlights of all alarms tested (weighted)

Type of alarm	
Smoke	**73%**
Combo smoke/CO	**17%**
CO	**10%**
	100%
Smoke alarm technology	
Ionization (incl. CO combo)	**47%**
Photoelectric (incl. CO combo)	**26%**
Don't know	**22%**
Ionization and photoelectric	**5%**
Power Type	
Replaceable battery	**59%**
AC power (incl. battery back-up)	**23%**
Sealed battery	**15%**
Connection Type	
Standalone/wire free	**84%**
Interconnected	**16%**
Specialty Technologies	
Has strobe light	**3%**
Connect to tactile notification device	**0.2%**

Source: Q44, 58, 60, 63. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,314 alarms. Note: Data is weighted. Percentages read down per section and may only show partial results that do not add to 100% or may not total to 100% due to rounding.

powered only by a replaceable battery (59%). About one-quarter (23%) of alarms used AC power, but it is more common for those to have a battery back-up than not (16% vs. 7%). Smoke alarms usually had ionization technology (47%), and there was a near equal incidence of combined technologies of 3-5% (photoelectric/ionization, ionization/CO, and photoelectric/CO). Strobe lights on alarms make up about 3% of alarms in households (this is the same as the unweighted composition as shown in Figure 4.1.5-1).

It is worth noting that the breakdown in Figure 4.1.4-2 does not represent a complete or absolute census of technologies for smoke and CO alarms in U.S. households; however, it does provide some directional data in understanding prevalence of some types of alarms over others when a variety of geographies and home types are tested.

4.1.5 Composition of Tested Alarms

In total, 1,314 alarms were tested across the 985 households that completed the full-length interview. An unweighted compositional breakdown of all the alarms tested, technologies of these alarms, and locations in the home, is provided in Figure 4.1.5-1. Seven-in-ten (71%) of alarms tested were smoke alarms. The remaining were mostly combination smoke/CO devices (22%) with a few being CO alarms (7%). As previously noted, the manufacturer year could not always be identified on the device; however, the average was 2015 (standard deviation of 6 years) among the 528 devices where the information was found.

The majority of alarms (54%) had replaceable batteries only as a power source and 16% used only sealed batteries. One-quarter (27%) used AC power either with (18%) or without a battery backup (9%). To note, 3% of alarms were not able to be confirmed on the type of power they used. Accordingly, most (80%) of these alarms were standalone with only 20% interconnected with other devices. It is worth noting that alarms connected to a central security system are likely to be interconnected, and households with those systems were limited in our sample and not allowed to be tested if part of the sample.

Figure 4.1.5-1: Composition highlights of all alarms tested (unweighted)

Total	**N=1,314**
Type of Alarm	
Smoke	**71%**
Combo smoke/CO	**22%**
CO	**7%**
	100%
Smoke Alarm Technology	
Ionization (incl. CO combo)	**42%**
Photoelectric (incl. CO combo)	**29%**
Don't know	**23%**
Ionization and photoelectric	**6%**
Power Type	
Replaceable battery	**54%**
AC power (incl. battery back-up)	**27%**
Sealed battery	**16%**
Level of Home	
First floor	**84%**
Second floor	**11%**
Basement	**4%**
Room/Locations Tested	
Hallway outside bedroom	**31%**
Hallway (other)	**19%**
Living/family room	**17%**
Inside bedroom	**12%**
Kitchen	**11%**
Dining	**4%**
Stairwell	**2%**
Laundry/Storage room	**2%**
Connection Type	
Standalone/wire free	**80%**
Interconnected[1]	**20%**
Specialty Technologies	
Has strobe light	**3% (n=44)**
Connect to tactile notification device	**0.2% (n=3)**
Average manufacturer year	**2015**

Source: Q43, 44, 58, 60, 61, 63. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,314 alarms.
Note: Data is unweighted. Percentages read down per section and may only show partial results that do not add to 100% or may not total to 100% due to rounding.
[1] Likely interconnected as there was a short period in the code where smoke alarms may have been only AC powered and not interconnected. Exact wires were not checked to confirm.

Alarms were tested on different floors and in a variety of locations. While alarms are more likely to be in certain parts of the home, access to the room and ability to reach the alarm potentially affected the distribution of locations of the

tested alarms. The majority of testing was conducted on the first floor (84%), 11% on the second floor, and just 4% in a basement. Hallways outside bedrooms were the most popular location to test the alarms (31%) followed by hallways in another areas (19%). The living/family room was the next most popular location where alarms were tested. Notably, 11% of tested alarms were located in kitchens, which was more popular than dining rooms (4%). Ultimately, 12% of alarms were tested inside bedrooms and 2% were tested in stairways. Each of these areas could have been restricted to interviewers or too difficult to test, respectively, which is why they are more limited in the sample.

Special technologies exist to alert the hearing impaired when the alarm sounds. Ultimately, 3% of the sample included testing an alarm that either had a strobe light or was connected to a tactile notification device (such as a bed or pillow shaker).

Figure 4.1.5-2: Location of alarm tested in household: CO/combo vs. smoke only devices

% of alarms tested on/in …	**Overall**	**CO/ Combo**	**Smoke only**
Level of Home			
First floor	**84**	82	85
Second floor	**11**	10	12
Basement	**4**	7	3
Room/Locations Tested			
Hallway outside bedroom	**31**	28	32
Hallway (other)	**19**	21	18
Living/family room	**17**	19	17
Inside bedroom	**12**	8	14
Kitchen	**11**	11	11
Dining	**4**	4	3
Stairwell	**2**	3	2
Laundry/Storage room	**2**	3	1

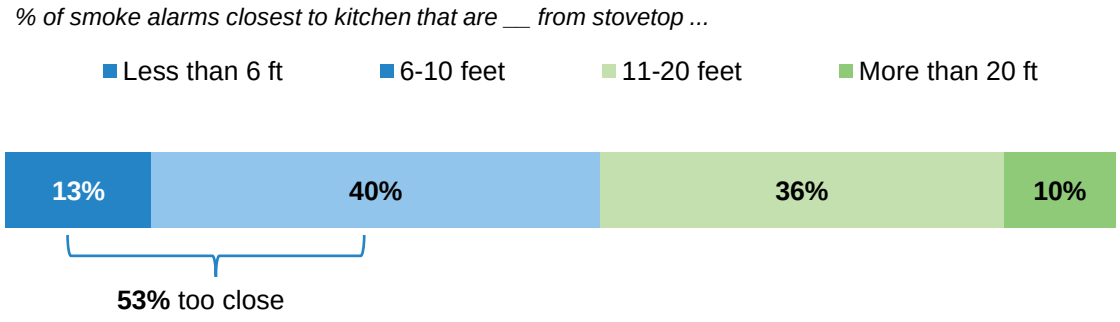
Source: Q43, 44. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,314 (alarms overall), 385 (CO/combo), 929 (smoke). Note: Data is unweighted. Percentages read down per section and may only show partial results that do not add to 100%.

As shown in Figure 4.1.5-2, CO and combination smoke/CO alarms were tested at approximately the same rate on house floor and rooms as smoke only alarms. More CO/combination alarms were tested in basements (7%) than smoke alarms (3%). Based on room location, both categories of devices were about equally spread through the house. Notably, alarms tested in bedrooms were more often smoke only alarms rather than a CO/combination device (14% vs. 8%). This might be because a CO only alarm is unlikely to be installed in a bedroom, so either a smoke or combination alarm would be installed, and fewer combination alarms were found throughout the households. Positively, each category of devices was most prevalent in hallways outside of bedrooms, but there were slightly more smoke alarms than CO/combination devices (32% vs. 28%, respectively). Slightly more CO or combination alarms were found in hallways in areas not near bedrooms (21% vs. 18%). Additionally, these alarms were more often found in laundry/storage rooms compared to smoke alarms tested (3% vs. 1%, respectively).

To reduce the risk of nuisance alarms due to cooking fumes, it is recommended to install smoke alarms at least 10 feet away from a stovetop. Among the 703 smoke alarms closest to the kitchen (which could have been in the kitchen or a nearby room such as the dining room, family/living room, or one of the hallways), half (53%) were installed too close to the stovetop (within 10 feet), including 13% less than 6 feet away. Of the 46% of alarms that were a proper distance from the stovetop, they were usually 11-20 feet away (36%).

As stated in section 4.1.4, the compositional summaries of these alarms do not represent a complete or absolute census of technologies or locations of installation for smoke and CO alarms in U.S. households; however, it does provide some directional data in understanding prevalence of some types of alarms over others when a variety of geographies and home types are tested. Further discussion about the benefits and limitations of this research can be found in section 6 of this report.

Figure 4.1.5-3: Distance of from stovetop to closest smoke alarm tested



Source: Q48b and Q48c. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=708. Note: Data is unweighted. Percentages may not sum to 100% due to rounding.

4.1.6 Comparison of 1994 vs. 2024 Report Core Findings

Since this study was based on a replication of a report from several decades ago, the expectation is that some of these core measures of presence and functionality of these devices would increase in U.S. households. The 1994 report placed national estimates of smoke alarms at 88%. This study found the point estimate for smoke alarm presence to be 99%. While still a point estimate, this marks a significant increase of these devices in homes over the past 30 years. CO alarms were just getting to market in the early 1990s. While studies have been done since then on their prevalence in homes, this study estimates their national presence at 55%.

Figure 4.1.6-1: Comparison of presence and functionality of household alarms: 1994 vs. 2024 reports

Among all households, % …	**1994 study**	**2024 study**
With smoke alarms	**88**	**99**
With CO alarms	**--**	**55**
Among households with tested alarms, % …		
Functionality rate	**80[1]**	**85[1]**
Among all households, % …		
Has any alarm(s) and at least 1 is functional	**--**	**84**
Has CO alarm(s) and at least 1 is functional	**--**	**49**

1994 Source: Q12-13, Q21-22, Smoke Detector Operability Study, 1992. N= 1,067 (all households), 811 (tested) (main sample used for national estimates).
2024 Source: S15-17, S19-21, Q41, Q50, Q52, Q75. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,060 (all households), 913 (tested).
Note: Data is weighted. Percentages are independent per section and study.
[1] Functionality for the 1992 study only includes smoke alarms. The 2024 study includes smoke, CO and combo smoke/CO alarms for this measure.

Functionality/operability of these devices is more difficult to measure, as it requires direct testing. This is challenging to ask phone participants and requires a smoke test spray for thorough testing of smoke alarms; therefore, these studies are not common. When comparing the functionality rates among tested households only, there is a statistically significant 5%-point increase in functionality from the 1994 report this this one. The 1994 report did not provide a combined measure of households with alarms present and their testing results for a final number of households at risk. This report provides that estimate in section 4.1.1 and is summarized here in Figure 4.1.6-1 for convenience.

4.2 Attitudes, Behavior, and Knowledge of Smoke Alarms

Households strongly recognize the necessity for smoke alarms to provide fire safety to a home, and households with them feel safe. Most believe the alarms are working and claim to know how to maintain them in good working order, but most do not test them or test them less than recommended.

4.2.1 Beliefs About Current Safety & Necessity for Their Home

Most households (99%) have a smoke alarm in their home. Only 1% of households reported not having any smoke alarms in their home. Some reasons for not having a smoke alarm include the following: they did not come with their residence (3), it is the landlord's responsibility (3), battery issues led them to remove it (2). One household did not even know they were without alarms until they checked the house during screening.

Figure 4.2.1-1: Household views on the necessity of smoke alarms

How necessary is it to have a smoke alarm installed in your home?

% of households who say …	
5 - Extremely Necessary	**90**
4	**6**
3	**2**
2	**1**
1 - Not at all necessary	**0.4**
Don't Know	**1**
	100%

Source: Q14. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,060. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

As shown in Figure 4.2.1-1, nearly all households placed high importance on having smoke alarms installed in the home, including 90% who affirm they are "extremely necessary." A very small percentage of households (0.4%) believed having a smoke alarm in their homes is "not at all necessary."

Figure 4.2.1-2: Household views on the safety of home with current smoke alarms

% of households who say household is…	
Net: Very/mostly safe	**79**
Very safe	*51*
Mostly safe	*28*
Moderately safe	**14**
Net: Slightly/not at all safe	**6**
Slightly safe	*4*
Not at all safe	*2*
Don't know	**1**
	100%

Source: Q9. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,046. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

Figure 4.2.1-2 highlights that the majority (79%) of households with smoke alarms felt "very" or "mostly" safe with their current smoke alarms, including 51% who said they felt "very" safe. Only a small subset of households (6%) believed their homes were either "slightly" or "not at all" safe with their current smoke alarms. For the 12 households without smoke alarms (11 with no alarms and 1 with only CO alarms), most evaluated their home fire safety to be high. The majority considered their home to be "very" safe (5 households)

or “mostly” safe (3 households). Three more households evaluated their home to be “moderately” safe and only 1 household said their home was only “slightly” safe. None of these households thought their home was “not at all safe” in regard to home fire safety.

As shown in Figure 4.2.1-3, most households (89%) believed all of their smoke alarms were working, and 8% of households believed that not all of their smoke alarms were working. Only 4% of households did not know if their smoke alarms were working.

Among the households that reported believed that not all of their smoke alarms were working, 31% indicated it was because they did not get around to fixing them. More than one-quarter of these households (27%) admit their smoke alarms were not working because they took deliberate action to disable them; this includes households that removed the batteries and households that disconnected their smoke alarm. About 1-in-5 (18%) indicated their alarms’ batteries were not working and they had yet to replace them. Another 18% of households' smoke alarms did not work because of a lack of knowledge or resources to fix or replace them; this includes households that were not sure how to fix or replace their alarms, unable to afford new ones, and unable to install or fix their alarms. An additional 18% of households reported there was another reason their smoke alarms were not working, including four believing their smoke alarms did not work because of age, two stating that the alarm never goes off, and one household reporting that their alarm randomly goes off. Two more households reported they had not checked their alarm recently to see if it worked or if it needed new batteries.

Figure 4.2.1-3: Perception about smoke alarm functionality and possible reasons for smoke alarms not working

Do you think most or all of your smoke alarms are working?	**%**
Yes	**89**
No	**8**
Don’t know	**4**
Among those who do not think they are all working: **What are some reasons your smoke alarms may not be working?**	
Did not get around to fixing it	**31**
Took deliberate actions to disable them	**27**
Removed batter	*14*
Disconnected it	*13*
Lacked knowledge or resources or fix/replace	**18**
Do not know how to fix/replace	*12*
Unable to afford new ones	*4*
Unable to fix or install new ones	*3*
Battery not working and not yet replaced	**18**
Other reasons	**18**
Batteries never installed	**3**
It’s the landlord’s responsibility	**2**
Don’t know	**2**

Source: Q11a and 11b. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,046 (alarms working), 85 (reasons why not working). Note: Data is weighted. For the first part, percentages read down and may not total to 100% due to rounding. For the second part, percentages are from a select all that apply and do not sum to 100%.

Of the twelve households that reported disconnecting their smoke alarms, in a select all that apply question, five indicated that their alarms no longer worked and four said the alarms were a nuisance when they went off, leading them to disconnect the device. Of the nine households that reported removing the alarm batteries, a select all that apply question revealed that six respondents indicated removing the batteries because they no longer worked, four households reported that alarms would not stop beeping/chirping, and one household reported they intended to replace the batteries after removing them but forgot to install new ones.

4.2.2 Knowledge of Smoke Alarms

As shown in Figure 4.2.2-1, three-quarters of households with smoke alarms said that they know how to install (71%) and maintain (77%) a smoke alarm in good working order. This still means that about one-quarter of households are not knowledgeable about these key aspects of upkeeping these devices in the home.

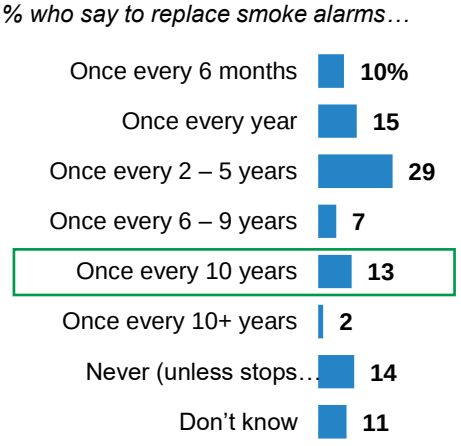
Figure 4.2.2-1: Knowledge about smoke alarms care

% of households saying that they know …	
How to install a smoke alarm	
Yes	**71**
No	**26**
Unsure	**2**
	100%
How to maintain a smoke alarm in good working order	
Yes	**77**
No	**20**
Unsure	**2**
	100%

Source: Q12. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,047. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

When asked about how often an old smoke alarm should be replaced, the most common answer was once every 2-5 years (29%), followed by once a year (15%), and never, unless the alarm stops working (14%). Slightly more than one-in-ten (11%) respondents said they do not know when to replace an old smoke alarm. Ultimately, only 13% of households chose the correct response, that a smoke alarm should be replaced once every 10 years. Overall, one-quarter of households overestimated, did not know, or did not think smoke alarms had to be changed on a particular cadence.

Figure 4.2.2-2: Knowledge about when to replace smoke alarms

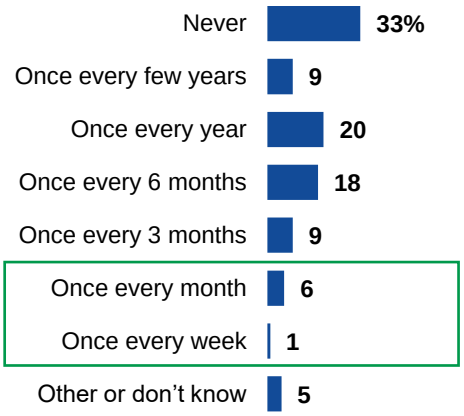


Source: Q13. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,047. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

4.2.3 Behaviors Regarding Smoke Alarm Testing

As reported in Figure 4.2.3-1, households that test their smoke alarms usually do so once a year (20%) or once every six months (18%). Still, one-third (33%) said that they never use the test button to test these alarms. While the recommended frequency of alarm testing is dependent on manufacturer instructions, it is generally recommended to test alarms with the test button at least once a month. Unfortunately, only 7% of households test their alarms that often. About 3% of households didn't know the frequency of testing, and the remaining 2% of households had a more specific response. There were a variety of "other" reasons given, including six households that reported they test their alarms whenever they beep or chirp, and six more households claiming they test their alarms once every two months.

Figure 4.2.3-1: Testing frequency of smoke alarms



Source: Q10a. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=988. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

Households that have smoke alarms but never test them were asked why they never tested them, which could have included multiple reasons. One-quarter of households explained that they did not know they should test their alarms, they did not think it was important enough, or they did not test them because they go off occasionally (26% each). Nearly 1-in-10 (8%) households said they were physically unable to reach their alarms. A few households (7%) indicated that the reason they do not test their smoke alarms is because they do not know how to.

Figure 4.2.3-2: Reasons smoke alarms have not been tested

% of households who …	
Did not know you should test	**26**
Did not think it was important enough	**26**
Don't need to test because they go off occasionally	**26**
Other	**17**
Physically unable to reach	**8**
Did not know how to test	**7 (36)**[1]
Don't know	**3**

Source: Q10b. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=314. Note: Data is weighted. Percentages are from a select all that apply and do not sum to 100%
1 When combined with Q10c, a total of 36% of households that did not test their alarms admit to not knowing how.

Of the 17% of households that cited other reasons for not testing their smoke alarm,

most mentioned that they did not think to test their alarms, that it was not “top of mind” or that they were “lazy” and did not want to. A smaller portion of households noted they recently moving and have not yet tested their alarms, while a few others noted that the landlord tests them. A couple of households mentioned that the smoke alarms have gone off during cooking, so they know they work and don’t need to test them.

A follow-up question was asked households that had smoke alarms and did not test them if they knew how to test their smoke alarms. This question was not asked to households that indicated one of the reasons they did not test was because they did not know how to. In total, 36% of households that never tested their alarms don’t know how to.

4.2.4 Fire and Nuisance Alarm History

In the past 12 months for each household with smoke alarms, 42% indicated their smoke alarms had gone off in their homes when there was no fire. As reported in Figure 4.2.4-1, three-quarters of these households (77%) reported they believed their fire alarms were set off because of cooking. A small number of households (13%) thought low battery was the reason for their smoke alarms going off when there was no fire.

Figure 4.2.4-1: Nuisance alarm occurrence and possible causes

% of households …	
Smoke alarm went off when no fire (nuisance alarm) in last 12 months	**42**
% who said alarm went off possibly due to …	
Cooking	**77**
Low battery	**13**
Other	**9**
Steam from bathroom	**6**
No apparent reason	**4**
Fireplace	**1**
Tobacco	**1**
Don’t know	**1**

Source: Q17 and 17a. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,046 (nuisance alarm), 389 (reasons). Note: Data is weighted. Percentages in second section are from a select all that apply and do not sum to 100%

While nuisance alarms were common, only 3% of households reported accidental home fires in the past 12 months. Figure 4.2.4-2 summarizes how these 39 households were alerted to the fire. Many were alerted by multiple methods, most commonly they were alerted by their smoke alarm (21 out of 39 households) and by seeing the fire (19 out of 39 households). A few households were made aware of the fire through their other senses, such as by smelling the fire (9 out of 39 households).

Figure 4.2.4-2: Accidental Fires and how households were alerted

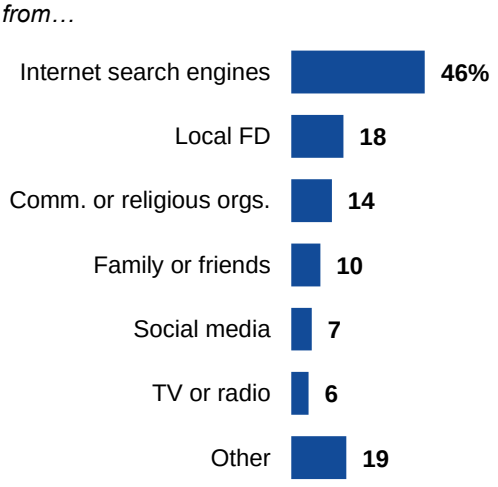
% of households …	**%**
Experienced accidental fire in last 12 months	**3**
Among the 39 households, they were alerted to fire …	**n**
Alerted by smoke alarm	**21**
Saw the fire	**19**
Smelled the fire	**9**
Someone notified me	**2**
Heard the fire	**1**
Felt the heat of the fire	**1**
Don't know	**1**

Source: Q16, 16a, 16b. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,046 (accidental fire), 39 (reasons). Note: First section, data is weighted and is a percentage of "yes". Second section, data is unweighted and shows the n sizes of a select all that apply list.

Overall, 18 out of 39 households did not hear their smoke alarm go off during the accidental fire; however, most noted that not enough smoke reached the smoke alarm to make it sound. Only 5 of these households believed enough smoke made it to the smoke alarm to make it sound, even though the device did not go off.

Households were also asked if they were aware that any friends, relatives, neighbors, or coworkers experienced accidental fires in the past 12 months. Less than 1-in-10 (7%) of households reported they knew someone who experienced an accidental fire in the prior 12 months.

Figure 4.2.4-3: Sources of fire safety information



Source: Q34. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=204. Note: Data is weighted. Percentages are from a select all that apply and do not sum to 100%

In the prior 12 months, 18% of households reported looking for information about either fire safety or CO safety. The most popular place to look for fire safety information was internet search engines like Google† (46%), followed by local fire departments (18%), and community or religious organizations (14%). Among the 19% of households who selected "other" (36 households), 14 out of 36 households (39%) indicated they learned about fire safety from their workplaces.

†Registered trademark of Google LLC, Delaware, USA

4.3. Attitudes, Behavior, and Knowledge of Carbon Monoxide Alarms

Households do feel CO alarms are necessary to homes, but less so compared to smoke alarms. Those who have them installed feel their home is safe. A feeling of safety is the general motivator for having them in the home. There are some gaps in knowledge regarding how much the household feels they know about these types of alarms, when it is best to change them, and the symptoms of CO poisoning. Similar to their responses about smoke alarms, households feel the alarms they have are working but they either do not test them or do not test them very often. Sources used to find information about CO safety were referenced at about the same rate as sources used to obtain fire safety information.

4.3.1 Beliefs About Current Safety & Necessity for Their Home

Figure 4.3.1-1: Household views on CO alarms

% of households who say …	
How necessary is it to have a CO alarm installed in your home?	
5 - Extremely Necessary	**66**
4	**11**
3	**11**
2	**3**
1 - Not at all necessary	**3**
Don't Know	**7**
	100%
Home is ___ with current CO alarms	
Net: Very/mostly safe	**84**
Very safe	*55*
Mostly safe	*29*
Moderately safe	**7**
Net: Slightly/not at all safe	**4**
Slightly safe	*3*
Not at all safe	*1*
Don't know	**5**
	100%

Source: Q27 and Q20. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,060 (necessary scale), 583 (CO safety).
Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

As shown in Figure 4.3.1-1, most households placed do see the necessity of having CO alarms installed in the home, including two-thirds (66%) who affirm they are “extremely necessary.” Notably, 22% of households appraise the necessity of CO to be on the higher side (3 or 4 out of 5) but not of the highest necessity. More than 1-in-10 (13%) either rate it very low (a 1 or 2 out of 5) or don’t know/are unsure what the necessity would be.

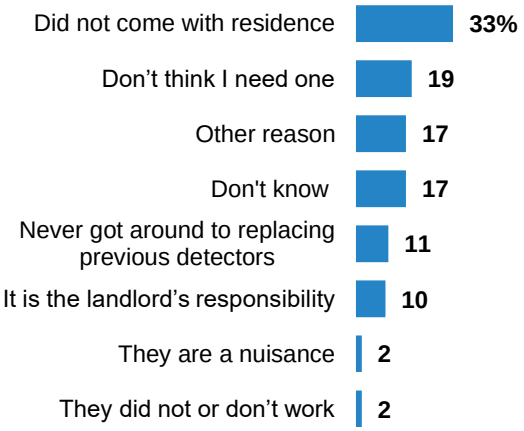
Most (84%) households with CO alarms felt “very” or “mostly” safe with their current CO alarms, including 55% who said they felt “very” safe. Only a small subset of households (4%) believed their homes were either “slightly” or “not at all” safe with their current CO alarms, and 5% of households did not know.

As shown in Figure 4.3.1-2, among those who do not have a CO alarm in their home, one-third (33%) claimed that this was because it did not come with their residence. Strikingly, one-in-five (19%) attributed not having a CO alarm because they did not think they needed one, which demonstrates a lack of awareness about CO home safety.

A large portion of respondents (17%) attributed it to another reason, such as a lack of awareness about the necessity or use of these devices, having not thought about it or not knowing enough about them, while others expressed neglect and forgetfulness. A few others admitted they simply had not gotten around to purchasing or installing a CO alarm. Others also perceived the CO alarms as unnecessary because they lacked gas appliances or believed their homes were not at risk.

Figure 4.3.1-2: Household reasons for not having CO alarms

% of households who do not have a carbon monoxide alarm installed because…



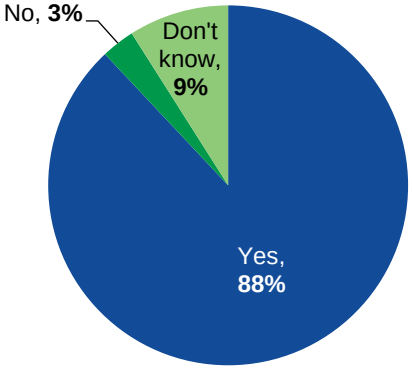
Source: Q28. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=471. Note: Data is weighted. Percentages are from a select all that apply and do not sum to 100%.

Among renters (n=215), 20% believed it was the landlord's responsibility to provide an alarm. This amounts to a reason for 10% of all of those without a CO alarm.

As reported in Figure 4.3.1-3, nearly nine-in-ten (88%) households with CO alarms believed their CO alarms were working; only 3% thought that they were not working, while 9% were unsure. Among the 3% of respondents (n=22) who assumed they were not working, some explained that the batteries are not working and have yet to be replaced or that they "did not get around

Figure 4.3.1-3: Most households believe their CO alarms work

Do you think most or all of your carbon monoxide alarm(s) are working?



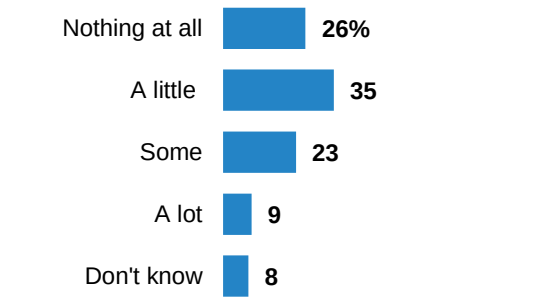
Source: Q24. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=543. Note: Data is weighted. Percentages may not total to 100% due to rounding.

to fixing it." Concerningly, a few either said that they "disconnected it" or "removed the battery". Two respondents expressed that their alarms were old, and therefore, likely not working. No one said that their CO alarm did not work because of a lack of knowledge or resources, such as money to purchase a new one.

4.3.2 Knowledge of CO Alarms

Regarding Figure 4.3.2-1, the majority (61%) of households believe they have little to no knowledge about CO alarms, including one quarter (26%) who have no knowledge at all. Households were most likely to report having only "a little" knowledge of CO alarms (35%) compared to just 9% who reported having "a lot" of knowledge about such devices. Households without a CO alarm were more likely to know "nothing" or "a little" compared to households with a CO alarm (69% vs. 56%, respectively), with twice as many knowing "nothing" (36% vs. 18%).

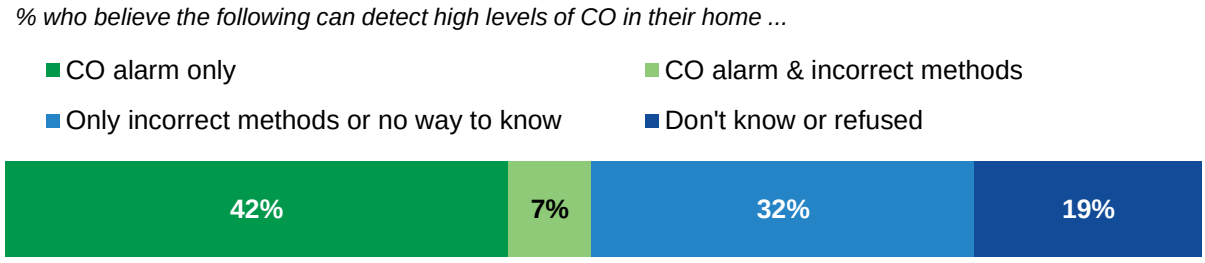
Figure 4.3.2-1: Households knowledge of CO alarms



Source: Q22. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,060. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

As summarized in Figure 4.3.2-2, when provided the opportunity to name any methods of detecting high levels of CO in their homes, slightly less than half (49%) either only stated the correct answer of CO alarms (42%), or stated CO alarms along with an incorrect answer, such as detecting CO through one of senses (7%). Overall, 15% of households did not believe there is any way to know if CO is present in their

Figure 4.3.2-2: Knowledge on what can detect high CO levels: CO alarm vs. other methods



Source: Q21. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,060. Note: Data is weighted. Percentages may not sum to 100% due to rounding. Total CO alarm selection adds to 49%, compared to 48% in Figure 4.3.2-3 due to rounding.

homes. As with perceived knowledge about CO alarms, a 60%-point gap disparity is found based on presence of these devices in the household. Three-quarters (77%) of households with CO alarms mentioned that a CO alarm was needed to detect high levels of CO compared to only 13% of households without CO alarms that said the same.

As Figure 4.3.2-3 highlights, households were more likely to think there weas no way to know if CO was present or didn't know of a way to detect it than think it could be detected through a sense, like smelling it. It is possible that "feel it" could have selected if a respondent described "feeling bad" from being exposed; however, these responses were mostly covered in the 4% of the households who selected "other." Those households usually described negative health effects, such as headaches or sleepiness, which alert them of high CO levels. A few others also mentioned that they would notice issues with their pet feeling ill.

On other measures of CO alarm awareness, as summarized in Figure 4.3.2-4, three-quarters of households (73%) said that they know how to install a CO alarm, and a similar proportion (73%) said they know how to maintain a CO alarm in good working order. Still, this leaves one-quarter of households unable or unsure how to conduct these tasks.

Figure 4.3.2-3: Knowledge on what can/how to detect high CO levels

How would you know if high levels of carbon monoxide (CO) were present in your home?	
% of households who say …	
CO Alarm	**48**
There is no way to know if CO is present	**15**
Don't know	**19**
Can smell it	**12**
Can feel it	**9**
Can taste it	**2**
Other	**4**

Source: Q21. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=1,060. Note: Data is weighted. Percentages are from a select all that apply list and do not sum to 100%. Total CO alarm selection adds to 48%, compared to 49% (42% + 7%) in Figure 4.3.2-2 due to rounding.

Figure 4.3.2-4: Knowledge about CO alarms

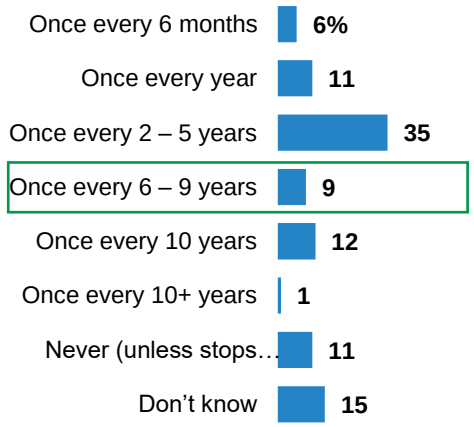
Households were confident in how to install and maintain a CO alarm

% of households saying that they know …	
How to install a CO alarm	
Yes	**73**
No	**27**
Unsure	**1**
	100%
How to maintain a CO alarm in good working order	
Yes	**73**
No	**24**
Unsure	**3**
	100%

Source: Q31. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=545. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

As shown in Figure 4.3.2-5, when households were asked how often they believe CO alarms need to be replaced, a quarter (25%) selected a timeframe longer than recommended, with nearly half of those (11%) stating that it never needs replacement unless it stops working. Additionally, 15% of households admit to not knowing the replacement timeframe for these devices. The majority (61%) selected either the correct time range or a time sooner; this includes 35% who selected once every 2 – 5 years, and 9% who selected the closest correct range of 6 – 9 years. CO alarms are most commonly recommended to be replaced every 7 years.

Figure 4.3.2-5: Knowledge of when to replace CO alarms



Source: Q26. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=543. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

4.3.3 Behaviors Regarding CO Alarms

When households with CO alarms were asked to explain why they have a CO alarm, as displayed in Figure 4.3.3-1, half (47%) said they have them because it makes them feel safe, expressing how they were more than just intellectually but also emotionally driven to this decision.

Figure 4.3.3-1: Reasons for having CO alarm

% of households who say …	
It makes me feel safe	**47**
It came with the residence	**29**
It is helpful in detecting carbon monoxide	**26**
It is required by law	**16**
I own generators/ fuel-burning appliances	**9**
Other	**8**
Don't know	**2**

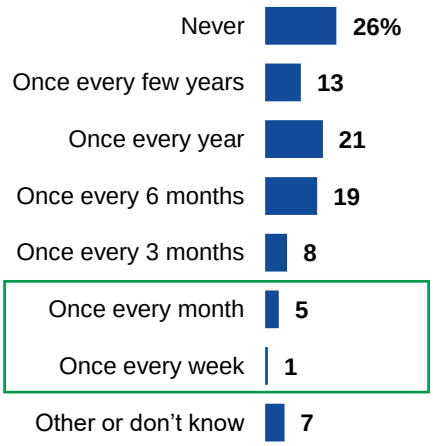
Source: Q25. CPSC SCOA Survey, Jan 1, 2019 - May 30, 2019; Mar 23, 2021 - Feb 16, 2024. N=545. Note: Data is weighted. Percentages are from a select all that apply list and do not sum to 100%.

On the other hand, others mentioned more matter-of-fact reasons. A quarter (26%) of households with CO alarms specified the more logical reasoning behind the decision: that having a CO alarm is helpful in detecting CO. On a similar note, 16% mention having a CO alarm because it is required by law. Three-in-ten (29%) households did admit that they have CO alarms because it came with their residences. Finally, the 8% of households who selected "other" reiterated a desire for safety both generally and some specifically mentioning safety regarding to their fuel-burning appliances.

When asked how often they use the test button to test the CO alarms in their homes,

only 6% of households test their CO alarms within the recommended frequency – either once a month (5%) or more frequently said (1%). Notably, one quarter (26%) said that they have never done so. Among the 2% of households who selected "other," four specified that they only use the test button when changing batteries or when it beeps. This is summarized in Figure 4.3.3-2.

Figure 4.3.3-2: Testing frequency of CO alarms



Source: Q23. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=543. Note: Data is weighted. Percentages read down and may not total to 100% due to rounding.

The one-quarter (26%) of households who have CO alarms but have never tested them were asked to explain in their own words why they have not done so. Among the detailed responses, several key themes emerged: a lack of awareness, forgetfulness, perceived unimportance, accessibility issues, and a diffusion of responsibility (e.g., building maintenance will do it).

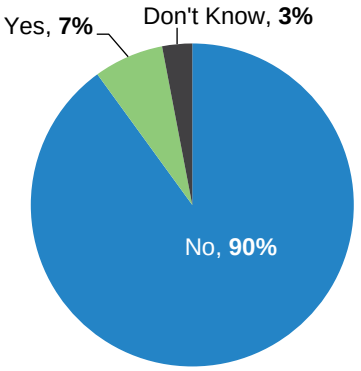
A notable 33 respondents indicated a lack of awareness or knowledge about carbon monoxide alarms, with responses such as "Didn't know how" and "Didn't know you had to." Neglect and forgetfulness were cited by seven respondents, exemplified by comments like "Forgot" and "Didn't get around to it." Additionally, seven respondents perceived testing the alarm as unimportant, using phrases such as "Not necessary" and "Not a priority." Accessibility issues, including physical barriers to testing, were mentioned by four respondents, with statements like "Can't reach." Lastly, four respondents relied on others to test their alarms, indicated by responses like "Complex checks them" and "Housing does it." A few other responses included just moving in, not liking the loud sounds, trusting that the battery is working correctly, and a few that did not have any specific reason at all. This analysis highlights the need for increased awareness and education on the importance of regularly testing CO alarms, as well as making these devices more user-friendly to encourage routine testing.

4.3.4 Carbon Monoxide Incident History

From all sources, whether nuisance alarms or safety incidents, households have far fewer incidents of CO alarms sounding compared to smoke alarms. Only a small share of households (7%) reported that their CO alarms have gone off in the last 12 months. Of those households who had their CO alarms sound, from the independent accounts of participants, 10 ventilated their homes, eight removed the battery, six reset the CO alarms, six called the fire department, five unplugged or disconnected the CO alarms, and three left the house. The vast majority (41 households) did not remember how they reacted. Most of the households (96%) did not know anyone who had experienced a CO incident.

Figure 4.3.4-1: CO alarm function

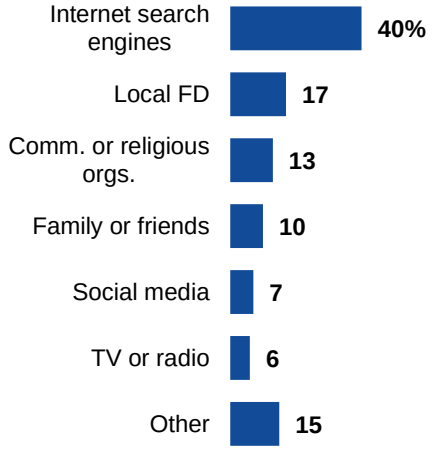
In the past 12 months, has your carbon monoxide alarm(s) ever gone off, other than when being tested?



Source: Q30. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=543. Note: Data is weighted. Percentages may not sum to 100% due to rounding.

Figure 4.3.4-2: Sources of CO safety information

% of households who obtain CO safety information from…



Source: Q35. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=204. Note: Data is weighted. Percentages are from a select all that apply and do not sum to 100%

On sources of information about either fire safety or CO safety, only 18% of households said that they looked for this news or information. Among this 18% of households, internet resources (40%), contacts with a local fire department (17%), and community or religious organizations (13%) were reported as the most common sources of information about CO alarms and/or safety. Few households obtained CO information from more casual social sources such as family or friends (10%), social media (7%) or TV news/radio (6%). Among the 15% of households (34 households) who selected “other”, 16 of 34 households specified their work as a source of CO safety information.

4.4 Household Characteristics to Manage Fire/CO Risk

Household age, type, years lives in home, ownership status, presence of fuel-burning appliances, presence of a garage and its use, cooking frequency, and certain health characteristics of residents are important aspects of gauging fire and CO risk.

4.4.1 Composition of Sampled Homes

Figure 4.4.1-1: Home characteristics

% of households …	
Year structure was built	
Before 1960	**22**
Between 1960 and 1969	**9**
Between 1970 and 1979	**12**
Between 1980 and 1989	**11**
Between 1990 and 1999	**8**
Between 2000 and 2009	**9**
2010 or later	**8**
Do not know	**22**
	100%
Type of home/structure	
Detached single-family homes	**71**
Attached single-family homes	**14**
Apartment/Condo	**10**
Other	**5**
	100%

Source: Q3, S1. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,060. Note: Data is unweighted. Percentages read down and may not total to 100% due to rounding.

Figure 4.4.1-2: Years lived in and ownership

% of households …	
Years lived in apartment/house	
Less than 1 year	**8**
1 – 9 years	**55**
10 – 19 years	**15**
20 – 29 years	**10**
30 – 39 years	**6**
40 – 49 years	**3**
50 years or more	**2**
Do not know	**1**
	100%
Ownership status	
Own	**61**
Rent	**39**
	100%

Source: Q2, Q1. CPSC SCOA Survey, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=1,060. Note: Data is unweighted. Percentages read down and may not total to 100% due to rounding.

As shown in Figure 4.4.1-1, most heads of household knew the year the housing/dwelling structure was built, with the majority (54%) built before 1990. Almost one-quarter (22%) of the unweighted sample did not know the age of their home.

In terms of physical structure, the unweighted frequencies of the types of homes surveyed in the study consisted mostly of single-family dwellings detached housing units (71%). Fewer home types were attached single-family housing units such as townhomes or rowhouses (14%). Apartment-style housing units (including condos) were sometimes more difficult to access, but 10% of the sample was made up of this housing type.

The final 5% consisted of other housing types such as mobile or manufactured homes, trailers, or other dwellings such as multi-family units. Note that sometimes field teams encountered sealed buildings, “no trespassing” signs and no soliciting zones, as well as access limitations set by neighborhood associations, making it difficult to recruit sample participants from apartments and condominium complexes in some tracts.

As displayed in Figure 4.4.1-2, nearly two-thirds (63%) of the sample have lived in their homes for under a decade, including 55% who have lived in their home for 1-9 years. Only 11% reported living in their home for 30 years or more. Additionally, the unweighted sample has more heads of household who own vs. rent their home (61% vs. 39%).

Overall, the two variables regarding the housing structure (home age and type) and whether the household is owned or rented were used in the third stage of weighting to correct for imbalances in the sample. See Section 3.3 for more details.

4.4.2 Household Fire and CO Incident Risk Factors

Based on the household characteristics – both physical and behavioral – described by heads of household, some households are at a higher risk than others of a fire or CO incident, including most (88% weighted) single-family attached and detached houses who own fuel-burning appliances (see Figure 4.4.2-1). Overall, 57% of the sample (unweighted) have at least one fuel-burning appliance.

A fuel-burning appliance consists of any appliance that uses gasoline, natural gas, propane, oil, wood pellets, coal, or kerosene. Owning a fuel-burning appliance introduces greater vulnerability to CO poisoning or accidental fire. As shown in Figure 4.4.2-1, the most common fuel-burning appliances are kitchen appliances (60%), followed by water heaters (56%), and furnaces or boilers (40%). Nearly a quarter of households reported owning a gas dryer (22%) and fewer than two-in-ten reported owning a wood or pellet fireplace or stove (17%), charcoal grill (13%), gas powered generator (8%), or other types of fuel-burning appliance (5%).

A garage is a common location in which U.S. households store flammable substances or can be the source of CO (e.g., from a car, lawn mower, or fuel-burning appliance such as a gas dryer). Approximately half (52% unweighted) of households have an attached garage. The majority of respondents with an attached garage said it is used primarily to store a vehicle (65%), while only 8% of respondents indicated there is

Figure 4.4.2-1: Fuel-burning appliances in detached single-family homes

88% of single-family households own a fuel-burning appliance

% of single-family households that own fuel-burning…	
Kitchen appliances	**60**
Water heater	**56**
Furnace or boiler	**40**
Gas dryer	**22**
Wood or pellet fireplace/stove	**17**
Charcoal grill	**13**
Gas powered generator	**8**
Other	**5**
Does not own any	**12**

Source: Q4. CPSC SCOA Survey, Jan 1, 2019 – Sept 16, 2023. N=1,002. Note: Data is weighted. Percentages are from a select all that apply list and do not add to 100%. “Does not own any” is exclusive.

a fuel burning appliance (e.g., furnace, water heater, grill, etc.) in their attached garage.

When it comes to everyday household risk of a fire or CO accident, unsurprisingly, daily household cooking is a common practice. Seven-in-ten households (72%) said that they use an oven or stove to cook meals every day, while only 21% of households reported doing so a few times per week; the remaining 7% do so less frequently.

4.4.3 Household Health Characteristics and Behaviors

The health characteristics and behaviors of those who live in the household impact their vulnerability during a fire or CO event. Households that include persons with disabilities, such as hearing impairments (9% weighted in our sample, 8% unweighted) or a “physical, mental or other health condition that prevents them from conducting day to day activities” (16% weighted, 14% unweighted), may be especially vulnerable during an event. A behavior that may increase the risk of a fire is the smoking of cigarettes, cigars, hookahs, or pipes within the home. About one-quarter (26% weighted, 2% unweighted) of households have someone in their home who smokes one of these products.

5. Non-Response Analysis

Understanding non-response is crucial for this study as it helps identify potential biases present in the analysis, as well as some of the reasons for the challenges faced during the data collection process. By analyzing the characteristics of individuals who did not participate in our study, we can gain insights into specific demographic and/or regional factors that may influence survey participation.

We tracked households that were contacted but declined to participate. For each non-responding household, the reason given or observed for not doing the survey and the house type and location was catalogued. If a non-respondent was met at the door several demographics (approximate based on observation) were also recorded. In some cases, demographic data did not get recorded. The following information was included in the non-response form:

- Main reason for non-participation,
- Type of Home: Single-family home, apartment, mobile home, etc.,
- Age: Age group category,
- Gender,
- Race/Ethnicity.

Figure 5-1: Distributions of main reasons for non-participation

% of households not participating because …	
Didn't want to do the survey	**51**
Health reasons - COVID[1]	**21**
No consent (questions or alarm testing)	**8**
Busy at the moment	**7**
Not in home (spoke through doorbell speaker)	**4**
Language barrier	**4**
Said their alarms work	**2**
Failed COVID screening questions[2]	**1**
Presence of big dogs	**0.3**
Baby-related issues	**0.2**
Work	**0.1**
Aggressive response	**0.1**
Sick	**<0.1**
Other	**1.1**
	100%

Source: CPSC SCOA Screen Out Capture Form, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=4,773.
Note: Percentages read down and may not sum to 100% due to rounding.
1 This reason for non-participation was added after restarting.
2 This reason for non-participation was added after restarting.

The main reasons for non-participation included a general reluctance to participate (51%), and health concerns related to COVID-19 (21%), which corresponds to an impact in the increase of efforts to be able to reach the target population and achieve the needed participation for the study. Some other relevant reasons included people not giving consent, being too busy, language barrier, or the head of household not being at home (this could have been due to only a child being home or an adult who answered the door believed someone else in the household should take the survey). Other

factors such as being aggressive/confrontational, specifically stating they are busy with work or a baby or being sick were rare reasons for not participating.

In addition, the socio-demographic distribution of non-respondents allows us to identify patterns in non-participation. The data outlined in Figure 5-2 indicates that gender does not significantly influence non-response rates, as the proportions of male and female non-respondents are similar. Since we looked to survey the head of the household, the participant needed to be at least 18 years old and was more likely to skew older rather than younger. Twice as many 35-64-year-olds declined to participate (54%) compared to 18-34-year-olds (24%) and those 65 and older (20%), which is comparable to proportions of the U.S. population (40% vs. 21% and 16%, respectively).

Figure 5-2: Demographic distribution for non-participation by gender and age compared to U.S. population

% who are …	**Among All**	**Among Reported**	**U.S. Population**
Gender			
Male	29	52	49
Female	32	47	51
Other	0.2	0.3	--
Not Reported	39	--	--
	100%	100%	100%
Age group			
Under 18	0.9	2	23
18-34	13	24	21
35-64	29	54	40
65 or older	11	20	16
Not Reported	46	--	--
	100%	100%	100%

Source: CPSC SCOA Screen Out Capture Form, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=4,773 (all), N=2,890 (gender reported), N=2,565 (age group reported). Note: Percentages read down per demographic section and may not add to 100% due to rounding. U.S. population percentages based on 2013-2017 ACS 5-year estimates.

The need to implement a weighting schema is underscored by the demographic distribution discrepancies observed between the reached population, participants, non-participants, and the overall population by race and housing type. As shown in Figure 5-3, while the overall population is predominantly white (78%), the reached population (among reported) and participants included significantly lower proportions of white individuals (62% and 59%, respectively). Asian households were reached at a much higher level than the overall population (17% vs. 5%), but only 5% of the final sample consisted of Asian respondents. This demonstrates an overall much lower cooperation rate among this group. Conversely, other racial groups such as Black or African American were overrepresented among participants compared to the population (21% vs. 13%), demonstrating that less effort was needed to gain cooperation for those households.

Similarly, the distribution of housing types among participants did not match the population distribution, indicating potential biases. Analyzing data on the type of home reveals that most houses recruited consisted of single-family detached homes (92% among reported housing types), while they only make up 63% of housing types in the U.S. Likewise, apartments and condos make up 11% of our final sample while they are one-quarter (24%) of households in the U.S. This is partly due to the barriers of entering those communities. Conversely, other types of households such as trailers, RVs, mobile homes, or other manufactured housing types posed the least difficulty for participation in the survey, as they make up the smallest portion of housing types contacted (1%) but nearly all agreed to participate and made up 4% of our sample. Implementing a weighting schema helped to correct these imbalances, ensuring that the survey results more accurately reflect the target population.

Figure 5-3: Demographic distribution by race and type of home compared to U.S. population

% who were …	**Total Contacted**	**Participants**	**Non-Participants (reported)**	**U.S. Population**
Race				
White	32	59	62	78
Asian	7	5	17	5
Black or African American	8	21	12	14
Some Other Race	5	13	9	1
American Indian or Alaska Native	0	3	0.3	1
Native Hawaiian or other Pacific Islander	1	0	0.3	<0.4
Not reported	46	-	-	-
	100%	100%	100%	100%
Type of Home				
Single-family detached housing	83	71	92	63
Apartment/Condo	5	11	4	24
Single-family attached housing (e.g., townhouse, rowhouse)	5	13	3	7
Mobile/Other manufactured housing/ Trailer/RV	1	4	1	6
Not reported	6	-	-	-
	100%	100%	100%	100%

Source: CPSC SCOA Screen Out Capture Form, Jan. 1, 2019 - May 30, 2019; Mar. 23, 2021 – Feb. 16, 2024. N=5,782 (total), N=1,060 (participants), N=4,773 (non-participants, reported). Note: Percentages read down per demographic section and may not add to 100% due to rounding. U.S. population percentages based on 2013-2017 ACS 5-year estimates.

6. Research Benefits, Limitations, Context, and Future Directions

6.1 Benefits

The study employed a multi-stage sampling approach, ensuring a randomized sample that included a wide range of metropolitan (metro) areas across the United States. This design allowed for the inclusion of all metro areas available for sampling, thus providing a comprehensive overview of urban residential settings. Additionally, the inclusion of non-metro tracts in proximity to the selected metro areas ensured the representation of both urban and rural households, enhancing the study's generalizability to the entire U.S. population, while still ensuring practical sampling for field teams.

Moreover, the sampling methodology was designed to be representative of U.S. households, rather than focusing on specific high-risk fire areas or low socioeconomic status (SES) regions. This approach ensures that the findings are broadly applicable and reflective of the general population. As a result, the insights and conclusions derived from this study can be confidently applied to a wide range of residential contexts across the country.

In addition, various types of household structures were included in the study, not just single-family homes. This inclusivity ensured that the data captured the experiences and practices related to smoke and CO alarms in different living arrangements, such as multi-family units, apartments, and other residential housing types.

By conducting in-home research and gathering primary source data directly from respondents, the study ensured the accuracy and reliability of the information collected. This also streamlines recruitment and screening into the study and conducting the interview. This hands-on approach allowed for real-time observation and testing of smoke and CO alarms within the respondents' homes using the correct tools, providing a level of detail and validity that is often lacking in studies relying on self-reported questionnaires or third-party data sources. For example, documentation of alarms by interviewers confirmed the type of alarms present, which found that due to finding combination smoke/CO alarms, slightly more households had CO alarms than initially reported by participants. Additionally, strict quality controls measures ensured that interviewers were uniformly trained to provide consistent data inputs.

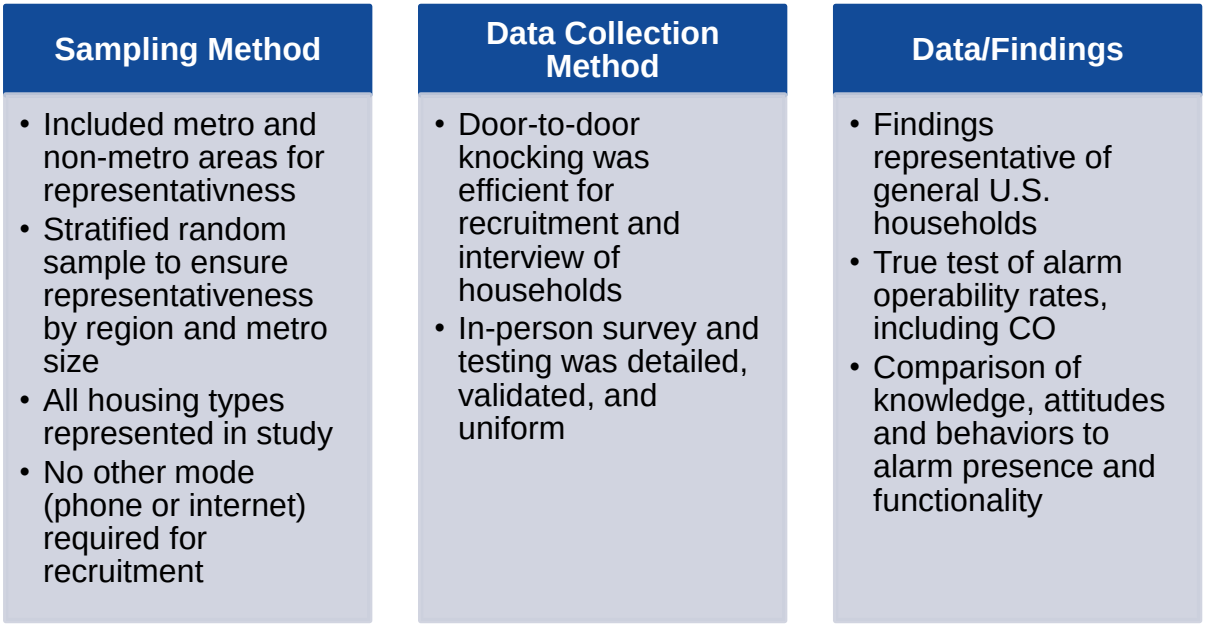
The in-home data collection methodology provided an in-depth and practical wasy to survey the actual usage, maintenance, and operability of smoke and CO alarms in real-world settings. This approach facilitated the collection of contextual information and nuanced insights

that are crucial for developing effective safety standards, guidelines, and public education programs aimed at improving household safety.

Gilbert (2008)[7] posited that "Previous estimates of the number of homes with smoke alarms based on telephone surveys appear biased upward. This is most likely in part because smoke alarm installation likely correlates with having a phone." In-person data collection possibly eliminates a bias based on phone (or even internet) connection required to do other types of data collection.

By leveraging a randomized and representative sampling strategy, focusing on primary source data collected in-person, and ensuring the inclusion of diverse household structures, this study offers valuable and generalizable insights into the functionality and operability of smoke and CO alarms in U.S. households. The findings contribute to a robust understanding of current safety practices and inform future efforts to enhance residential fire and CO safety nationwide.

Figure 6.1-1: Summary of benefits based on this methodology



[7] [7] Gilbert, S. (2018). *Estimating Smoke Alarm Effectiveness and Spatial Distribution in Homes*. Nvlpubs. Retrieved August 4, 2024, from https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.2020.pdf

6.2 Limitations

All research studies are subjected to biases and limitations. The following is a summary of the limitations of this methodology and data collection strategy.

- **Limited Number of Alarms Tested**: The number of alarms tested in each household was constrained by the set maximum duration of the survey and where respondents would allow interviewers to be in the home. These constraints resulted in not all alarms being tested for each household.
- **Partial Home Inspection**: The study did not conduct a full home inspection, meaning not all alarms in a household were counted and/or tested. This partial inspection limits the comprehensiveness of the data to provide information about the total number of alarms, their location, functionality etc. in every home.
- **Reliance on Householder Perception**: Since the study is based on survey responses, some questions rely on the perception and self-reporting of the householders. This reliance on personal perception can introduce biases or inaccuracies in the data, as respondents' understanding and recall may vary.
- **Bias in Home/Area Selection**: While tracts were randomly selected and only replaced if extremely unsafe or too difficult to field, this introduces some bias with interviewers not being able to field in certain areas. Even within tracts that were not replaced, some interview teams may have fielded certain neighborhoods over others due to safety concerns, available time, or ease of access. While teams were instructed to recruit from a variety of housing types and neighborhoods within each tract, selection bias was still possible.

Overall, these limitations do not prevent these findings from being generalizable to U.S. households as the study was designed to be. It is important to recall all point estimates have a margin of error (typically +/- 3% points), and that no single study can provide definitive answers for such major questions within a research domain.

6.3 Research Context, Comparison, and Implications

The 1994 report’s core goal was understanding national operability rates of smoke alarms. This report looked to update those estimates; therefore, followed national random sampling procedures to focus on representing the general population. In addition to updating

estimates on smoke alarm operability rates, this new research provided national estimates for presence and operability rates of CO alarms in general U.S. households.

Other research in this domain has primarily focused on self-reported questionnaires and less on in-person research. Also, there have been many sampling methods, including random digit dial (phone), stratified sampling (mail and phone), and convenience sampling. These studies are still important pieces of research but are not one-to-one comparisons to this study.

Examples of other research in the domain of smoke and CO presence and functionality/operability and how they differ from this study is as follows:

- CPSC's 2004-2005 national survey used random digit dial to produce a nationally representative sample of U.S. households and administer the questionnaire over the phone. Smoke alarm estimates were estimated at 97%. The survey and analysis also strongly focused on fires in households.[8]
    - This is one of many phone surveys used to ask about the presence of smoke alarms in the home. Asking about CO alarm presence has become more popular in time, and our study asks about both. Additionally, this research was not able to provide operability estimates for smoke alarms overall, but only in relation to how it performed during a fire in the household. Our study tests all alarms, regardless if the household experienced a fire.
- A 2012 study in North Carolina used a stratified sample to randomly select households in Mecklenburg County. Field teams were sent to recruit and conduct a short interview about CO presence and awareness of a local CO ordinance. Operability testing was only conducted if households gave permission for interviewers to inspect the devices, which not all did. Ultimately, 68% reported having a working CO alarm. Only a small portion of households agreed to

[8] Green, M. A., Andres, C. (2009). *2004-2005 National Sample Survey of Unreported Residential Fires*. CPSC. Retrieved August 4, 2024, from https://www.cpsc.gov/s3fs-public/UnreportedResidentialFires.pdf

inspection/testing, where 75% of these homes had working alarms.[9]

  - This study is methodologically most similar to our study, but the random selection of households led to difficulties fielding where 20% of locations were invalid and other locations were difficult to access. Our study presented a more efficient method where tracts were randomly selected, and households/neighborhoods were randomly walked to recruit participants. Additionally, this study focused only on CO alarms and did not make testing them a requirement for participation but rather an additional request later in the interview, which led to a small sub-sample that did allow for proper estimation of operability rates of these devices. Our study required participants to consent to alarm testing of CO and smoke alarms. Overall, this study had a smaller sample size and focused on a smaller geographic area and is not suitable for making estimates about all U.S. households.

- A functional test of smoke alarms over 42 months to determine true operability rate of devices (chemical smoke spray test vs. the test button). This took place in 691 homes which were part of another longitudinal study in a "rural Iowa county" and sampled over 3,000 alarms.[10]

  - This research focused strongly on the devices themselves rather than in relation to the household, which was selected using a convenience sample. Results are not generalizable to all U.S. households but provides vital information about smoke alarm technology.

- Multiple secondary data sources were used to model estimated smoke alarm presence and impact on reducing house fire causalities. Data was sourced from the National Fire Incident Reporting System (NFIRS) of the top 50 fire departments with the most single-family-residence fires, the American Housing

[9] Iqbal, Shahed; Clower, Jacquelyn H.; Saha, Shubhayu; Boehmer, Tegan K.; Mattson, Christine; Yip, Fuyuen Y.; Cobb, Robert D.; Flanders, W. D.. (2012). Residential Carbon Monoxide Alarm Prevalence and Ordinance Awareness. Journal of Public Health Management and Practice, 18(3), 272–278. doi:10.1097/phh.0b013e318221b1d1

[10] Peek-Asa, Corinne; Yang, Jingzhen; Hamann, Cara; Young, Tracy. (2011). Smoke Alarm Tests May Not Adequately Indicate Smoke Alarm Function. Journal of Burn Care & Research, 32(4), e135–e139. doi:10.1097/bcr.0b013e3182223f2e

Survey (AHS), the American Community Survey (ACS) summary tables, the American Community Survey Public Use Microdata Sample (PUMS), and several CPSC surveys. Smoke alarm installation was estimated at 92%.[11]

  - This research relied on third-party data and modeling, including samples from a specialized population to develop estimates. This study suggested that phone and smoke alarm prevalence are correlated, which still makes it not comparable to our in-person data collection.

- Another study also combined two secondary data sources from Version 5.0 of the U.S. Fire Administration's National Fire Incident Reporting System and survey data from NFPA's annual fire department survey to estimate presence and operational status of smoke alarms in U.S. homes. Estimated smoke alarm presence was 97% and operational rate was 83%.[12]

  - This study combined two types of data sources to create estimates, using data from homes that had fires. The estimates in this study are close to ones in our study but are less able to make generalizable estimates to the U.S. population as the sample is biased towards homes that had a fire.

All research findings on this topic should be considered in the context of:

- **Population of interest**: geographic boundaries such as county, state, or MSA or type of household such as ones in a high-risk fire area or low-SES communities.
- **Sampling method**: stratification by housing type, geography, oversample by populations of interest, random or convenience sample.
- **Data collection mode**: phone (random digit dial vs. purchased list), mail, mixed-mode, in-person, use of secondary data sources.

All these factors and others contextualize findings and estimates to be either specific to a certain group or more generalizable. All research in this domain is essential to ensuring that

[11] Gilbert, S. (2018). *Estimating Smoke Alarm Effectiveness and Spatial Distribution in Homes*. Nvlpubs. Retrieved August 4, 2024, from https://nvlpubs.nist.gov/nistpubs/TechnicalNotes/NIST.TN.2020.pdf
[12] Marty Ahrens. (2011). Smoke Alarm Presence and Performance in U.S. Home Fires. , 47(3), 699–720. doi:10.1007/s10694-010-0185-6

both household behavior and the devices themselves are optimized to save lives.

6.4 Future Research Directions

This report provides a strong foundation for future research directions with the current data and for new studies moving forwards.

- **Cross-tabular Analyses and/or Integration with Secondary Data**: This dataset or future research can be enhanced by using demographic and household information for crosstab analyses. Additionally, appending secondary data such as fire incident reports, other demographics or housing characteristics, or tract information can be used for more comprehensive analyses of risk factors associated with smoke and CO alarm presence and functionality.
- **Replication of Method Nationally or in Local Municipalities**: The research methodology successfully collected this specialized data in 1,060 households across the country in 250 unique fielding days. This methodology could be redeployed nationally or replicated for other more specialized samples (such as a singular state) to provide operability estimates to those populations.
- **Replication of Method with Modified Survey**: This methodology could be used to conduct in-home surveys that prioritized alarm testing and limited the number of perception, knowledge, and behavior questions. While that information is valuable, future in-home research might focus on a thorough census and operability testing of alarms with questions focusing on total number of alarms, size of home, and total number of floors and rooms.
- **Assessment of Awareness and Functionality**: Investigating the relationship between household awareness of functioning alarms and the occurrence of reported fires will provide insights into whether greater awareness leads to improved safety outcomes. Future studies could examine how well households recognize the operational status of their alarms and how this awareness impacts their responses during fire incidents.
- **Exploration of Technological Impact**: Researching the impact of emerging alarm technologies, such as smart alarms with connectivity features, on household safety practices and perceptions could inform future product development and safety recommendations.

7. Appendices

Appendix A. Detailed Methodology

Three-Stage Sampling Design

EurekaFacts adopted a proportional multi-stage sampling approach to select housing units for the SCOA survey. The full design of the door-to-door methodology consisted of the following steps:

1. At the first stage, a random sample of 24 metropolitan sampling areas (MSAs) was selected as primary sampling units (PSUs) among the 389 MSAs in the U.S., using the 2013-2017 American Community Survey (ACS) 5-year estimates. The sample was stratified first by Census Region (Northeast, South, West, Midwest) and then by population size (those with a population of 1 million or more and those with less than 1 million residents), ensuring the number of PSUs selected for each region was proportional to the number of occupied housing units (OHUs).

2. At the second stage, a random sample of residential census tracts was selected in proportion to the number of OHUs within each of the 24 MSAs selected at the first stage. Also at this stage, an additional random sample of Census tracts within non-MSAs were selected. These tracts were located adjacent to or near each PSU.

3. At the third stage, a random walk door-to-door sampling method[13] was conducted in each Census tract, allowing field interviews to directly recruit respondents from randomly selected OHUs for the in-home survey.

This overall approach made it possible to calculate the probability of selection for each sample unit at every stage by consistently accounting for population size. Consequently, reliable calculations for design effect and sampling error can be made for the whole study. In addition, this approach retains the integrity of a probability-based survey design, where the findings are representative of housing units in the U.S. within a calculable level of precision.

[13] Random walk door-to-door sampling methodology is a simplified cluster sampling method developed by the World Health Organization. For more see: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4894817/, accessed online, March 31, 2020

Based on the 2013-2017 ACS 5-year estimates, the final sample of 24 MSAs included interviews in 213 out of the 73,057 tracts in the U.S. Those 24 MSAs contain a total of 20.6 million occupied housing units, which is 15.2% of all OHUs within the 389 MSAs.

Figure 7A-1: Summary and proportionate sampling of occupied housing units for full and pilot study compared to U.S. MSAs

The full study sampled from 15.2% of occupied housing units out of all OHUs in the 389 U.S. MSAs

	Total U.S.	Full Study	Pilot Study
Sample Size	--	1,060	130
Number of MSAs	389	24	1 (DC)
US Census tracts (MSAs + non-MSAs)	73,057	213	21
Total OHUs represented	135.4 million	20.6 million	2.3 million
Housing unit proportions	(100%)	(15.2%)	(1.7%)

Source: 2013-2017 American Community Survey 5-Year Estimates.

Specific Tract Selection and Quotas

Census tracts were randomly selected for fielding and assigned soft quotas for each MSA in accordance with a proportional distribution based on its size relative to the other MSAs. The tracts in the MSA and their accompanying quotas were determined based on a downloaded list from the Census Bureau website of the 2013-2017 ACS 5-year estimates (retrieved on December 6, 2018).

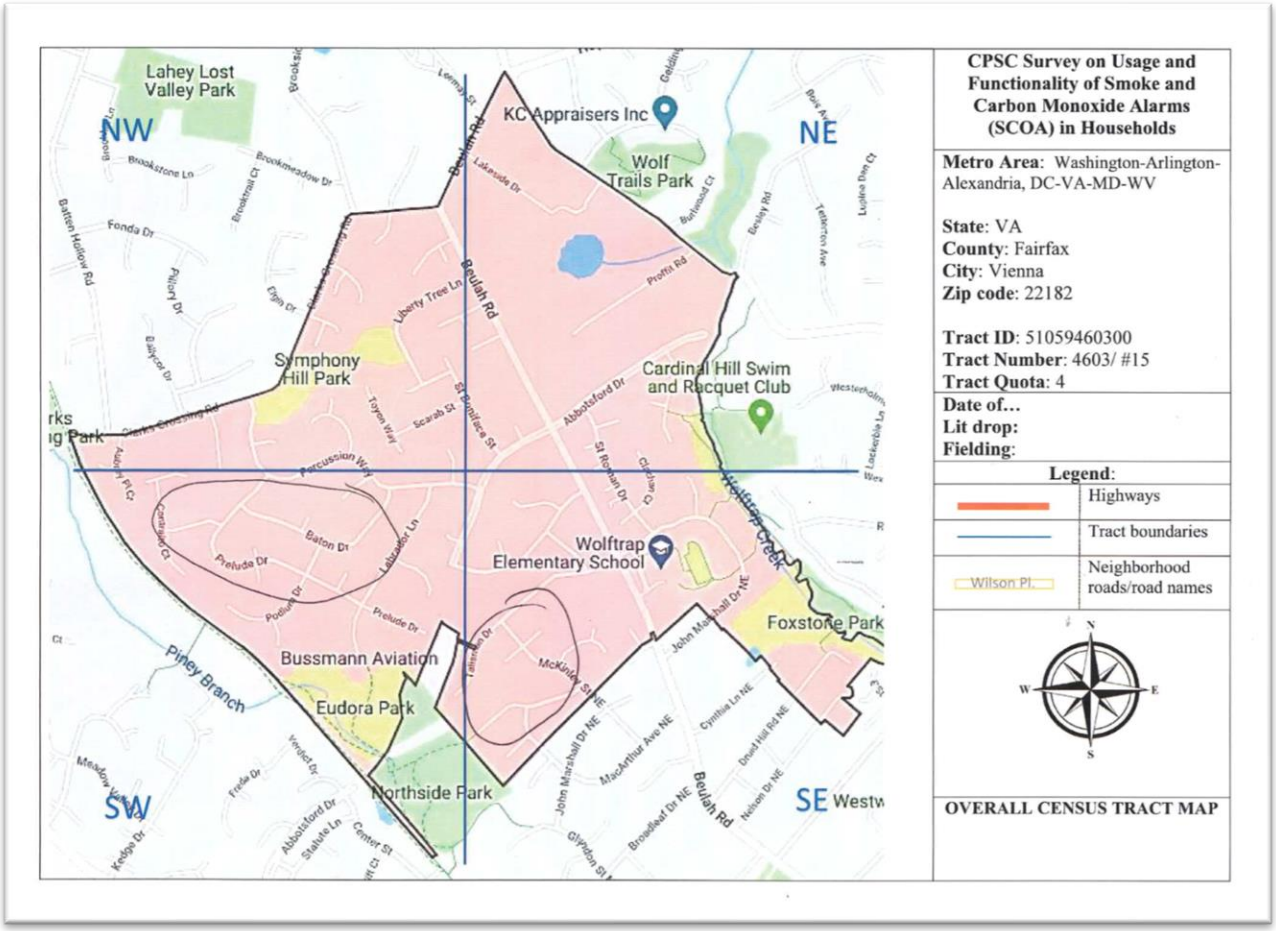
Once the set of tracts was determined, each tract was proportionally assigned estimated/target completes. These “soft” quotas were based on the proportion of OHUs in each tract relative to the sum of all tracts in that MSA divided by the MSA quota. Inclusion of replacement and/or supplementary tracts did not change the quotas for all other tracts. For further details regarding replacing or supplementing tracts, see Appendix D.

Tract Walking Maps and Pre-Notification

Vendors were instructed to ensure a variety of areas within a tract were solicited for participation, whereby tracts were divided into sections and two areas were selected for fielding. The example provided to them is the following: An overall map of the tract could be divided into four sections/quadrants and labeled according to the four intercardinal directions (i.e., NE, SE, NW, and SW). Two quadrants could then be selected for walking where the combination of fielding areas included different housing types (as applicable) and different sections/sub-neighborhoods within a tract.

No matter how the field teams determined the path to walk through a tract, tract maps provided the boundaries and guidelines both for distribution of the pre-notification door hangers and for field teams. EurekaFacts shared online mapping tools with vendors so they could prepare the maps as needed for their teams and direct their teams where to go.

Figure 7A-2: Example of a tract map used in DC pilot

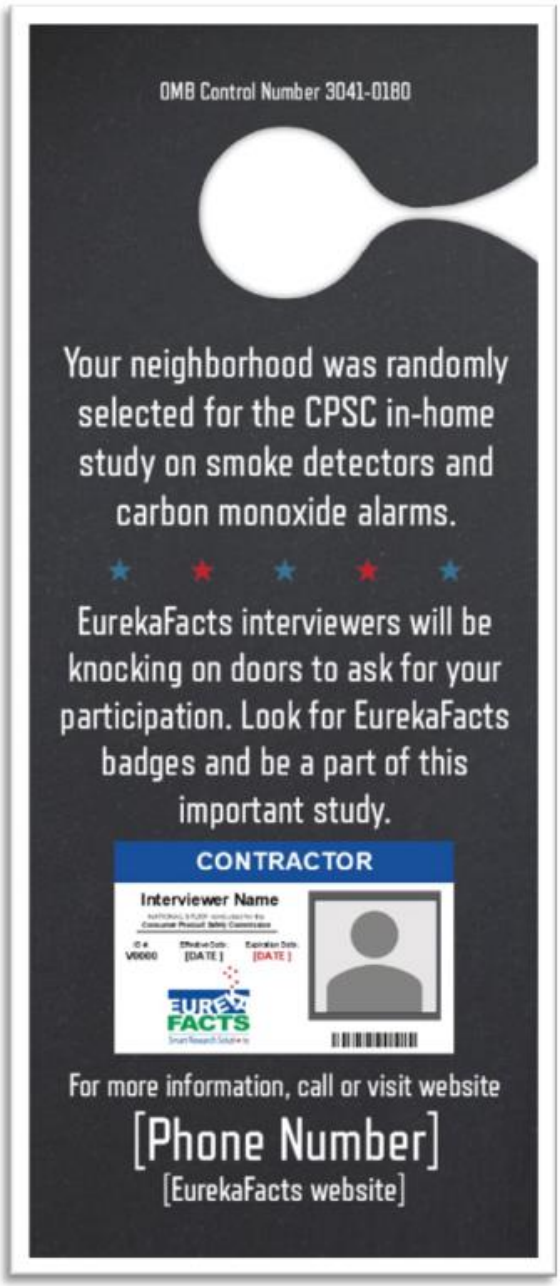


Door hangers were distributed to the selected households in a fielding location to notify neighborhoods and residents of the SCOA survey and that fielding teams would be in their area. Typically, 160 door hangers were hung in each tract, about 80 in each of the two selected quadrants/locations. This was based on the practical number of houses a team could attempt to recruit and thereby ultimately complete three-to-four surveys/interviews in one day. More or less door hangers could be distributed based on quotas or if multiple fielding days were needed.

Door hangers included information about the study and organization conducting the interviews and further contact information to learn more. The following days when they returned to the homes where they previously left door hangers, field teams would show residents one of the door hangers to remind the resident's memory of previously receiving one. The use of the highlighted maps ensured field teams would make contact only at homes that received a door hanger. If all 80 homes in one quadrant were contacted in-person and time remained in the day, field teams would continue trying to recruit other households within the tract. The door hanger was used as a recruitment tool for these households, as they may have some familiarity with them since they were publicly visible in the neighborhood. The door hangers concisely presented information about the study while field teams gave further information about the survey and tried to persuade the head of household to participate

See Figure 7A-3 for a template of the door hangers used for the study. This example uses EurekaFacts information for the DC pilot, but the company name, number, and badge were customized for each field team.

Figure 7A-3: Template SCOA survey door hanger distributed by field teams



Data Collection: Interview Types and Fielding Teams

Due to the importance of direct smoke and CO alarm testing data to the SCOA study, two types of interviews were part of the SCOA survey. Depending on the status of their smoke alarms, respondents were eligible to participate in either the full-length (60 minute) or shortened (20 minute) in-home interview. Residents who had a smoke alarm not connected to a central or security system that would notify the police or fire department were eligible for the full-length in-home interviews. These respondents were asked questions related to their attitudes and knowledge about their smoke and CO alarms and behaviors related to smoke and CO safety; then their smoke and CO alarms were tested for operability. The absence of a security device that notifies first responders allows for direct testing of alarms, removing the liability from fielding teams setting off false alarms to emergency services. Faulty alarms were collected, and new alarms were provided for free. Additionally, new batteries were provided, if needed. Interviews lasted no longer than 60 minutes, and participants were compensated with a $50 gift card for completing the survey. The initial study design included an incentive equal to $25; for the redesign, OMB approved an increase of the allowable incentive to $50.[14]

Respondents who did not have smoke alarms or had smoke alarms connected to a central or security system, were eligible to participate in a shortened version of the survey. This included many of the same survey questions, but without the alarm testing portion. These interviews lasted no longer than 20 minutes and participants received a $10 gift card for their time.

For either the full or shortened survey, a qualified two-member fielding team conducted the recruitment and survey of respondents. Each team member presented themselves professionally, displayed study badges (as shown on the example door hanger), and completed complementary tasks during the data collection procedure. One team member, the interviewer, took the lead on recruiting participants at their door and was responsible for administering the survey questions to the participant. The other team member, the inspector, took the lead on conducting the alarm testing portion of the survey. Both team members were trained in each type of role to support the other as needed.

[14] The initial study design included an incentive equal to $25 for the full-length survey; for the redesign, OMB approved an increase of the allowable incentive to $50. The incentive for the short interview was not changed.

Technology and Confidentiality

Fielding teams used two technology platforms for two distinct data collection efforts. Qualtrics was the primary software utilized for collecting survey data from qualified participants. Additionally, Zoho Forms was used to log contacts that did not result in completed interviews, including cases in which no one was home, or the household did not qualify to participate. This screen-out data was captured to determine the reasons and frequency for non-participation and to ascertain any common characteristics of households that did not want to participate. This information was used later for weighting the sample and performing non-response analysis.

Each field team member used a tablet to record their respective data. Interviewers filled out the interview and housing information in Qualtrics to prepare for a potential interview, and the inspectors filled out corresponding information in Zoho, in case the household did not participate. Once all data was pre-filled, the field team made in-person contact with the household. If the resident was successfully recruited, the interviewer continued data collection in Qualtrics, and the inspector deleted the Zoho case. If no contact was made or recruitment was unsuccessful, the interviewer deleted the Qualtrics entry, and the inspector completed the Zoho form with the reason for non-participation and any demographic information of the resident at the door. This method provided each field team member with an essential task for survey data collection and monitoring sample disposition.

These two technology platforms were selected for their overall functionality, practicality in the field, and data security. Qualtrics and Zoho Forms each have apps allowing for offline data collection for later uploading to cloud accounts. This allows for seamless data collection in unknown locations without concerns about data or Wi-Fi connectivity.[15] To further safeguard participant data, all respondents were assigned a unique identifier (ID) number for tracking and disposition purposes. This ID was not linked to a participant's name or other personally identifiable information (PII).

[15] Qualtrics has FedRAMP authorization, ISO 27001 certification, and FISMA compliance, ensuring data security. Zoho also upholds high standards of organizational and network security to guarantee data is secure, isolated, encrypted, and accessible only to the research team.

Appendix B. Comparison of the Original and Revised Sampling Design

The original, address-based sampling approach consisted of a pre-notification letter, reminder letter, and a telephone recruitment strategy that yielded a significantly lower, and inadequate, response rate and cooperation rate than that of the revised door-to-door sampling method. This comparison is summarized in Figure 7B-1.

During the original phone recruitment method's implementation, 10,480 address records were purchased of OHUs within the randomly selected tracts in North and South Carolina in the Charlotte MSA PSU and New Bern, NC MSA PSU. Potential participants were mailed a pre-notification letter explaining the purpose and objectives of the study, along with the incentives of the study (free alarm testing, replacement batteries and alarms, and a $25 incentive). This was followed by 23,702 phone calls made to participants through a multi-call design strategy. Three-hundred and one (301) households were reached by a calling agent, which means only 2.9% of residents received a follow-up about participation in the study (301 interactions/10,480 notified residents). Only 35 participants completed screening where they scheduled an in-home or over-the-phone interview, which indicated an initial response rate of 1/3rd of 1% (35 screened households/10,480 notified residents= .33%). No households contacted EurekaFacts to participate in the study from only receiving the letter.

Figure 7B-1: Original vs. redesigned methodology comparison and outcomes

Methodology	Fielding dates	Total weeks	Response rate	Cooperation rate
Address-based sampling multi-mode recruitment approach	Jan. 1 - May 30, 2019	23 weeks	.09%	3.0%
Door-to-Door household random walk method sampling approach	Dec. 21, 2019 - Mar. 1, 2020	11 weeks	3.5%	17.4%
Change		*-12 weeks*	*+3.41%*	*+14.4%*

Sources: CPSC SCOA Survey original launch and DC pilot.

All combined efforts resulted in nine total in-home and over-the-phone interviews, a .09% response rate, equivalent to 9/100th of 1% (9 completes out of 10,480 notified residents). Once a participant was reached by an interviewer and screened, the cooperation rate was 3.0% (9 completes out of 301 interactions).

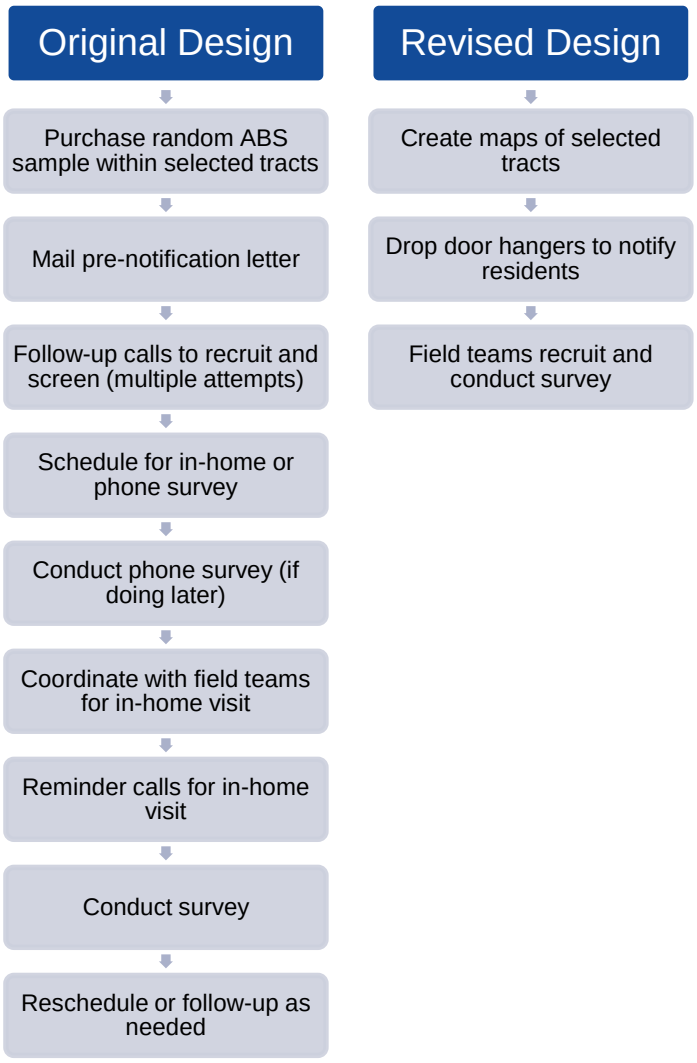
EurekaFacts collected nine cases from January 1, 2019, to May 30, 2019. After a redesign (door-to-door methodology using door hangers), the pilot ran from December 21, 2019, to March 1, 2020. On March 1, 2020, EurekaFacts completed 130 interviews in the Washington, DC MSA, fulfilling survey quotas for the PSU. The new methodology was a success and under

the revised method, the response rate reached 3.5% and the cooperation rate reached 17.4%. Between the original method and the revised method, the response increased by a factor of almost 40, from .09% to 3.5%. Similarly, the cooperation rate increased by a factor of almost six, from 3.0% to 17.4%.

After pausing due to the COVID-19 pandemic, EurekaFacts implemented the new survey sampling and administration process following the OMB approved approach starting March 23, 2021, and ended fielding February 16, 2024.

See Figure 7B-2 for a summary of the original vs. revised recruitment design, demonstrating the reduced number of steps in the revised design which aided in boosting response and cooperation rates and eliminating points of drop-off.

Figure 7B-2: Comparison or original vs. revised household recruitment designs



Appendix C. Lessons Learned from Pilot and Full Launch

EurekaFacts took special care during the launch and initial fielding period to refine the door-to-door methodology. A review of the successes and potential changes needed were conducted after the first 50 completed interviews from the pilot, which were collected over nine fielding days from December 21, 2019, to January 25, 2020. The cases were a combination of multiple tracts in Maryland, DC, and Virginia, and ranged in demographic composition (e.g., race/ethnicity, social economic status). In total, 46 were full-length interviews and 4 were short interviews.

During the period to collect the first 50 cases, field teams debriefed the project research team on their experiences. They shared success stories, challenges, strategies, and emerging patterns with the research team. These lessons learned informed ways to improve, and modifications to the overall fielding strategy and logistics to increase efficiency and participation.

Many of these lessons continued to be true in the full launch of the study. Additionally, collaborating with subcontractors across the country reinforced and provided its own set of lessons learned for a study like this.

Key lessons learned are presented below.

Door hangers are critical to successful fielding. Door hangers enhanced credibility of field teams, generated interest for participation, and provided information in a succinct and visually distinct form. Many participants commented on how the door hangers caught their attention and prompted them to search for information about the study, either online, through the phone number, or by talking with their neighbors. While some interviews were completed without the participant receiving or recalling the door hanger, field teams often reported how the door hanger was instrumental in priming residents' interest and decision to participate.

As an illustration, Tract 7022 was initially fielded during the DC area pilot without literature (door hanger) dropping first. Of the 82 doors knocked on, 55 no one was home, 25 households declined to participate, and 2 interviews were completed. In contrast, this tract was fielded again and garnered twice as many completes when door hangers were distributed three days prior: 62 doors knocked on in this round, 32 where no one was home, 26 where households declined to participate or did not pass the screening criteria, and 4 interviews were completed. The contrasting cooperation rates of 7% (2 completes/27 households screened) and 13% (4 completes/30 households screened), respectively, demonstrate the importance of pre-

notifying residents.

The door hangers were customized to the vendor fielding in the area. The vendor's name, ID badge image, and phone number of choice were used in the design. This kept the consistency between field team personnel and communication materials to promote the study's legitimacy.

Physical gift cards are more enticing, and therefore, more effective for recruiting respondents. Compared to offering a virtual/electronic gift card, the tangible presence of a gift card is more attractive and led to higher cooperation, especially among lower income communities. The promise of directly and immediately receiving the promised incentive mitigates concerns around study legitimacy or being scammed. Field partners in other metro areas considered the use of virtual incentives entirely as part of interviewer safety, but they found that use of physical cards to be critical to successfully fielding certain populations and on the scheduled timeline.

Testing alarms without being in the home is a viable option to gain completes. Some respondents were interested in the study but unwilling to let strangers in the home. Field teams successfully offered the alternative of testing battery-powered alarms outside. Several participants were willing to complete the survey on their front porch and bring alarms outside to test and provide all relevant information about the devices (location in home, interconnected or standalone status, etc.). This was critical after the study restarted in 2021 as it allowed participation by those interested in participating in the survey and alarm testing but concerned about COVID-19 exposure. Some aspects of the alarm had to be asked of participants rather than just observed by the field team (such as if the alarm is part of an interconnected system), but otherwise did not impact the ability to conduct this portion of the in-home survey.

Complexes with property managers are burdensome to canvas. As part of a government-sponsored study, the field teams conducting the SCOA survey were not considered solicitors or engaging in soliciting; however, locked buildings, restricted access, parking restrictions, and unwilling property managers on premise made it difficult to recruit in apartment and condominium complexes. Calling the property managers in advance was sometimes necessary to access these buildings, but this varied by region, state, and MSA. The time needed for these contacts was logistically near impossible under tight timelines to complete the fielding, especially during the pilot. Notably, some areas had more relaxed policies and access, so surveying condominium and apartment complexes was possible during the full study.

Recruitment strategies and refusal aversion must be adapted by area and household. Field teams noticed that certain communities were more responsive to certain techniques or language. More affluent communities were usually less interested in the $50 incentive and more willing to participate for altruistic reasons, such as interest in the research goals and overall safety. Field teams used the official CPSC letter (original pre-notification letter) and official credentials to convince respondents who had been uncertain about the legitimacy of the study. Other concerns regarding time commitment or the belief that the study was only for those who did not know their alarms were working were mitigated with focused language to counter those misconceptions and redirect potential respondents to the positive outcomes of participation.

Families with young children can be a challenge to recruit. Asking for participation of households with younger children was a challenge because the resident was often preoccupied with the children to focus on the survey. Days and times of the week when children are not in the home are preferable for recruiting this demographic.

Daylight hours of the seasons are most successful for gaining cooperation, particularly in the early and late afternoon. Field teams would only knock on doors in daylight hours (which did extend to later hours in the spring and summer months), starting no earlier than 10:00 AM local time. During the pilot, which took place during winter, participants were most receptive earlier in the day or midday before residents became unavailable due to plans and obligations scheduled for later in the day. The average starting time for the first 50 interviews was around 1:43 PM local time. Participation sharply dropped off after 3:30 PM. During the full launch, which took place across all seasons but when fielding was most conducted in the spring and summer months, the average starting time was around 3:00 PM with a standard deviation of 2 hours and 45 minutes. Participation dropped sharply after 8:00 PM. This corresponds to longer days in the spring and summer months and reinforces the need not to disturb households too early in the day or late in the evening.

An experienced field interviewer can conduct the survey alone. After conducting the study as part of a pair and gaining experience, a confident and organized field interviewer can administer the survey as an individual, if needed. The interviewer would need to remain in constant contact with the other team and supervisor, but it is a potential and efficient alternative if a two-person team is unavailable.

Local vendors have established knowledge and rapport within the community,

which makes them ideal partners to field the survey. Knowledge about the residents, safety concerns, and geography allows for local area vendor partners to more easily field the survey compared to a non-local entity. Taking advantage of an established name in an area improves the legitimacy of the study in the eyes of residents. An established organization also speeds up the process to set up the logistics and complete the local fielding quota more efficiently.

Working with a vendor partner with a wide network allows for more efficient fielding of a multi-city study. If a vendor can conduct fielding in multiple MSAs, then that increases the efficiency of the fielding operation. This allows for more streamlined training, less time spent on logistics and coordination, and more experienced field teams to work on the project. Time must be set aside for finding, contracting, and onboarding vendors in these areas, which is worth doing since local staff has a distinct advantage in conducting in-person research with residents. Working with a partner who has pre-established connections and staff in multiple areas streamlines the initial phase and keeps fielding moving from one area to the next.

Field managers should spend time on the ground with field teams to fully learn the interview process, which leads to better training and quality. During the survey's pilot and full launch, field managers trained staff in the office and conducted canvassing and interviews with them. This helped management staff incorporate real experiences into the training and supervision of data collection teams and promoted closer quality monitoring and guidance. For management staff that launched field teams in multiple MSAs, they could more easily train and manage staff in the new locations based on their experiences fully implementing the survey in the field. This is another reason to use subcontractors or staff who can complete fielding in multiple locations; it creates efficiency and consistency in the data collection.

Appendix D. Tract Challenges

High Burden Census Tracts

Census tracts were determined to be a high burden if they produced no or minimal completes or were impractical or unsafe for fielding. A high-burden tract was replaced entirely if fielding was not possible. A high-burden tract was supplemented with another tract if the number of completed interviews was drastically under quota but had at least two completes (necessary for any weighting). In each case, the new/additional tract was randomly selected and of comparable size, measured by number of OHUs.

A new tract needed a comparable number of OHUs to properly substitute for the high-burden tract's quota. To select a new/additional tract, the tracts associated with that MSA were sorted by total OHUs and 10 tracts were designated as replacements (five with higher and five with lower OHUs). The new tract was chosen through random number assignment and took on the quota of the high-burden tract.

Underperforming Census Tracts

Some Census tracts did not rise to the level of being high burden, but certain factors caused them to underproduce the needed number of completes and required additional effort. For example, day of the week, distance between homes, and high incidence of security systems may have impacted the completion rate in certain tracts.

These challenges were mitigated through additional fielding efforts. If there was a high incidence of residents who did not answer or were not interested in participating, field teams knocked on doors of homes that did not receive door hangers. This maximized the field teams' time within a tract in a day and led to some success. If a tract did not produce many completes, a second fielding day was usually planned for a different day of the week. In some instances, the number of completes was still under quota for the tract. This was balanced by some tracts having slightly higher cooperation rates, and therefore more completes, to reach the total quota for the MSA.

Appendix E. Field Teams: Onboarding, Logistics, and Quality Control

EurekaFacts worked with partners experienced with in-person recruitment and surveys in their respective MSAs. By leveraging their local knowledge and connections, and working with multiple partners at once, the project was more efficiently fielded.

EurekaFacts provided comprehensive training to all staff and interviewers involved in the execution of the SCOA survey project. A large component of training was an hour-long presentation, covering a variety of subjects including, but not limited to, the objectives of the study, fielding details and instructions, survey administration techniques, alarm testing procedures, and interviewer expectations. Once each interviewer completed the training, they signed an acknowledgement of receipt, kept on file before they can work on the project. Meetings were also held with interviewers prior to fielding to answer any questions or concerns.

EurekaFacts conducted virtual training sessions that were recorded and used to train additional staff. Afterwards, staff could refer to the recording and other materials to prepare before going out in the field. Checklists and quick reference guides were also provided to interviewers to reference while in the field. Subcontractors coordinated additional trainings with their team as new members were onboarded.

Additionally, on their first day of the job, interviewers shadow an experienced teammate (someone who has been in the field several days and successfully recruited participants and conducted the survey) or the project lead through the tasks of recruiting respondents, interviewing, and testing devices, among other core tasks. This allowed for the new interviewers to learn interviewing techniques and test procedures being implemented in real time. The vendor's project lead took additional time to train supervisors. This was effective if the project lead worked with teams in multiple MSAs. EurekaFacts checked in with new vendors to ensure that all was going smoothly.

Quality Control and Supervision

The supervisor was responsible for supporting interviewers during field data collection by having additional materials prepared, monitoring field progress, and by making decisions based on the daily cooperation rates observed. The supervisor was also responsible for ensuring the recruitment quotas for the tract were met, adjusting the walking route interviewers follow, the recruitment teams, or the exact fielding locations in the tract, as needed, and reporting all of this to the project lead.

Vendors also provided frequent progress reports to EurekaFacts, along with questions and troubleshooting needs, especially regarding Qualtrics technical issues or clarification of tract boundaries. EurekaFacts was responsible for reviewing all submitted cases to ensure that they were conducted in a valid location (matching address to tract) and monitoring that the data and meta-data were imputed correctly (e.g., tract #).

The research team then reviewed the uploaded data for consistency and quality. The information on smoke and CO alarms was matched to submitted photographs during the interviews, and edits were made to the data on a rolling basis. Overall fielding progress was continuously monitored by the research team and any adjustments were communicated back to the vendors and their field teams.

Interviewer Safety

The safety of each interviewer was a high priority for EurekaFacts. To keep staff safe, each interviewer was required to wear a hi-visibility safety vest and an ID badge with their name, photo, and company. Interviewers and supervisors were asked to maintain constant contact during recruitment hours using mobile phones. Power banks (or battery chargers) were also provided to interviewers to ensure that communication devices always remain charged. The supervisor was responsible for ensuring the safety of the fielding locations and to visually monitor the safety of multiple teams that may have been in the area. Interviewers were also instructed during the training process to withdraw from an interview if they felt unsafe or in danger for any reason.

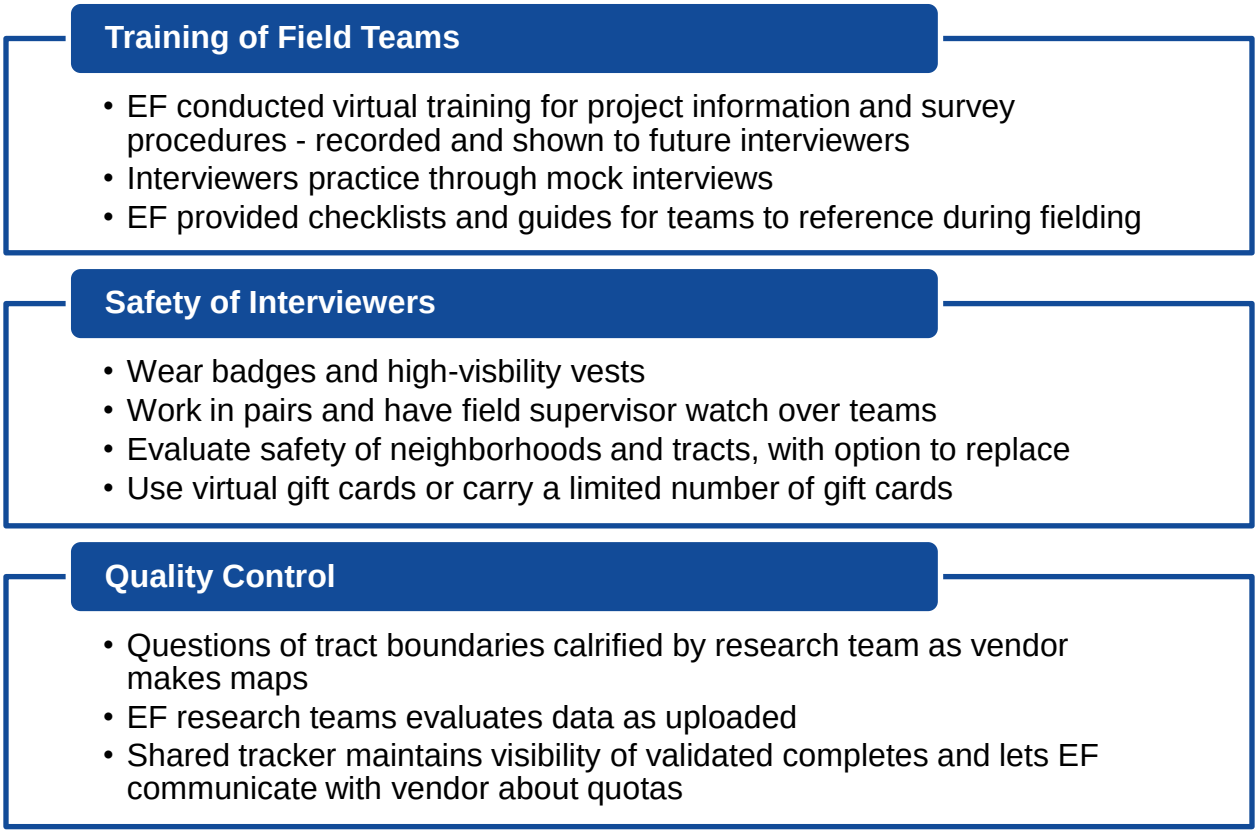
Teams were also composed of two interviewers to increase safety while recruiting. To further protect interviewers, door-to-door recruitment was scheduled only during daylight hours. Interviewers were instructed to practice safety techniques, which likely varied from vendor to vendor, but included practices such as only taking out one gift card per household instead of the entire pack, limiting the number of gift cards carried, using virtual gift cards instead (noted by some vendors), noting they have a supervisor in the area, and stopping recruitment in any area they felt unsafe. Supervisors had additional gift cards if more were needed by interview teams.

As previously noted, an experienced interviewer could conduct fielding alone; however, the preference was to use teams of two. Neighborhood safety was assessed before and during fielding to determine the viability of using a solo team. If conditions were met, individuals were permitted to recruit and conduct surveys individually with additional monitoring and check-ins from the field supervisor.

These safety methods were very successful. No major safety incidents were reported during the field period. For the few reports that were received about unsafe areas, teams reported that they decided to leave the area, and EurekaFacts selected a new tract following the selection procedure described earlier.

The figure below summarizes the core aspects of working with vendors, including training, maintaining interviewer safety, and quality control during data collection.

Figure 7E-1: Summary of working with vendor field teams



Appendix F. Collected Alarms

Completely non-functional alarms are of interest to CPSC for further testing and analysis to understand why they failed. These alarms were identified during testing, and interviewers asked permission to remove the devices to send to CPSC laboratory for further analysis. If a respondent agreed to let an interviewer collect the alarm, the interviewer labeled the alarm and recorded that label in the survey. The label number allowed the EurekaFacts research team to track that alarm back to a specific case with the corresponding geographic and household information and documented information about that alarm.

Early in the study, if a respondent did not want to give the alarm to the interviewers, an option was provided to respondents for interviewers to still label the alarm but have the respondent remove and mail the alarm themselves later. Very few households agreed to that option, and the few that did not follow through on the request. By the end of the study, that option was no longer given. Interviewers were trained to encourage participants to let teams collect their non-functioning alarms as part of the efforts of CPSC to learn about these devices and how to enhance their functionality. All collected alarms were gathered while interviewers were in the home.

At the end of fielding in a metro area, vendors mailed the alarms to EurekaFacts to log before sending them to CPSC. EurekaFacts matched the label number of each non-functioning alarm to the corresponding case and alarm information within the submitted surveys. Key information about each alarm and the location and household they were collected from was summarized in a spreadsheet. This spreadsheet was shared with the CPSC research team as a reference for the alarms they received.

Appendix G. Maps of Fielding Locations

The following two maps are provided to visualize the distribution of data collection across the country. Figure 7G-1 shows the boundaries of the metropolitan areas and the location of the non-metro tracts in the sample.

Figure 7G-1: Map of metropolitan areas (blue) represented in the study and non-metro tracts (red)

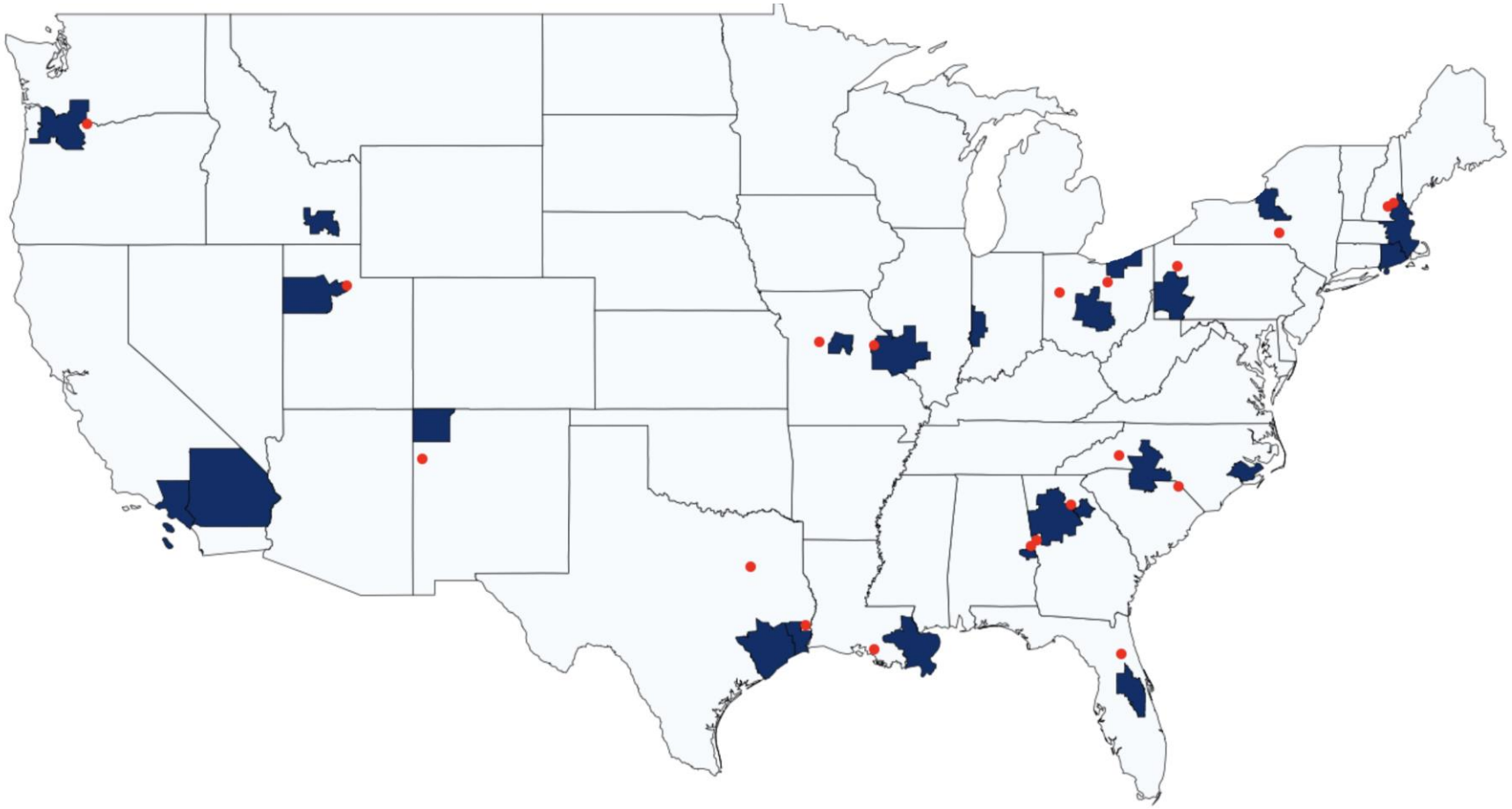
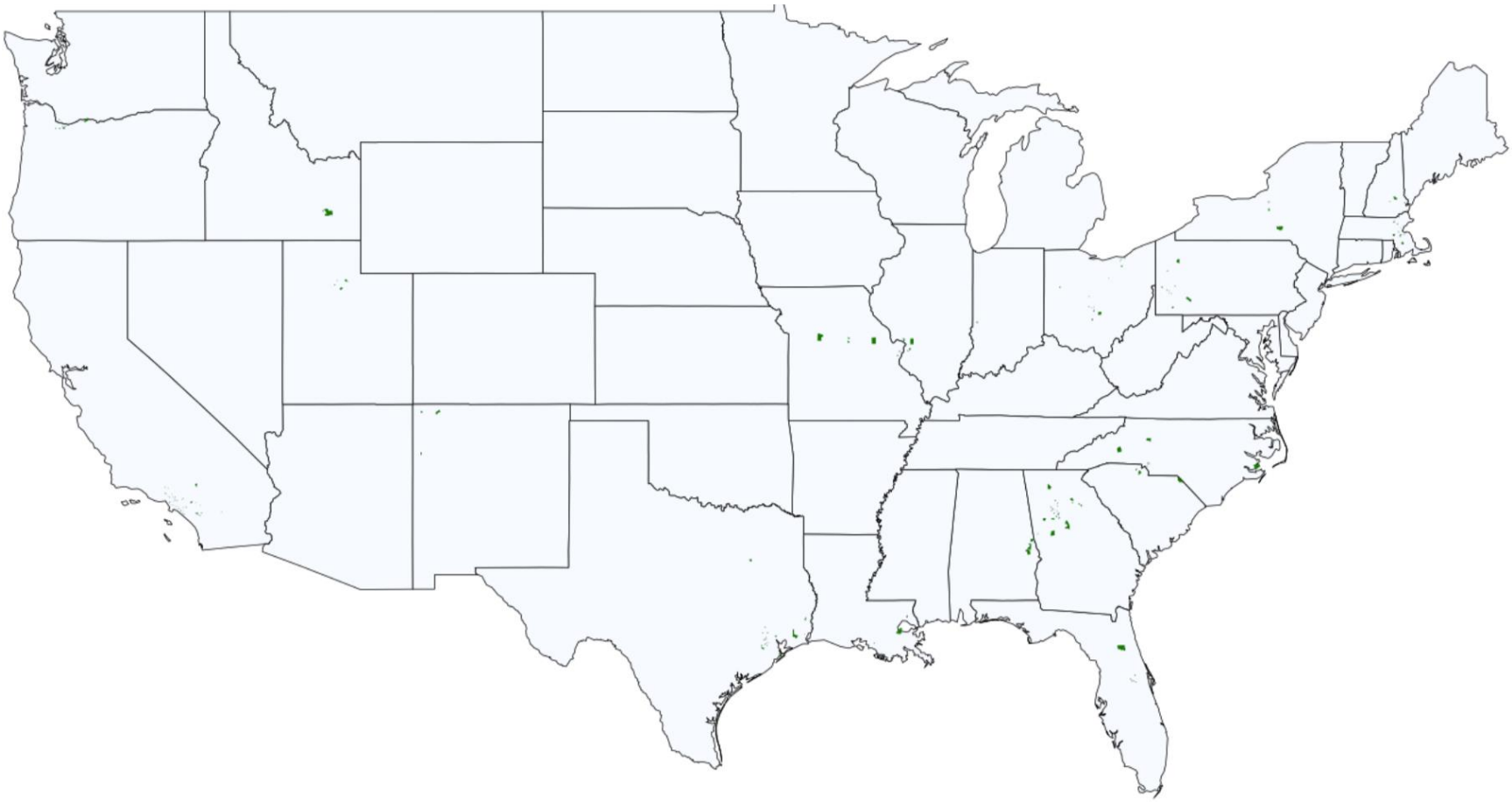


Figure 7G-2 shows the 213 tracts (out of 73,057) in the sample. Tracts are very small geographic areas when taken in the context of the entire country but were useful in constructing a proportional stratified random sample that was both statistically appropriate for this methodology and practical to field.

Figure 7G-2: Map of the 213 tracts (green) fielded



Appendix H. SCOA Full In-Home Survey Instrument

U.S. Consumer Product Safety Commission (CPSC) Survey on Usage and Functionality of Smoke and Carbon Monoxide (CO) Detectors in Households
Door-to-Door Recruitment and Data Collection Survey Instrument
Final Questionnaire (Full and Short Version)

[INTERVIEWER] This is the In-home survey instrument that is to be administered to participants in person. The instrument features both questions to be asked of the participant and clearly labeled instructions for the interviewers.

[MODULE 1: APPROACHING HOUSEHOLDS - QUESTIONS FOR INTERIVEWERS TO FILL]

[ASK ALL:]
S.1 What is the type of home in which the resident resides?

1 Single Family Detached Housing
2 Single Family Attached Housing (*e.g.,* townhouse, rowhouse)
3 Apartment/Condo [If Apartment see Instructions for Apartment Selection]
4 Mobile/Other Manufactured Housing
5 Trailer/RV
6 Other (Specify)

[IF APARTMENT (S.1=3) CONTINUE TO S.3, ELSE SKIP TO S.4]

[Interviewer Instructions] For selection of the first apartment household within an apartment/condominium building or complex, please reference the training on "Instructions for Apartment Selection."

[Interviewer Instructions]
The following script is to be read in the instances where there is a front desk concierge. If there is no front desk concierge present continue to apartment door.

"Good Morning/Afternoon/Evening. I am conducting research on behalf of the U.S. Consumer Product Safety Commission and National Fire Protection Association. Part of our research requires us to interview residents of this building. I can offer them free carbon monoxide and smoke alarm testing. Would it be ok for us to offer your residents this free service?"

Show front desk staff your Field Interviewer identification and provide them with an official letter/factsheet for validation.

[ASK IF APARTMENT, S.1=3:]
S.2 **(OBSERVE)** Do you have permission to enter the building?

1 Yes (CONTINUE)
2 No (TERMINATE – RECEIVE END MESSAGE 2)
3 Permission not needed (CONTINUE)

[Interviewer Instructions]

Start screening process before knocking on the door (Complete questions S.1 – S.3)

Once contact has been made with the resident, interviewers should immediately begin collecting information from the respondent.

- Interviewers should be thoroughly familiar with the scripted content below to the extent that you can engage in a conversational style. Scripted content shown in *italics.*

Important — Addressing non-response to questions: Response options to questions may include "Don't know", "Unsure", or "Refused" options. Do not read these aloud at any time during the interview.

- Only record these options if the respondent provides it him or herself.
- If the respondent indicates that they don't know the answer to a question, mark the appropriate answer or fill in "DK" for Don't Know in the space provided.

Questions marked **(Observe)** are for interviewers to fill in themselves. Do not read to participants.

[ASK ALL:]
S.3 **Interviewer**: Please complete the required team information

a. Unique ID (Format: YYYYMMDDHHMM)
b. Date of visit
c. Survey Interviewer name
d. Alarm Inspector name
e. Partnering Organization/ Fire Department
f. Street address
g. Apt/ Suite
h. City
i. State
j. Zip code
k. Pre-screen Start time (hh:mm)

[ASK ALL:]
S.4 **(OBSERVE)** Did someone answer the door at the participant's household?

1 Yes (CONTINUE)
2 No (TERMINATE – RECEIVE END MESSAGE 2)

[MODULE 2: INTRODUCTION]

[Interviewer Instructions]
Use the following options to get in the door – alter as applicable.

[READ:] "Hello. I am [Surveyor name piped in – S.3c] and this is [Alarm Specialist name piped in – S.3d] from [Fire department/Organization piped in – S.3e].

Show the participant the organization or EurekaFacts provided ID badge. Have copies of letters endorsing the survey from CPSC and local fire department if available to share when needed.

[READ:] *"Good Morning/Afternoon/Evening. I am a here on behalf of the U.S. Consumer Product Safety Commission, or CPSC, as part of a survey about household smoke detectors. This is a nationwide effort along with the National Fire Protection Association to improve home safety. We are in your neighborhood today offering smoke alarm and carbon monoxide detector testing and replacements if needed for free!*

[If needed:] *"Just for simplicity, I will refer to the sponsor of the survey as CPSC."*

[ASK ALL:]
S.6 Are you the head of the household and over 18 years of age?

1 Yes (SKIP TO S.10)
2 No (CONTINUE)

[ASK IF S.6=2:]
S.7 Is there another person available we may speak with, who is 18 years or older and may be considered one of the heads of the household?

1 Yes (CONTINUE)
2 No (TERMINATE – RECEIVE END MESSAGE 2)

NO QUESTIONS S.8-S.9

[Read:] *"We are asking people in your community a few questions about their smoke and carbon monoxide detectors and doing some simple tests to make sure the detectors work. If the batteries in your detector need to be replaced, we have new batteries to give out, free of charge. Also, if any of your detectors do not work, we have new ones to replace them, again free of charge. We would like to collect any detectors that don't work and send them to the Consumer Product Safety Commission's lab to find out why they don't work. This interview will take up no more than 60 minutes, and at the end of the interview we will provide you with a $50 gift card as appreciation for your time."*

[ASK IF S.6=1 OR S.7=1:]
S.10 *Would you like to see if you qualify for this opportunity? Remember if you qualify, we will replace the batteries and/or alarms as needed and you will receive a $50 visa gift card as a thank you for your time.*

1 Yes, I want to see if I qualify (SKIP TO S.13)
2 No, I do not want to check my qualification

[ASK IF S.10=2:]
S.11 **Refusal Aversion:**
[Interviewer Instructions] Select and read the following refusal aversion prompts below. Attempt multiple combinations and find the approach that works best for you. [Programming note: Select all that apply]

1. *We cannot complete this important safety campaign without the help of community members like you. Your input is urgently needed. [Can we count on your participation?]*

2. *This survey on home fire and carbon monoxide safety is the first of its kind in over 25 years. Now is a unique opportunity for you to represent the voice of your community in this important public safety campaign. [Can we count on your participation?]*

3. *Do you happen to know someone impacted by a fire in their home in the last few years? [Wait for*

response] I am sorry to hear that. Unfortunately, they are not alone. Household fires strike 1.3 million homes each year [If "no" Redirect to Fire Fact Below] [Can we count on your participation?] [Can we count on your participation?]

4. *Did you happen to know that around the U.S. there are 1.3 million household fires and more than $10 billion dollars in losses each year? This survey, that could benefit from your input, and from others like you, is vital to reducing this kind of loss and tragedy. [Can we count on your participation?]*

5. *Did you happen to know that 3 out of 5 home fire deaths involve missing or malfunctioning smoke detectors? At the same time … the risk of death in a home fire is 54% lower in homes with working smoke alarms. Your participation today will help the U.S. Consumer Product Safety Commission improve home safety and save lives. [Can we count on your participation?]*

[ASK IF S.10=2:]

S.12 **(OBSERVE)** Was/were the prompts successful?

1 Yes, participant wants to see if they qualify (CONTINUE)
2 No, participant does not want to check qualification (TERMINATE – RECEIVE END MESSAGE 2)

[ASK IF S.12=1:]

S.13 Thank you, may I please have your name?

1 [Textbox to record name]

[ASK ALL:]

S.14 [COVID SCREENING QUESTIONS, READ:] *Before we continue it's important that I ask a few quick questions regarding COVID-19. In the past 14 days, has anyone within the household had a fever, cough or shortness of breath? Has anyone come in contact with someone known to have COVID-19 or in contact with a person currently waiting for a COVID-19 test result? Lastly, has anyone in the household had contact with an individual who is currently quarantined due to COVID-19 infection?*

[Interviewer Instructions]
If participant says "yes" to any of these questions, terminate the session. Thank the participant for their willingness to participate but decline to continue.

[READ IF DISQUALIFIED:] *Thank you for your willingness to participate in our study, but just to be cautious we will not be able to complete the interview. This is for the safety of the interview and research team and for other residents we will encounter. Thank you for understanding. Have a good day.*

1 Yes to any (TERMINATE – RECEIVE END MESSAGE 2)
2 No to all (CONTINUE TO MAIN SCREENING S.15)

[MODULE 3: SMOKE ALARM/CO DETECTOR SCREENING]
[READ:] *"Great. Let's begin."*

[ASK ALL:]
S.15 First, do you have any smoke detectors in your home? When considering whether you do, please do not include any uninhabited outbuildings or apartment hallways. If you are not sure, I can assist by inspecting the home with you. (DO NOT READ LIST)

1 Yes, I have smoke detectors (CONTINUE)
2 No, I do not have smoke detectors (SKIP TO S.19)

[ASK IF S.15=1, "Yes":]
S.16 Are any of your smoke detectors connected to a central alarm or security system that notifies the police or fire department when it goes off? (DO NOT READ LIST)

[If needed: "*What we mean by this is if the smoke detector detected smoke, it would automatically notify the police or fire department."*]

1 Yes (SKIP TO S.19)
2 No (SKIP TO S.19)
3 Don't know (CONTINUE)

[ASK IF S.16=3, "Don't know":]
S.17 Thinking of all fire and smoke related incidents at your residence, has the police or fire department ever arrived in response to a notification from a central alarm or security system? (DO NOT READ LIST)

1 Yes
2 No
3 Never had a fire or smoke related incident

NO QUESTION S.18

[ASK ALL:]
S.19 Do you have any carbon monoxide detectors in your home? When considering whether you do, please do not include any uninhabited outbuildings or apartment hallways. If you are not sure, I can assist by inspecting the home with you. (DO NOT READ LIST)

1 Yes, I have CO detectors (CONTINUE)
2 No, I do not have CO detectors (SKIP TO S.23)

[ASK IF S.19=1, "Yes":].
S.20 Are any of your carbon monoxide detectors connected to a central alarm or security system that notifies the police or fire department when it goes off? (DO NOT READ LIST)

[If needed: *What we mean by this is if the carbon monoxide detector detected carbon monoxide, it would automatically notify the police or fire department.*]

1 Yes (SKIP TO S.23)
2 No (SKIP TO S.23)
3 Don't know (CONTINUE)

[ASK IF S.20 "DON'T KNOW", S.20=3:].

S.21 Thinking of all carbon monoxide related incidents at your residence, has the police or fire department ever arrived in response to a notification from a central alarm or security system? (DO NOT READ LIST)

1 Yes
2 No
3 Never had a carbon monoxide related incident

NO QUESTION S.22

[ASK ALL:]

S.23 **(OBSERVE)** Time screening ended: ___ (hh:mm AM/PM)

[Programming Instructions: See Appendix I for full list of combinations that would indicate the participant would receive only the survey portion of the study because there are no alarms at all in the household or that indicates that the interviewer is unable to inspect either a smoke or CO detector. "FULL STUDY PARTICIPANTS" and "SHORT STUDY PARTICIPANTS" will be used to indicate content and questions that diverge based on participant type.]

[ASK SHORT STUDY PARTICIPANTS:]

S.24 [INTERVIEWER:] The participant does not have alarms eligible for testing. However, they do qualify for the "no alarm/security alarm" version of the survey.

[INTERVIEWER:] **If "no alarm/security alarm" interviews are needed for survey quotas use the following script**: *"Thank you for answering these questions. Since you do not have a detector that we can test or because we have identified that your alarms will notify first responders, you are not eligible for the 60-minute survey in alarm testing study; you are, however, eligible for the 20-minute version of the survey where you can earn a $10 gift card for answering our brief questionnaire. Would you like to participate in this survey? "*

[INTERVIEWER:] **If quota for "no alarm/security alarm" interviews is complete**: *"Thank you for answering these questions. Since you do not have a smoke detector that we can test or because we have identified that your alarms will notify first responders, you are not eligible for this study. Have a nice day."*

1. Yes, I would like to participate in the short survey (CONTINUE)
2. No, I do not want to participate (TERMINATE – RECEIVE END MESSAGE 2)
3. Quota complete for "no alarm/security alarm" interviews (DO NOT READ) (TERMINATE – RECEIVE END MESSAGE 2)

[SHOW ALL:]

S.25 [READ] *"Great you qualify for this interview! Before we begin, we need you to review a consent form with information about the study."*

"Please read the following off of my tablet. If you agree to allow this interview to proceed, please sign the bottom. Let me know you have any questions."

[Interviewer Instructions]

- Go to the next page and hand the tablet to the respondent for them to read and sign electronically.
- If participant refuses, say thank you and terminate.
- Do not read the options below to participant.

1 Continue to consent (CONTINUE)
2 Terminate (TERMINATE – RECEIVE END MESSAGE 2)

[SHOW FULL STUDY PARTICIPANTS:]

Consumer Product Safety Commission (CPSC) Survey on Usage and Functionality of Smoke Detectors and Carbon Monoxide Detectors in Households

Informed Consent Form

Thank you for your interest in participating in the research study. This study is conducted by EurekaFacts on behalf of the U.S Consumer Product Safety Commission (CPSC) and the National Fire Protection Association (NFPA). We are conducting a nationwide survey on household fire and carbon monoxide (CO) safety. The purpose of this study is to gather information about the functionality of smoke detectors and CO detectors in U.S. households by asking a series of survey questions and testing your household smoke and CO alarms. Findings from this research will help the CPSC and NFPA improve home safety.

The combined survey and testing of smoke alarms and CO alarms will take up to 60 minutes. Our trained and qualified two-member survey team will ask you questions related to your smoke detectors and CO detectors, and then inspect these devices in your home. You will receive a $50 gift card from a major card company as a token of appreciation for completion of the study.

If the survey team finds any detectors to be non-functioning, new detectors and/or batteries can be offered, free of charge, based on availability. If you are renting your home, the property manager will need to be contacted to arrange installation of the new detector at a later date. With your permission, we would like to collect non-functioning smoke or CO detectors and send them to CPSC's lab to find out why they don't work. In addition, we may request your permission to take a photograph of your smoke and CO detector(s) to study different alarm types and functionalities.

Information collected from this study will help the CPSC to improve household fire and CO safety. Your input will assist with developing standards and guidelines that will help protect property and human life. This research does not involve any foreseeable risks.

Your participation in this research study is completely voluntary. You may stop at any time if you do not want to continue with the study by notifying a member of the survey team. Your responses will be maintained confidential and will be used for research purposes only. At no time will any identifiable information be linked to any of your answers. All information collected through our research process is reported to the CPSC anonymously.

[ASK FULL STUDY PARTICIPANTS:]

S.25a We ask for your consent to participate in answering questions as part of the survey portion of this study.

1 I consent
2 I do not consent (TERMINATE – RECEIVE END MESSAGE 2)

[ASK FULL STUDY PARTICIPANTS:]

S.25b We ask for your consent to participate in the smoke and CO alarm testing portion of this study in your home.

1 I consent
2 I do not consent (TERMINATE – RECEIVE END MESSAGE 2)

[ASK FULL STUDY PARTICIPANTS:]
S.25c Your signature below means that you have freely agreed to participate in this research study. You should consent only if you have read this document and you understand its contents.

a. Signature [Signature box]
b. Enter Name [Text box]
c. Date [Textbox]

[SHOW SHORT STUDY PARTICIPANTS:]

Consumer Product Safety Commission (CPSC) Survey on Usage and Functionality of Smoke Detectors and Carbon Monoxide Detectors in Households

Informed Consent Form

Thank you for your interest in participating in the research study. This study is conducted by EurekaFacts on behalf of the U.S. Consumer Product Safety Commission (CPSC) and National Fire Protection Association (NFPA). We are conducting a nationwide survey on household fire and carbon monoxide (CO) safety. The purpose of this study is to gather information about the functionality of smoke detectors and CO detectors in U.S. households by asking a series of survey questions and testing your household smoke and CO alarms. Findings from this research will help the CPSC and NFPA improve home safety.

The interview lasts about 20 minutes, and you will receive a $10 gift card from a major credit card company in appreciation for completion of the survey. Our trained and qualified two-member survey team will ask you questions related to fire and carbon monoxide safety.

Information collected from this study will help CPSC to improve household fire and CO safety. Your input will assist with developing standards and guidelines that will help protect property and human life. This research does not involve any foreseeable risks.

Your participation in this research study is completely voluntary. You may stop at any time if you do not want to continue with the study by notifying a member of the survey team. Your responses will be maintained confidential and will be used for research purposes only. At no time will any identifiable information be linked to any of your answers. All information collected through our research process is reported to CPSC anonymously.

[ASK SHORT STUDY PARTICIPANTS:]
S.25a_F2 We ask for your consent to participate in answering questions as part of the survey portion of this study.

1 I consent
2 I do not consent (TERMINATE – RECEIVE END MESSAGE 2)

NO QUESTION S.25b_F2

[ASK SHORT STUDY PARTICIPANTS:]
S.25c_F2 Your signature below means that you have freely agreed to participate in this research study. You should consent only if you have read this document and you understand its contents.

a. Signature [Signature box]
b. Enter Name [Text box]
c. Date [Textbox]

[Interviewer Read:] *"Thank you. Your input is very important to this research. Let's Begin!"*

[Programming Instructions: Short Survey Participants SKIP to Q.1; Full Survey Participants Continue]

[Page Break]

[Interviewer Read:] *"Thank you. It is also important that you read and sign a hold harmless agreement for our visit to your house today."*

[SHOW FULL STUDY PARTICIPANTS:]

Waiver, Release and Hold Harmless Agreement

In consideration of the voluntary performance of my participation in the U.S. Consumer Product Safety Commission (CPSC) and National Fire Protections Association (NFPA) Survey on Usage and Functionality of Smoke Detectors and Carbon Monoxide Detectors in Households, which is being conducted at my residence, located at **[INSERT S.3f-j Participant Address]**

I, on behalf of myself, and all members of family, as well as my heirs, executors, administrators or successors, hereby waive any claim or cause of action of any nature that I have, or in the future may have, against any and all individual or organizational participants in the CPSC and NFPA Survey on Usage and Functionality of Smoke Detectors and Carbon Monoxide Detectors in Households, including but not limited to the CPSC, NFPA, and EurekaFacts, LLC, its agents or employees, which claim or cause of action grows out of or results from increased levels of carbon monoxide, a fire or other damage, following the testing and inspection of one or more of the smoke and or carbon monoxide detectors, in addition one or more of the following action(s):

1) Replaced batteries
2) Provided new smoke detector(s)
3) Collected faulty smoke detector(s)
4) Obtained photograph of smoke/ carbon monoxide detector(s) (Device only)
5) Provided new CO detector(s)
6) Collected faulty CO detector(s)
7) The possibility of no additional action

I further hereby agree to release and hold harmless any and all organizational and individual participants including the **[Insert S.3e Partnering Organization Name]** and municipality of **[Insert S.3h City Name]** in the CPSC and NFPA Survey on Usage and Functionality of Smoke Detectors and Carbon Monoxide Detectors in Households from and against all damages of any kind, to persons or property, growing out of or resulting from a fire or increased levels of carbon monoxide in my referenced home.

*This form generally indicates that the occupant or owner of the property agrees to waive his or her rights to sue any individual, any municipality and any other organizations or individuals involved in the safety inspection of this home, if a fire or increased levels of carbon monoxide occurs after the inspection. The purpose of the waiver is to protect the individual or any of the organizations involved against liability arising from the home fire inspection. This statement is intended for information only, the terms of the waiver themselves shall prevail if there are any questions. You should seek advice if you do not understand this waiver.

[ASK FULL STUDY PARTICIPANTS:]
S.27 Please indicate your acknowledgement below:

1 I acknowledge having read, understood, and agreed to the above waiver, and release.
2 I decline the above waiver and release. (TERMINATE – RECEIVE END MESSAGE 2)

[SHOW IF S.27=1:]
S.28 Your signature below means you have read this document, and you understand its contents.

a. Participant Signature [Signature box]
b. Enter Name [Text box]
c. Date [Textbox]

[Page Break]

[Interviewer Read:] *"Thank you. Your input is very important to this research. My teammate will now gather the tools needed to test your alarms. In the meantime, you and I will begin the questionnaire."*

[INTERVIEWER INSTRUCTIONS] Alarm inspector should ensure all materials are available for alarm testing and call supervisor for any needed supplies (ladder, measuring tape, etc.) If there are pets in the home, please politely ask the participant if they can be placed in a separate room during the interview.

[MODULE 4: HOME CHARACTERISTICS]

[ASK ALL:]
Q.1 Do you or another member of your household own or rent your home? (DO NOT READ LIST)

1 Own
2 Rent
98 Don't know
99 Refused

[ASK ALL:]
Q.2 For how many years have you lived in this (apartment/house)? (DO NOT READ LIST)

1 Drop down menu of full year integers [Include less than one year to 50 or more]
98 Don't know
99 Refused

[ASK ALL:]
Q.3 Please tell me to the best of your knowledge, in what year was this (apartment/house) built? Was it … (READ LIST)

1 2010 or later
2 Between 2000 and 2009
3 Between 1990 and 1999
4 Between 1980 and 1989
5 Between 1970 and 1979
6 Between 1960 and 1969
7 Before 1960
98 Don't know (DON'T READ)
99 Refused (DON'T READ)

[IF "Single Family Detached Housing" or "Single Family Attached" (S.1=1-2), ASK:]
Q.4 What types of fuel-burning appliances, if any, do you own or have in your home? By fuel burning appliances, we mean appliances that use gas, propane, oil, wood, wood pellets, coal, or kerosene. Do not include electric-powered appliances. (READ LIST, SELECT ALL THAT APPLY)

1 Gas powered generator
2 Furnace or boiler
3 Water heater
4 Charcoal grill
5 Gas Dryer
6 Wood or pellet burning fireplace or stove
7 Kitchen appliances (e.g., stove, oven)
8 Other (Specify)
9 Do not own any fuel-burning appliances [EXCLUSIVE]
98 Don't know (DON'T READ) [EXCLUSIVE]
99 Refused (DON'T READ) [EXCLUSIVE]

[IF "Single Family Detached Housing" or "Single Family Attached" (S.1=1-2), ASK:]
Q.5 Does this residence have an attached garage unit? (DO NOT READ LIST)

1 Yes
2 No (SKIP TO Q.9)
98 Don't know (SKIP TO Q.9)
99 Refused (SKIP TO Q.9)

[ASK IF Q.5=1, "Yes"]
Q.6 For what purposes is the attached garage used? Would you say… (READ LIST, SELECT ALL THAT APPLY)

1 Workshop/ workspace
2 Store tools or lawn/ sports equipment
3 Store vehicle(s) (e.g., motorcycle, car, SUV, van, etc.)
4 Fuel burning appliances (e.g., furnace, water heater, grill, etc.)
5 Other (Specify)
98 Don't know
99 Refused

NO QUESTIONS 7-8

[MODULE 5: SMOKE DETECTOR BEHAVIORS]

[ASK IF HAS SMOKE DETECTORS, S.15=1:].
Q.9 Please tell me to what extent do you believe your home is safe with your current smoke detectors? Would you say ...

1 Not at all safe
2 Slightly safe
3 Moderately safe
4 Mostly Safe
5 Very safe
98 Don't know (DON'T READ)
99 Refused (DON'T READ)

[Programming Note: IF SHORT STUDY PARTICIPANTS, SKIP TO Q.12; FULL STUDY PARTICIPANTS CONTINUE]

[ASK IF HAS SMOKE DETECTORS, S.15=1:]
Q.10a About how often do you use the test button to test the smoke detector or detectors in your home? Would you say… (READ LIST)

1 Never
2 Once every few years (SKIP TO Q.11a)
3 Once every year (SKIP TO Q.11a)
4 Once every 6 months (SKIP TO Q.11a)
5 Once every 3 months (SKIP TO Q.11a)
6 Once every month (SKIP TO Q.11a)
7 Once every week (SKIP TO Q.11a)
8 Other (specify) (SKIP TO Q.11a)
98 Don't know (DON'T READ) (SKIP TO Q.11a)
99 Refused (DON'T READ) (SKIP TO Q.11a)

[ASK IF HAS SMOKE DETECTORS & NEVER TESTS, S.15=1 & Q10a=1:]
Q.10b Please tell me, what are some of the reasons that you have not tested your smoke detector or detectors? (DO NOT READ LIST, SELECT ALL THAT APPLY):

1 Did not know you should test
2 Did not think it was important enough
3 Did not know how to test (SKIP TO Q.11a)
4 Don't need to test because they go off occasionally
5 Physically unable to reach
6 Other (Specify)
98 Don't know
99 Refused

[ASK IF HAS SMOKE DETECTORS & NEVER TESTS, S.15=1 & Q.10a=1:]
Q.10c Do you know how to test your smoke detector or detectors, or not? (DO NOT READ LIST)

1 Yes
2 No
98 Unsure
99 Refused

[ASK IF HAS SMOKE DETECTORS, S.15=1:]
Q.11a Do you think most, or all of your smoke detectors are working? By working, I mean they would make a sound if they detected smoke right now. (DO NOT READ LIST)

1 Yes (SKIP to Q.12)
2 No
98 Don't know (SKIP TO Q.12)
99 Refused (SKIP TO Q.12)

[ASK IF Q.11a=2, "No":]
Q.11b What are some of the reasons your smoke detectors may not be working? Again, by working, I mean they would make a sound if it detected smoke right now. (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 Did not get around to fixing it
2 Do not know how to fix or replace it
3 Unable to install or fix it
4 Unable to afford new ones
5 Disconnected it (GO TO Q.11c)
6 It is the landlord's responsibility
7 Removed battery (GO TO Q.11d)
8 Batteries never installed
9 Batteries not working and not yet replaced
10 Other reason (Specify)
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[ASK IF Q.11b=5, "Disconnected it"]

Q.11c You mentioned that one or more of your smoke detectors was disconnected. For what reason(s) were the smoke detectors disconnected? (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 Nuisance when they go off
2 Detector frequently went off
3 Would not stop beeping/ chirping
4 No longer worked
5 No reason in particular
6 Other reason (Specify)
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[ASK IF Q.11b=7, "Removed battery"]

Q.11d You mentioned that the batteries were removed from one or more of your smoke detectors. For what reason(s) were the batteries removed from the smoke detector or detectors? (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 Batteries no longer worked
2 Batteries were leaking/ discharge
3 Batteries expired
4 Detector would not stop beeping/chirping
5 Intended to replace batteries, but forgot to install new ones
6 Installed wrong type of batteries
7 Needed batteries for another device
8 Other reason (Specify)
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[ASK IF HAS SMOKE DETECTORS, S.15=1:]

Q.12 Do you know how to… (DO NOT READ RESPONSE OPTIONS)

a. Install a smoke detector?
b. Maintain a smoke detector in good working order?

[Response Options]

1 Yes
2 No
98 Unsure
99 Refused

[ASK IF HAS SMOKE DETECTORS, S.15=1:]

Q.13 To the best of your knowledge, how often should you replace your old smoke detector with a new smoke detector in your home? Would you say… (READ LIST)

1 Never, unless the detector stops working
2 Once every 6 months
3 Once a year
4 Once every 2 – 5 years
5 Once every 6 – 9 years
6 Once every 10 years
7 Once every 10+ years
98 Don't know (DON'T READ)
99 Refused (DON'T READ)

[ASK ALL:]

Q. 14 On a scale of 1 to 5, where 1 is "Not at All Necessary", and 5 is "Extremely Necessary", how necessary do you feel it is to have a smoke detector installed in your home?

1 1 – Not at All Necessary
2 2
3 3
4 4
5 5 – Extremely Necessary
98 Don't know
99 Refused

[ASK IF NO SMOKE DETECTOR, S.15=2]

Q.15 Please tell me what are some of the reasons you don't have a smoke detector installed in your home? (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 Don't think I need one
2 Did not come with residence
3 They are a nuisance
4 They did not or don't work
5 Never got around to replacing previous detectors
6 It is the landlord's responsibility
7 Other reason (Specify)
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[MODULE 6: FIRE HISTORY]

[ASK ALL:]

Q.16 In the past 12 months, have you had any accidental fires – that is unintended or unwanted smoke or flames - in your home? Please include fires that were too small to call the fire department. (DO NOT READ LIST)

1 Yes (CONTINUE)
2 No (SKIP TO Q.17)
98 Don't know (SKIP TO Q.17)
99 Refused (SKIP TO Q.17)

[ASK IF "Yes", Q.16=1:]

Q.16a Thinking of the most recent accidental fire(s), how did you become alerted to the incident? (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 Saw the fire
2 Smelled the fire
3 Heard the fire
4 Felt the heat of the fire
5 Smoke detector (SKIP Q.16c)
6 Someone notified me
7 Other (Specify)
8 Don't remember [EXCLUSIVE]
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[Programming Note: IF S.15=1, "Has smoke alarms", CONTINUE; ELSE SKIP TO Q.20]

[ASK IF Q.16a= 1-4, 6-8, or 98-99, OTHER THAN "Smoke detector"]

Q.16b Thinking of the most recent accidental fire(s), did any of the smoke detectors go off during the fire(s)? (DO NOT READ LIST)

1 Yes (SKIP TO Q.17)
2 No
98 Don't know (SKIP TO Q.17)
99 Refused (SKIP TO Q.17)

[ASK IF Q16b= "No", Q.16b=2]

Q.16c Thinking of the most recent accidental fire(s), do you think that enough smoke reached the smoke detector that it should have sounded? (DO NOT READ LIST)

1 Yes
2 No
98 Don't know
99 Refused

[ASK IF HAS SMOKE ALARMS, S.15=1]

Q.17 In the past 12 months, have any of your smoke detectors gone off when there was no fire, other than when the smoke detector was being tested? (DO NOT READ LIST)

1 Yes
2 No
98 Don't know
99 Refused

[ASK IF Q.17=1, "Yes"]

Q.17a Why do you think the smoke detector went off when there was no fire? (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 Cooking
2 Fireplace
3 Tobacco
4 Steam from bathroom
5 Low battery
6 Other (Specify)
7 No apparent reason
98 Don't know
99 Refused

NO QUESTIONS 18-19

[MODULE 7: CO DETECTORS]

[ASK IF HAS CO DETECTORS, S.19=1:].

Q.20 Please tell me to what extent do you believe your home is safe with your current carbon monoxide detectors? Would you say... (READ LIST)

1 Not at all safe
2 Slightly safe
3 Moderately safe
4 Mostly Safe
5 Very safe
98 Don't know (DON'T READ)
99 Refused (DON'T READ)

[ASK ALL:]

Q.21 How would you know if high levels of carbon monoxide (CO) were present in your home? (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 You can smell it
2 You can taste it
3 You can see it
4 You can feel it
5 Carbon monoxide detector
6 Other (Specify)
7 Respondent does not believe there is a way to know if CO is present [EXCLUSIVE]
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[ASK ALL:]

Q.22 How much do you believe you know about carbon monoxide detectors? (READ LIST)

1 Nothing at all
2 A little
3 Some
4 A lot
98 Don't know (DON'T READ)
99 Refused (DON'T READ)

[Programming Note: FULL STUDY PARTICIPANTS - IF HAS CO DETECTORS, S.19=1 CONTINUE; ELSE SKIP TO Q.27]
[Programming Note: IF SHORT STUDY PARTICIPANTS, SKIP TO Q.27]

[ASK IF HAS CO DETECTORS, S.19=1:]

Q.23 About how often do you use the test button to test your carbon monoxide detector or detectors? Would you say… (READ LIST)

1 Never
2 Once every few years (SKIP TO Q.24)
3 Once every year (SKIP TO Q.24)
4 Once every 6 months (SKIP TO Q.24)
5 Once every 3 months (SKIP TO Q.24)
6 Once every month (SKIP TO Q.24)
7 Once every week (SKIP TO Q.24)
8 Other (Specify) (SKIP TO Q.24)
9 Don't know (SKIP TO Q.24) (DON'T READ)
10 Refused (SKIP TO Q.24) (DON'T READ)

[ASK IF Q.23=1, "NEVER":]

Q.23a What were the reasons that you have not tested your carbon monoxide detector or detectors? (Open ended, capture their response)

1 [Text box to capture open end]

[ASK IF HAS CO DETECTORS, S.19=1:]

Q.24 Do you think most or all of your carbon monoxide detectors are working? By working, I mean they would make a sound if they detected carbon monoxide right now. (DO NOT READ LIST)

1 Yes (SKIP TO Q.25)
2 No
98 Don't know (SKIP TO Q.25)
99 Refused (SKIP TO Q.25)

[ASK IF Q.24=2, "No":]

Q.24a What are some of the reasons your carbon monoxide detectors may not be working? Again, by working, I mean they would make a sound if it detected carbon monoxide right now. (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 Did not get around to fixing it
2 Do not know how to fix or replace it
3 Unable to install or fix it
4 Unable to afford new ones
5 Disconnected it
6 It is the landlord's responsibility
7 Removed battery
8 Batteries never installed
9 Batteries not working and not yet replaced
10 Other reason (Specify)
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[ASK IF Q.24a=5, "Disconnected it":]

Q.24b You mentioned that one or more of your carbon monoxide detectors was disconnected. For what reason(s) were the carbon monoxide detectors disconnected? (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 Nuisance when they go off
2 Detector frequently went off
3 Would not stop beeping/ chirping
4 No longer worked
5 No reason in particular
6 Other reason (Specify)
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[ASK IF Q.24a=7, "Removed battery":]

Q.24c You mentioned that the batteries were removed from one or more of your carbon monoxide detectors. For what reason(s) were the batteries removed from the smoke detector or detectors? (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 Batteries no longer worked
2 Batteries were leaking/ discharge
3 Batteries expired
4 Detector would not stop beeping/chirping
5 Intended to replace batteries, but forgot to install new ones
6 Installed wrong type of batteries
7 Needed batteries for another device
8 Other reason (Specify)
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[ASK IF HAS CO DETECTORS, S.19=1:]
Q.25 For what reasons do you have a carbon monoxide detector? (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 It is required by law
2 It makes me feel safe
3 It is helpful in detecting carbon monoxide
4 It came with the residence
5 I own generators/ fuel-burning appliances
6 Other (Specify)
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[ASK IF HAS CO DETECTORS, S.19=1:]
Q.26 To the best of your knowledge, how often should the carbon monoxide detectors in your home be replaced? Would you say… (READ LIST)

1 Never, unless the detector stops working
2 Once every 6 months
3 Once a year
4 Once every 2 – 5 years
5 Once every 6 – 9 years
6 Once every 10 years
7 Once every 10+ years
98 Don't know (DON'T READ)
99 Refused (DON'T READ)

[ASK ALL:]
Q.27 On a scale of 1 to 5, where 1 is "Not at All Necessary", and 5 is "Extremely Necessary", how necessary do you feel it is to have a carbon monoxide detector installed in your home?

1 1 – Not at all necessary
2 2
3 3
4 4
5 5 – Extremely Necessary
98 Don't Know
99 Refused

[ASK IF NO CO DETECTOR, S.19=2]
Q.28 Please tell me what are some of the reasons you don't have a carbon monoxide detector installed in your home. (PRECODED LIST. DO NOT READ, SELECT ALL THAT APPLY)

1 Don't think I need one
2 Did not come with residence
3 They are a nuisance
4 They did not or don't work
5 Never got around to replacing previous detectors
6 It is the landlord's responsibility
7 Other reason (Specify)
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[Programming Note: IF NO CO DETECTORS, S.19 = 2, SKIP TO Q32; ELSE, CONTINUE]

NO QUESTION 29

[MODULE 8: CO History]

[ASK IF HAS CO DETECTORS, S.19=1:]
Q.30 In the past 12 months, has your carbon monoxide detector or detectors ever gone off, other than when the carbon monoxide detector was being tested? (DO NOT READ LIST)

1 Yes
2 No (SKIP TO Q.31)
98 Don't know (SKIP TO Q.31)
99 Refused (SKIP TO Q.31)

[ASK IF Q30=1, "Yes":]
Q.30a Thinking of the last time your carbon monoxide detector went off, how did you react when you heard the detector? (DO NOT READ LIST, SELECT ALL THAT APPLY)

1 Left the house
2 Called the fire department
3 Ventilated home (opened windows, door, used fan, etc.)
4 Unplugged or disconnected it
5 Reset it
6 Removed battery
7 Other action (specify)
8 Don't remember [EXCLUSIVE]
98 Don't know [EXCLUSIVE]
99 Refused [EXCLUSIVE]

[ASK IF HAS CO DETECTORS, S.19=1:]
Q.31 Do you know how to… (DO NOT READ RESPONSE OPTIONS)

a. Install a carbon monoxide detector?
b. Maintain a carbon monoxide detector in good working order?

[Response Options]
1 Yes
2 No
98 Unsure
99 Refused

[ASK ALL:]

Q.32 In the past 12 months, were you aware that any of your friends, relatives, neighbors, or coworkers experienced… (DO NOT READ RESPONSE OPTIONS)

a. An accidental fire?
b. A carbon monoxide incident? (e.g., effects of carbon monoxide poisoning)

[Response Options]

1 Yes
2 No
98 Unsure
99 Refused

[MODULE 9: Fire Safety Sources]

[ASK ALL:]

Q.33 In the past 12 months, have you looked for any information about either fire safety or carbon monoxide safety, or not? (DO NOT READ LIST)

1 Yes
2 No (SKIP TO Q.36)
98 Unsure (SKIP TO Q.36)
99 Refused (SKIP TO Q.36)

[ASK IF Q.33=1, "Yes":]

Q.34 Where do you obtain information about fire safety? (READ LIST ONE AT A TIME) (SELECT ALL THAT APPLY)

1 TV news, or radio
2 Internet search engines like Google
3 Family or friends
4 Community or religious organizations
5 Social media like Facebook
6 Local fire department
7 Other (Specify) (DON'T READ)
8 None of these (DON'T READ) [EXCLUSIVE]
98 Don't know or remember (DON'T READ) [EXCLUSIVE]
99 Refused (DON'T READ) [EXCLUSIVE]

[ASK IF Q.33=1:]

Q.35 Where do you obtain information about carbon monoxide safety? (READ LIST ONE AT A TIME) (SELECT ALL THAT APPLY)

1 TV news, or radio
2 Internet search engines like Google
3 Family or friends
4 Community or religious organizations
5 Social media like Facebook
6 Local fire department
7 Other (SPECIFY) (DON'T READ)
8 None of these (DON'T READ) [EXCLUSIVE]
98 Don't know or remember (DON'T READ) [EXCLUSIVE]
99 Refused (DON'T READ) [EXCLUSIVE]

[ASK ALL:]

Q.36 How often do you or another member of the household cook at home using a stove or oven? Does a member of this household cook… (READ LIST)?

1 Never
2 A few times per year
3 A few times per month
4 A few times per week
5 Every day
98 Don't know (DON'T READ)
99 Refused (DON'T READ)

NO QUESTION 37

[ASK IF SHORT STUDY PARTICIPANT:]

Q.38 Please tell me how you would evaluate your home fire safety. Would you say it is… (READ LIST)

1 Not at all safe
2 Slightly safe
3 Moderately safe
4 Mostly Safe
5 Very safe
98 Don't know (DON'T READ)
99 Refused (DON'T READ)

[ASK ALL:]

Q.39 **(OBSERVE)** Time survey questions end: ___ (hh:mm AM/PM)

[Programming Note: Modules 10a – 16 (Q.40-84) for Full Study Participants Only; Short Study Participants SKIP to Module 17 (Q.85)]

[MODULE 10a: Alarm Testing]

[Interviewer note: Reintroduce team member who will conduct alarm test and hand them the tablet to continue the interview.]

"Now we'd like to test your detector(s) to make sure that they are working properly."

[ASK ALL:]

Q.40 **(INTERVIEWER READ)** How many floors (levels) are there in your home? Please include the basement and finished attic, if you have one.

[INTERVIEWER INSTRUCTIONS] For an apartment, treat the entire apartment as one floor unless more than one level. DO NOT report the number of floors in the apartment building.

[Dropdown Options:]

1 1
2 2
3 3
4 4
5 5
6 6 or more

[ASK ALL:]

Q.41 **(READ)** Would you show me the (first/next) detector?

[INTERVIEWER NOTE] Please ensure to have all materials are available and prepared for testing. If there are no more alarms to test, select "No more alarms available for testing" to skip the alarm testing portion. Q41 through Q79 asked/conducted for each smoke alarm and each CO alarm.

1 Begin inspection
2 No more alarms available for testing (SKIP TO Q.80)

[ASK IF Q.41=1:]

Q.42 **(READ)** What level of the home are we currently on? (NOTE: For an apartment, treat the entire apartment as first level unless more than one level. Do NOT report what floor of the building it is on.)

1 Basement
2 First level
3 Second level
4 Third level
5 Fourth level
6 Fifth level
7 Sixth level
8 Finished attic
9 Other (Specify)

[ASK IF Q.41=1:]

Q.43 **(OBSERVE)** What area or room of the home are you currently in?

1 Inside the bedroom
2 Hallway outside of bedrooms
3 Hallway - other
4 In Family room/Living room
5 In Kitchen
6 In Dining area
7 In Bathroom
8 In Closet
9 In Stairwell
10 In Laundry room /Storage room
11 Other area

[ASK IF Q.41=1:]

Q.44 **(READ)** What type of detector is this? Would you say it is a smoke detector, carbon monoxide detector, both a smoke and CO detector, or you don't know?

1 Smoke detector
2 CO detector
3 Smoke/CO Combined
4 Don't know or other (INSPECT)

[ASK IF Q.44=4]

Q.44a **[INTERVIEWER INSTRUCTIONS]** Please inspect back of detector for manufacturer information - look for name/ type of detector. Please select correct type of detector.

1 Smoke detector
2 CO detector
3 Smoke/CO Combined

NO QUESTION 45

[ASK IF Q.41=1:]

Q.46 **(READ)** For quality control purposes, we'd like to collect three photographs of this detector. Do we have your permission?

1 Yes
2 No
3 Could not take picture

[READ IF Q.46=2, "No":]
"Okay. No problem."

[SHOW IF Q.46=1, "Yes"]

[INTERVIEWER INSTRUCTIONS] Only remove the alarm from the mounting plate to see the back of the alarm, disconnected only the ac pig tail if needed. Do not cut or disconnect any electrical wires connected to the wall or ceiling directly.

Please obtain three photographs including the following items.

Instructions:

1) Press the "Upload" button.
2) Select the camera option.
3) Take picture.
4) Accept picture.

[ASK IF Q.46=1]
Q.46a [IMAGE UPLOAD] Front of detector (to capture image of detector)

[ASK IF Q.46=1]
Q.46b [IMAGE UPLOAD] Back of detector (UL and Manufacturer information)

[ASK IF Q.46=1]
Q.46c [IMAGE UPLOAD] Side of detector (may have a install/replacement sticker)

[ASK Q.41=1, Alarm Testing Being Conducted]
Q.47 **(READ)** How old do you think this detector is? Would you say… (READ LIST)

1 Less than 1 year old
2 1 – 5 years old
3 6 – 10 years old
4 More than 10 years old
5 Don't know (DON'T READ)
6 Refused (DON'T READ)

[PROGRAMMING NOTE: IF Q.44 or Q.44a= "Smoke Alarm" or "Smoke/CO Combined" Continue; ELSE IF Q.44 or Q.44a= "CO", SKIP TO CO TESTING Q.52]

[MODULE 10b: Smoke Alarm Testing]

[ASK IF Q.44 or Q.44a= "Smoke Alarm" or "Smoke/CO Combined:]
Q.48a **(READ)** Is there a kitchen with a stove top on this floor?

1 Yes
2 No (SKIP TO Q.49)

[ASK IF Q.48a=1:]
Q.48b **(READ)** Is this alarm the closest to the Kitchen with a stove top?

1 Yes
2 No (SKIP TO Q.49)

[ASK IF Q.48b=1:]

Q.48c **(OBSERVE)** Approximately, what is the horizontal distance between the stove or cooktop in the kitchen and the closest smoke detector on the same floor? Use measuring tape if necessary.

1 Less than 6 feet
2 6 – 10 feet
3 11 – 20 feet
4 More than 20 feet
98 Don't know

[ASK IF Q.44 or Q.44a= "Smoke Alarm" or "Smoke/CO Combined:]

Q.49 **INSTRUCTIONS ON TESTING SMOKE DETECTOR WITH AEROSOL-SMOKE TEST**

- Warn consumer of loud noise when the smoke detector sounds.
- Use hearing protection, if needed.
- Only disconnect alarms from AC Pig tails. Do not disconnect AC pig tails from other electrical wires in the wall/ceiling.

FIRST SMOKE TEST:

1) Using the aerosol smoke test spray, point tube at detector from a distance of 1 – 2 feet
2) Spray a three second burst of aerosol, and wait 10 seconds
3) If detector sounds, testing is complete.
4) Spray short burst of canned air to accelerate and clear smoke detector

IF NO DETECTOR SOUNDS:

1) Using microfiber cloth, brush alarm lightly clear grille and surface of detector
2) Spray again using aerosol smoke test for 5 seconds and wait 10 seconds
3) If detector sounds, testing is complete
4) Spray short burst of canned air to accelerate and clear smoke detector

(OBSERVE) Did smoke detector sound in response to this smoke test?

1 Yes (SKIP TO Q.51 IF COMBINED ALARM, OR Q.58 IF SMOKE ONLY)
2 No (CONTINUE)
3 Could not test (SKIP TO Q.75)

[ASK IF Q.49=2, SMOKE DETECTOR DID NOT SOUND:]

Q.50 INSTRUCTIONS ON TESTING USING TEST(S) BUTTON

- Warn consumer of loud noise when the smoke detector sounds.
- Use hearing protection, if needed.

1) Read directions on detector for testing function (push and release/push and hold)
2) Press and hold the "Test" button according to directions
3) If detector sounds, testing is complete. Label for collection due to inoperable sensor

(OBSERVE) Did detector sound in response to the smoke test button?

1 Yes (SKIP TO Q.58 – INOPEREABLE)
2 No (SKIP TO Q.53 – BATTERY REPLACEMENT)

3 No test button on unit (SKIP TO Q.53 – BATTERY REPLACEMENT)
4 Could not test (SKIP TO Q.75)

[MODULE 10c: Combination CO/Smoke Alarm Testing]

[ASK IF COMBINATION CO/SMOKE ALARM, Q.44 or Q.44a=3]
Q.51 INSTRUCTIONS ON TESTING COMBINED CO DETECTORS

1) Press and hold the "Test/Reset" button until the detector sounds
2) Release the "Test/Reset" button
3) If detector sounds, testing is complete

(OBSERVE) Did detector sound in response to the second (CO) test button?

1 Yes (SKIP TO Q.58)
2 No (SKIP TO Q.58 – INOPERABLE)
3 No test button on unit (SKIP TO Q.58)

[MODULE 10d: CO Alarm Testing Only]

[ASK IF CO ALARM, Q.44 or Q.44a=2:]
Q.52 INSTRUCTIONS ON TESTING CO DETECTOR ONLY

- Warn consumer of loud noise when the CO detector sounds.
- Use hearing protection, if needed.
- Only disconnect alarms from AC Pig tails. Do not disconnect AC pig tails from other electrical wires in the wall/ceiling.

1) Press and hold the "Test/ Reset" until the detector sounds
2) Place your fingers over the sounder opening and check the power and detector by releasing the "Test/Reset" button.
3) If detector sounds, testing is complete.

(OBSERVE) Did detector sound in response to the CO test button?

1 Yes (SKIP TO Q.60)
2 No (CONTINUE TO BATTERY, Q.53)
3 Could not test (SKIP TO Q.75)

[MODULE 11: Battery Replacement & Retesting]

[ASK IF SMOKE DETECTOR DID NOT SOUND TO SMOKE TEST BUTTON, OR NO TEST BUTTON ON UNIT, Q.50=2 or 3:]
[ASK IF Q.52=2, CO DETECTOR ONLY DID NOT SOUND DURING TEST:]
Q.53 REPLACING/INSTALLING BATTERY

[INTERVIEWER INSTRUCTIONS] You will now attempt to change the batteries on the non-working alarm.

1) Verify the type of batteries the alarm may need and check your inventory.
2) If the smoke detector uses a 10-year seal battery, the battery cannot be replaced. A smoke detector that uses a 10-year sealed battery can be identified if:
    a. The unit does not have a battery door or compartment.
    b. The label states “10-year seal battery” or similar.

(READ) May I put a new battery in this detector to determine whether the detector needs to be replaced?

1 Yes (CONTINUE)
2 No (Label for collection) (SKIP TO Q.58 IF SMOKE/COMBINATION OR Q.60 IF CO ONLY)
3 No – 10-year Seal Battery Present or AC only (Label for collection) (SKIP TO Q.58 IF SMOKE/COMBINATION OR Q.60 IF CO ONLY)
4 No replacement batteries available (SKIP TO Q.75)

[ASK IF Q.53=1, “Yes” TO CHANGING BATTERY AND Q44/Q44a=1” SMOKE” OR “3” COMBINATION]
Q.54 REPLACING/INSTALLING BATTERY

1) Replace or restore batteries in detector
2) Repeat smoke test using up to 3- one second sprays, ten seconds apart with tube against the grill.

(OBSERVE) Did the detector sound in response to this smoke test?

1 Yes (SKIP TO Q.58)
2 No (Label for collection-INOPERABLE) (SKIP TO Q.58)

NO QUESTION 55

[ASK IF Q.53=1 AND Q.44/Q.44a= 2 "CO" OR 3 "COMBINATION"]

Q.56 INSTRUCTIONS ON RETESTING CO DETECTOR TEST BUTTON

1) Press and hold the "Test/ Reset" until the detector sounds
2) If detector sounds, testing is complete.

(OBSERVE) Did detector sound in response to the second test button?

1 Yes (CONTINUE)
2 No (Label for collection) (CONTINUE)

NO QUESTION 57

[PROGRAMMING NOTE: IF Q.44/Q.44a=1" SMOKE" OR 3 "COMBINATION" CONTINUE; ELSE SKIP TO Q.59]

[MODULE 12: DETECTOR CHARACTERISTICS]

[ASK IF Q.44/Q.44a=1" SMOKE" OR 3 "COMBINATION"]

Q.58 **(OBSERVE)** What type of smoke detector is this? Ionization smoke detectors may state that they contain radioactive americium.

1 Photoelectric
2 Ionization
3 Combined photo/ion
4 Combined ion with CO
5 Combined photo with CO
98 Don't know
99 Other (Specify)

NO QUESTION 59

[ASK IF Q.41=1:]

Q.60 **(OBSERVE)** What type of power source does the detector have?

1 Replaceable battery
2 Sealed battery
3 AC Only
4 AC with battery
98 Don't know

[ASK IF Q.41=1:]

Q.61 **(OBSERVE)** What is the manufacture date of the detector?

1 Year [Textbox to record year]
98 Don't know

[ASK IF Q.41=1:]

Q.62 **(OBSERVE)** What is the model number of the detector?

1 Model number [Textbox]
98 Don't know

[ASK IF Q.41=1:]

Q.63 **(OBSERVE)** Is the detector interconnected with other detectors in the home, (i.e., a wired detector), OR is it a standalone wire free detector (i.e., a wireless detector)?

1 Interconnected
2 Standalone
98 Don't know

NO QUESTION 64

[ASK IF Q.41=1:]

Q.65 **(OBSERVE)** Does the detector have strobe lighting for hearing impaired?

1 Yes
2 No
98 Don't know

[ASK IF Q.41=1:]

Q.66 **(OBSERVE)** Is this detector connected to a tactile notification device (bed shaker or pillow shaker) for the hearing impaired or blind?

1 Yes
2 No
98 Don't know

[MODULE 13: BATTERY RELATED]

[ASK IF Q60=1, "Replaceable battery"]

Q.68 **(OBSERVE)** Was this detector found to have a dead battery, (e.g., the old battery was connected but the detector responded to aerosol smoke after battery replacement?)

1 Yes
2 No

[ASK IF Q.60=1-4, "Battery" or "AC"]

Q.69 **(OBSERVE)** Was the detector found without a battery, with battery disconnected, or AC power disconnected?

1 Yes
2 No

[MODULE 14: NON-WORKING DETECTORS]

[ASK IF DETECTOR DOES NOT WORK: SEE APPENDIX II FOR COMBINATIONS:]

Q.70 **(READ)** *"It is important that we determine why detectors don't work. "*

"I would like to collect this detector and send it to the U.S. Consumer Product Safety Commissions lab for analysis to find out why it does not work properly."

(READ) May I collect this detector?

1 Yes
2 No

[ASK IF DETECTOR DOES NOT WORK: SEE APPENDIX II FOR COMBINATIONS:]

Q.71 **(READ)** *"I will need to label this alarm as inoperable/not working. Please do not remove the label. "*

Directions: Place a label from the provided label sheet on the front of the detector (not covering any important information) and record the identification number below.

1 Label number [Textbox]

[SHOWN IF Q.70=2, "No":]

Q.72 [Interviewer] Take an image of the shipping label/ tracking sticker and upload before handing to participant.

(READ) *"That is fine. You may keep the detector today. However, I will still provide you with a new detector, and give you this mailer so you may send your old detector to the U.S. Consumer Product Safety Commission's lab for analysis, if you choose to do so?"*

1 [UPLOAD IMAGE]

NO QUESTION 73

Q.74 **[INTERVIEWER INSTRUCTIONS]**

1) We are only able to provide up to 3 alarms per household.
2) Read script based on availability.

If alarms available*: "We are able to provide a replacement smoke smoke/CO detector based on availability."*

If alarms not available: *"Unfortunately, we do not have any additional alarms to provide based on availability."* (Select option 3 and do not read question text below.)

(READ) Would you like a replacement for this alarm?

1 Yes
2 No, I do not want a replacement alarm (SKIP TO Q.75)
3 No replacement alarms available (SKIP TO Q.75)

[SHOW IF Q.70=1:]
[INTERVIEWER INSTRUCTIONS] Carefully Package detector according to checklist.

[SHOW IF Q.74=1:]
(AFTER DETECTOR HAS BEEN REMOVED/BOX GIVEN, READ):
"Here is a replacement (smoke/CO) detector. I'm going to test it now to be sure it works. If you need any assistance installing the detector, please reach out to your local fire department."

[INTERVIEWER INSTRUCTIONS:]

1) Perform Button Test
2) If detector sounded, give respondent replacement detector.
3) If detector does not sound, select & test another detector.

[MODULE 15: Reporting on Testing]

[ASK IF Q.41=1, Alarm Testing Being Conducted]
Q.75 **(OBSERVE)** Post inspection actions taken: (SELECT ALL THAT APPLY)

1 No action required
2 Battery replaced
3 Installed missing battery
4 Refused battery installation/ replacement
5 No batteries available for replacement
6 Collected detector
7 Advised replacement (AC/ hard wired)
8 Could not provide replacement detector/ Refused
9 Could not test detector

[ASK Q.75=9, "Could not test detector"]
Q.75a If could not test, why not?

1 Could not reach
2 Homeowner would not allow
3 No time
4 Other (Specify)

[ASK IF Q.41=1, Alarm Testing Being Conducted]
Q.76 **(READ)** Are there any other detectors on this floor? This could include smoke detectors or carbon monoxide detectors.

1 Yes
2 No
3 Don't know

[ASK IF Q.41=1, Alarm Testing Being Conducted]

Q.77 **(READ)** What about other floors? Are there any smoke or carbon monoxide detectors on any other floors in this (house/apartment)?

1 Yes
2 No
3 Don't know

[OBSERVE:]

Q.78 **[OBSERVE)** Time: ___ (hh:mm AM/PM)

NO QUESTION 79

[ASK ALL:]

Q.80 [INTERVIEWER] Check the time count for possibility to test additional alarms. If more than 30 minutes out of 60 minutes remain, ask participant to guide you to the next alarm. If there are fewer than 30 minutes remaining, do not test additional alarms. Select No, all alarms have been inspected (Q.80=2).

If time allows, visually verify that there is another alarm to test before making a selection.
Once you select ***"Yes"*** the questions on Alarm inspection/testing will repeat for the next alarm.

Select ***"No, all alarms have been tested"*** If you have verified all smoke and CO alarms have been tested, OR if there is not enough time within the 60 minutes allotted. The system will move on to the next section and you will not be able to collect any additional alarm testing data.

Is there another alarm to test?

1 Yes
2 No, all alarms have been inspected

[Interviewer note/reminder: If respondent asks why you are not testing any additional alarms, explain that to continue testing and complete the remainder of the survey questions will take longer than the allotted 60 minutes. The government approved survey only allows you to be in their home for 60 minutes.

[PROGRAMMING NOTE: END OF ALARM TESTING LOOP. THE LOOP WILL REPEAT FROM Q.41 IF Q.80=1. IF Q.80=2, CONTINUE TO Q.82.][16]

[16] Qualtrics has a "loop & merge" question block programming option that allows you to take a block of questions and repeat them multiple times for a respondent. For the SCOA survey, this loop goes through Q41-80, where Q80 is used to either repeat the block as many times as needed or exit the loop and continue to the next module of questions. This was considered the most efficient way to capture data for multiple alarms tested.

[MODULE 16: DETECTORS]

NO QUESTION 81

[ASK Q.44 OR Q.44a= 1 or 3]

Q.82 Interviewer: Thinking about the smoke alarms that you just tested, did the participant know the location of the smoke detectors in their home?

1 Yes, Knew all of them
2 Yes, Knew at least one, but not all
3 No, knew none of the locations

NO QUESTION 83

[ASK Q.44 OR Q.44a= 2]

Q.84 Interviewer: Thinking about the carbon monoxide alarms that you just tested, did the participant know the location of the carbon monoxide detectors?

1 Yes, Knew all of them
2 Yes, Knew at least one, but not all
3 No, knew none of the locations

[MODULE 17: DEMOGRAPHICS]

[INTERVIEWER READ:] *"Great! To ensure that we interview a broad mix of residents, I have a few brief demographic questions to ask about you and others within the household. It should only take a few minutes of your time."*

[ASK ALL:]

Q.85 How many people live or stay in your household? This can include:

- Anyone who is living or staying here for more than 2 months
- Yourself, if you are living here for more than 2 months
- Anyone else staying here who does not have another place to stay, even if they are here for 2 months or less

Please do not include anyone who is living somewhere else for more than 2 months, such as a college student living away or someone in the Armed Forces on deployment.

1 [Enter number of people]

[ASK ALL:]

Q.86 Thinking of the individual(s) who live here, including yourself, is there anyone… (INSERT ITEM)

a. Under 5 years old
b. 5 to 9 years old
c. 10 to 14 years old
d. 15 to 19 years old
e. 20 to 34 years old
f. 35 to 54 years old
g. 55 to 64 years old
h. 65 years old or older

[Response Options]

1 Yes
2 No
98 Don't know (DON'T READ)
99 Refused (DON'T READ)

NO QUESTIONS 87-90

[ASK ALL:]

Q.91 Thinking of the individual(s) who live here, including yourself, how many are … (INSERT ITEM)

[Only show categories where Q.90=1]

a. Under 5 years old
b. 5-9 years old
c. 10-14 years old
d. 15-19 years old
e. 20 to 34 years old
f. 35 to 54 years old
g. 55 to 64 years old
h. 65 years old or older

[Response Options]

1 [Enter number of people]

[ASK ALL:]

Q.92 What is the highest level of education you have completed or the highest degree you have received? (DO NOT READ LIST)

1 Less than high school, no diploma
2 High school diploma, or high school equivalent (GED)
3 Trade or Vocational school degree
4 Some college, no degree
5 Associate's degree
6 Bachelor's degree
7 Master's degree or higher
98 Don't know
99 Refused

[ASK ALL:]

Q.93 Are you of Hispanic, Latino, or Spanish origin, such as Mexican, Puerto Rican or Cuban? (DO NOT READ LIST)

1 Yes
2 No
98 Don't know
99 Refused

[ASK ALL:]

Q.94 What is your race? (SELECT ALL THAT APPLY)

1 White
2 Black or African American
3 Asian
4 American Indian or Alaska Native
5 Native Hawaiian or other Pacific Islander
6 Some Other Race (Specify)
7 Hispanic/Latino (e.g., Mexican, Puerto Rican, Cuban)
98 Don't know (DON'T READ) [EXCLUSIVE]
99 Refused (DON'T READ) [EXCLUSIVE]

[IF NOT HISPANIC (Q.93=2-99), ASK:]

Q.95 Is anyone in the household of Hispanic or Latino origin or descent? (DO NOT READ LIST)

1 Yes
2 No
98 Don't know
99 Refused

[ASK ALL:]

Q.96 Is anyone in the household deaf or hard of hearing? (DO NOT READ LIST)

1 Yes
2 No
98 Don't know
99 Refused

[ASK ALL:]

Q.97 Does anyone in the household have a physical, mental, or other health condition that has lasted 6 or more months which makes it difficult for them to carry out day to day activities? (DO NOT READ LIST)

1 Yes
2 No
98 Don't know
99 Refused

[ASK ALL:]

Q.98 Do any people in the home smoke cigarettes, cigars, hookahs, or pipes? Please do not include e-cigarettes or vaping devices. (DO NOT READ LIST)

1 Yes
2 No
98 Don't know
99 Refused

[ASK ALL:]

Q.99 In the last 12 months, what was your total household income from all sources, before taxes? Just stop me when I get to the right category. (READ LIST)

1 Less than $15,000
2 $15,000 to under $25,000
3 $25,000 to under $35,000
4 $35,000 to under $50,000
5 $50,000 to under $75,000
6 $75,000 to under $100,000
7 $100,000 to under $150,000
8 $150,000 to under $200,000
9 $200,000 or more
98 Don't know
99 Refused

[OBSERVE:]

Q.100 **(OBSERVE)** Time visit ended: ___ (hh:mm AM/PM)

NO QUESTIONS 101-103

[MODULE 18: INCENTIVE]

[SHOW FULL STUDY PARTICIPANTS:]

Incentive Form

[INTERVIEWER:] Important Note. Do not hand participant gift card until you have verified their information.

(READ) *"Thank you so much for participating in this survey. Your answers will help with improving household fire and CO safety across the U.S. As a token of our appreciation for completing the survey, we would like to provide you with this $50 gift card. Here is a short informational card about how best to use the gift card."*

(READ) "Please verify that the following information is correct"

[INTERVIEWER: Show participant the next page and once all information is confirmed provide incentive card. Have participant sign receipt of card.

[PIPPED IN FIRST & LAST NAME FROM CONSENT – S.25c_b]
[PIPPED IN STREET ADDRESS – S.3f]
[PIPPED IN APT/SUITE # – S.3g]
[PIPPED IN CITY – S.3h], [PIPPED IN STATE – S.3i] [PIPPED IN ZIP CODE – S.3j]

[ASK FULL STUDY PARTICIPANTS:]

Q.104 I acknowledge that all this information is correct and that my $50 gift card for completing the In-home Smoke and CO Study has been provided.

1 [Signature box]

[SHOW SHORT STUDY PARTICIPANTS:]

Incentive Form

[INTERVIEWER:] Important Note. Do not hand participant gift card until you have verified their information.

(READ) *"Thank you so much for participating in this survey. Your answers will help CPSC with improving household fire and CO safety across the U.S. As a token of our appreciation for completing the survey, EurekaFacts would like to provide you with this $10 gift card."*

(READ) "Please verify that the following information is correct"

[INTERVIEWER: Show participant the next page and once all information is confirmed provide incentive card. Have participant sign receipt of card.

[PIPPED IN FIRST & LAST NAME FROM CONSENT – S.25c_F2_b]
[PIPPED IN STREET ADDRESS – S.3f]

[PIPPED IN APT/SUITE # – S.3g]
[PIPPED IN CITY – S.3h], [PIPPED IN STATE – S.3i] [PIPPED IN ZIP CODE – S.3j]

[ASK SHORT STUDY PARTICIPANTS:]
Q.104_F2 I acknowledge that all this information is correct and that my $10 gift card for completing the In-home Smoke and CO Study has been provided.

1 [Signature box]

[ASK ALL:]
Q.105 At a later date, the research team may want to talk further with people who took part in this survey. Would you be willing to talk to them about the survey at a convenient time in the future?

1 Yes
2 No
98 Don't know (DON'T READ)
99 Refused (DON'T READ)

[ASK IF Q.105=1, "Yes":]
Q.106 So that someone can reach you more easily, I just need to confirm your name, best phone number and email address.

1 Name
2 Best phone number
3 Email

[ASK ALL:]
Q.107 **(OBSERVE)** Time visit ended: ___ (hh:mm AM/PM) (GO TO END SCREEN MESSAGE 1)

END SCREEN MESSAGES

Message 1:

[INTEREVIEWER INSTRUCTIONS] Ensure all materials and collected alarms are in possession before leaving. Upload data by consulting technology guide.

(READ) *"Thank you very much for helping us with this study. All responses have been recorded."*

Message 2:

[INTERVIEWER INSTRUCTIONS] Participant is not eligible please thank them for their time and continue to next housing unit. Complete screen out form with appropriate reason for non-participation.

(READ) *"Thank you for answering these questions. Unfortunately, we are not able to continue with this interview. Have a nice day."*

Appendix I: Programed Qualifiers that result in Abbreviated Survey for Participants without Detectors or with Detectors Connected to a Security Alarm System

1. IF S.15= “No” AND S.19= No
2. OR IF S.15= “No” AND S.20= “Yes”
3. OR IF S.15= “No” AND S.21= “Yes”
4. OR IF S.15= “No” AND S.21= “Never has a CO …incident”

5. OR IF S.16= “Yes” AND S.19= No
6. OR IF S.16= “Yes” AND S.20= “Yes”
7. OR IF S.16= “Yes” AND S.21= “Yes”
8. OR IF S.16= “Yes” AND S.21= “Never has a CO …incident”

9. OR IF S.17= “Yes” AND S.19= No
10. OR IF S.17= “Yes” AND S.20= “Yes”
11. OR IF S.17= “Yes” AND S.21= “Yes”
12. OR IF S.17= “Yes” AND S.21= “Never has a CO …incident”
13. OR IF S.17= “Never has a fire …incident” AND S.19= No
14. OR IF S.17= “Never has a fire …incident” AND S.21= “Never has a CO …incident”
15. OR IF S.17= “Never has a fire …incident” AND S.20= “Yes”
16. OR IF S.17= “Never has a fire …incident” AND S.21= “Yes”

Appendix II: Logic resulting in replacement alarm question

1. OR IF Q.50 in the current loop = “Yes” (Faulty sensor, no smoke response but button sounds)
2. OR IF Q.51 in the current loop= “No” (Combination alarm, CO portion not working)
3. OR IF Q.53 in the current loop= “No” (Participant does not want batteries in non-responding alarms)
4. OR IF Q.53 in the current loop = “No- 10-year seal...” (Battery is 10 year)
5. IF Q.54 in the current loop = “No” (Battery was replaced, and the detector did not respond to smoke)
6. OR IF Q.56 in the current loop = “No” (Battery was replaced, and the CO detector did not respond to button test)

Appendix I. Recruitment Screen Out/Non-Response Form

U.S. Consumer Product Safety Commission (CPSC) Survey on Usage and Functionality of Smoke and Carbon Monoxide (CO) Detectors in Households
Door-to-Door Recruitment Screen Out Capture Form

[MODULE 1: INTERVIEWER QUESTIONS]
[Interviewer Instructions]
Only complete this form if participant is not eligible for the in-home study.

[ASK ALL:]
Q.1 Interviewer: Please complete the required team information.

a. Unique ID (Format: YYYYMMDDHHMM) [Textbox]
b. Date of visit [Textbox]
c. Interviewer Names [Textbox]
d. City [Textbox]
e. State [Drop Down]
f. Zip code [Textbox]
g. Tract # [Textbox]

[ASK ALL:]
Q.2 What is the type of home in which the resident resides?

1 Single Family Detached Housing
2 Single Family Attached Housing (*e.g.,* townhouse, rowhouse)
3 Apartment/Condo
4 Mobile/Other Manufactured Housing
5 Trailer/RV
6 Other (specify)

[ASK ALL:]
Q.3 If interview was not possible, what was the main reason?

1 Participant refused based on concerns over COVID-19 health risks
2 Participant refused for reasons other than COVID-19 health risks
3 Participant refused for unclear or unidentified reason(s)
4 Participant answered “yes” to at least one COVID screening question (symptoms, quarantine, etc.)
5 Refused entry to building
6 No one home
7 Only a minor was home
8 No smoke and CO alarms in the home & did not take short version
9 Alarms connected to security system & did not take short version
10 Participant did not consent to answering survey questions
11 Participant did not consent to alarm testing portion
12 Participant declined Hold Harmless agreement
13 Language barrier
14 Occupant refused entry (Why?): [Textbox]
15 Other (specify): [Textbox]

[ASK ALL:]
Q.4 What is the estimated age of the participant?

1 Under 18
2 18-34
3 35-64
4 65 or older

[ASK ALL:]
Q.5 What is the estimated gender of the participant?

1 Male
2 Female
3 Other

[ASK ALL:]
Q.6 To the best of your ability, identify whether or not the participant is of Hispanic or Latino origins:

1 Yes
2 No

[ASK ALL:]
Q.7 To the best of your ability, identify the race of the participant? (SELECT ALL THAT APPLY)

1 White
2 Black or African American
3 Asian
4 American Indian or Alaska Native
5 Native Hawaiian or other Pacific Islander
6 Some Other Race